



LAN-AD16fx

LAN Data Acquisition System

Data Acquisition via Network. Remote.

The LAN technology of the LAN-AD16fx 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.

PoE. Self-Supplier.

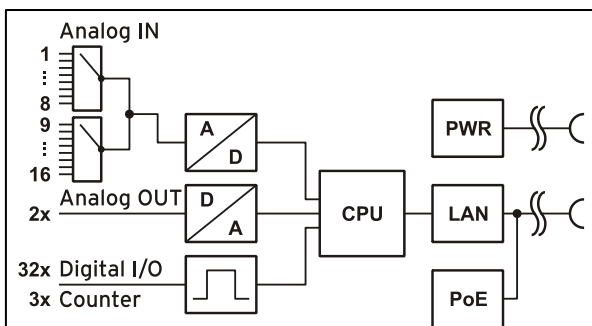
The device can be supplied with power via network (Power over Ethernet). This reduces cabling efforts to a minimum and makes mobile measurements a lot easier.

TCP/IP. Guaranteed Reliable.

LAN-AD16fx 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.

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 devices can be synchronized with each other. If so, all measured data in distributed operation always keep time even with long-term measurements.



Functional diagram

16 Analog IN. 2 Analog OUT.

16 analog inputs can be sampled with 16 bit resolution and 250kHz total sampling rate. The measuring range ($\pm 10V$, $\pm 5V$, $\pm 2V$, $\pm 1V$) is selected via software for each channel separately.

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

32 Digital I/O.

Digital states are recorded or set at 32 digital inputs or outputs. The direction of the two 16-bit ports is set via software

Count and Measure: Pulses. Frequency. Position. Period.

If for the acquisition of large quantities, speed measurement, or determination of position: These are only a few applications the three 32-bit counters of the LAN-AD16fx can be used for. With the pulse time feature, precise measuring e.g. at slowly rotating shafts is possible.

Open for Everyone.

Widely supported: The data acquisition system can be used under Windows[®] XP/7/8/10 as well as under Mac OS X, Free BSD, and Linux. The complete software for installation and programming of the LAN-AD16fx is included for free.

NextView[®]. Try for Free.

The DAQ system is supported by NextView[®], the software for data acquisition and analysis. A fully functional 14-day trial is included with delivery to directly test the functionality of the LAN-AD16fx.

1 Start-up Procedure

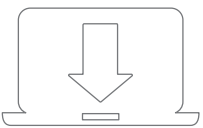
Before starting the device check the safe connection between the housing and earth.

All available software and documentation for the LAN-AD16fx are located on www.bmcm.de/lan-ad16fx-en in the tab **Downloads**.



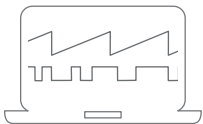
1. Step: Connect up

Set up a connection of a PC or measurement data server via network. The power supply is enabled through the network (PoE), too. Alternatively the LAN-AD16fx can be operated with an external power supply (s. Chap. 2.2). The device assigns itself a suitable link local IP address when connected.



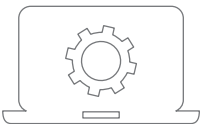
2. Step: Installation LAN-Admin

In order to check and change the network settings, firmware version and connection quality of the LAN-AD16fx, the LAN-admin needs to be installed (s. Kap. 1.1). It can be downloaded on www.bmcm.de/lan-ad16fx-en in the tab **Downloads** in the category **LAN-Admin – Configuration Software**.



3a Step: Measuring with NextView

To be able to use your measurement system with NextView, you just need to download and install the latest version of NextView on www.nextview.de/download. In case you did not buy NextView, request a free of charge trial version when first starting NextView. Find more information about NextView and its installation on www.nextview.de or in the manual on www.bmcm.de/man-nextview.



3b. Step: Measuring with API

In case you want to use the measurement device without NextView, you need to download and install the free of charge programming interface LIBAD4. You can find this on www.bmcm.de/lan-ad16fx-en in the tab **Downloads** in the category **LIBAD – Programming Interface (API)**, too. Find more information on www.bmcm.de/libad-en or directly in the manual www.bmcm.de/man-libad.

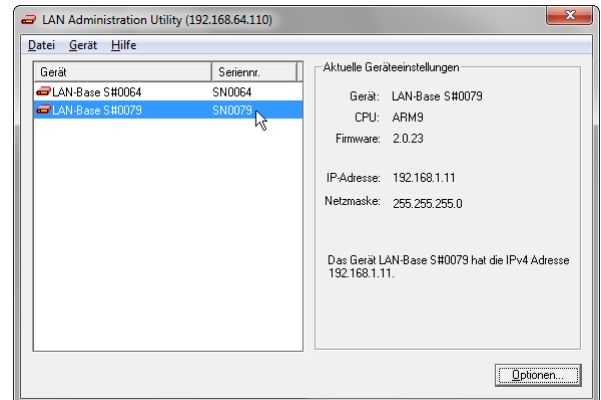
1.1 Configuration with LAN administration utility

The LAN-AD16fx is displayed by the software under the name "LAN-Base". The usage of the configuration software is described in detail in the user's manual [UM-LAN-ADMIN](#).

1.1.1 Operation

In the left window of the program screen, all DAQ systems with a working network connection to the PC are listed displaying their serial number. The LAN-AD16fx is displayed as "LAN-Base".

In the condition as supplied to the customer, the device automatically self-assigns an IP 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 using the automatically assigned configuration. Manual changes should only be done by a network administrator.

1.1.2 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-AD16fx are in the same net, i.e. they have the same network number, to be able to communicate with each other.

1.1.3 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.

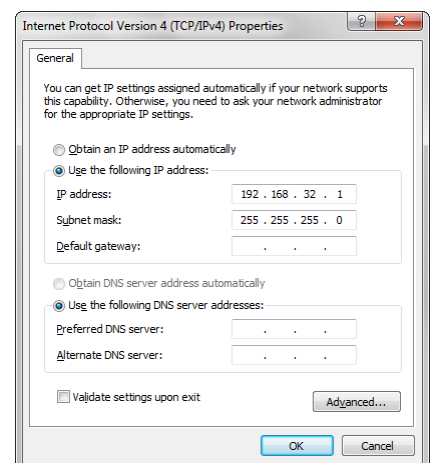
The IP address currently set in the PC is shown in the title bar of the LAN-AD16fx Administration Utility:

| Configuration | Value |
|-----------------------|---------------------|
| IP-Address PC | 192.168.32.1 |
| IP-Address LAN-AD16fx | 192.168.32.2 |
| Network mask | 255.255.255. |

1.2 Synchronisation

In NextView®, LAN-AD16fx devices can do measurement time-synchronously in relation to real-time. The frequency of the sample clock is adjusted by means of a configured NTP server.

Settings for time-synchronous measurements are done in the LAN-AD16fx Administration Utility as well as in NextView® and are described in the user manual [UM-LAN-ADMIN](#).



2 Connections and Pin Assignment



Figure 1

2.1 Netzwerk

The PC/data acquisition server and the LAN-AD16fx communicate via LAN realized with a Twisted Pair connection (RJ45, 100Mbit). Due to automatic MDI/MDIX, using a crossover cable is not necessary. A Twisted Pair cable is available as accessory (*ZUKA-TP*).

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

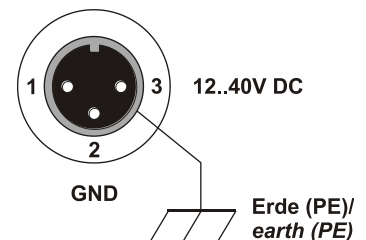


Firewall software installed on the PC might interfere with the operation of the LAN-AD16fx. In this case, please contact your network administrator.

2.2 Power Supply

The DAQ system is supplied with power via Ethernet cable (Power over Ethernet).

If the switch does not feature PoE, the device can be powered with 12-40V DC via the 3-pin DIN plug on the back of the device (see Figure 1). In this case, an external power supply unit *ZU-PW40W* (24V, 1.67A DC) is optionally available.



Connect the shield of the power supply with earth (PE).

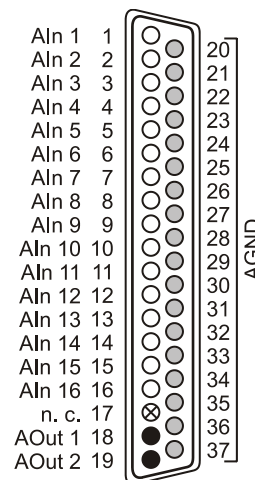
2.3 Analog channels

The 37-pin D-Sub female connector "Analog In/Out" at the back of the device is designed for the connection of the analog inputs and outputs. The input range ($\pm 10V$, $\pm 5V$, $\pm 2V$, $\pm 1V$) is set via software (e.g. in **NextView®**), the output range is $\pm 10V$.

2.3.1 Analog Pin Assignment

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

| D-Sub 37 | Assignment | D-Sub 37 | Assignment |
|----------|------------|----------|------------|
| 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 |



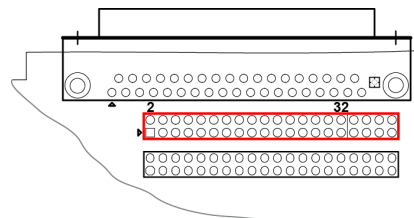
- AIn = Analogeingang / analog input
- AOut = Analogausgang / analog output
- AGND = analoge Masse / analog ground
- ⊗ n. c. = nicht verbunden / not connected

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

2.3.2 Current Measurement

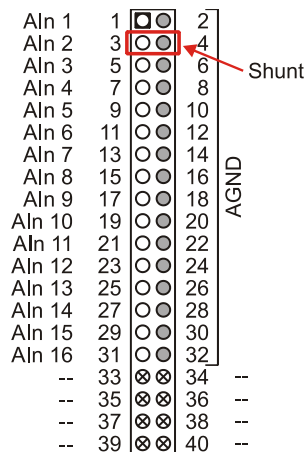
The internal connection of the 16 analog inputs is provided via a 40-way pin connector (see figure on the right, here: current measurement at channel 2) on the LAN-AD16fx board, which, for example, can be used to connect current shunts (*ZU-CS250R* available as accessory).

The following table shows the pin assignment of the 40-way pin connector:



Remove all cables from the device (especially network and power supply cable) before opening the housing.

| Pin. | Assignmen | Pin | Assignmen |
|-------------------|-----------|---------------------|-----------|
| 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

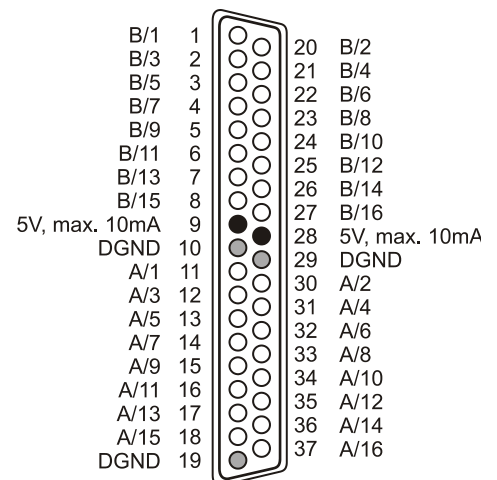
2.4 Digital Channels and Counters

The LAN-AD16fx features two digital ports with 16 inputs or outputs each. The lines are bidirectional and set in groups of eight. Additionally integrated are three counters (quadrature decoders) for pulse, frequency, position, or pulse time measurement.

2.4.1 Digital Assignment

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

| D-Sub 37 (Digital In/Out) | Assignment (Port/Bit) | D-Sub 37 (Digital In/Out) | Assignment (Port/Bit) |
|------------------------------|--------------------------|------------------------------|--------------------------|
| 11 | A/1 | 1 | B/1 |
| 30 | A/2 | 20 | B/2 |
| 12 | A/3 | 2 | B/3 |
| 31 | A/4 | 21 | B/4 |
| 13 | A/5 | 3 | B/5 |
| 32 | A/6 | 22 | B/6 |
| 14 | A/7 | 4 | B/7 |
| 33 | A/8 | 23 | B/8 |
| 15 | A/9 | 5 | B/9 |
| 34 | A/10 | 24 | B/10 |
| 16 | A/11 | 6 | B/11 |
| 35 | A/12 | 25 | B/12 |
| 17 | A/13 | 7 | B/13 |
| 36 | A/14 | 26 | B/14 |
| 18 | A/15 | 8 | B/15 |
| 37 | A/16 | 27 | B/16 |
| 10, 19, 29 | DGND | 9, 28 | 5V, max. 10mA |



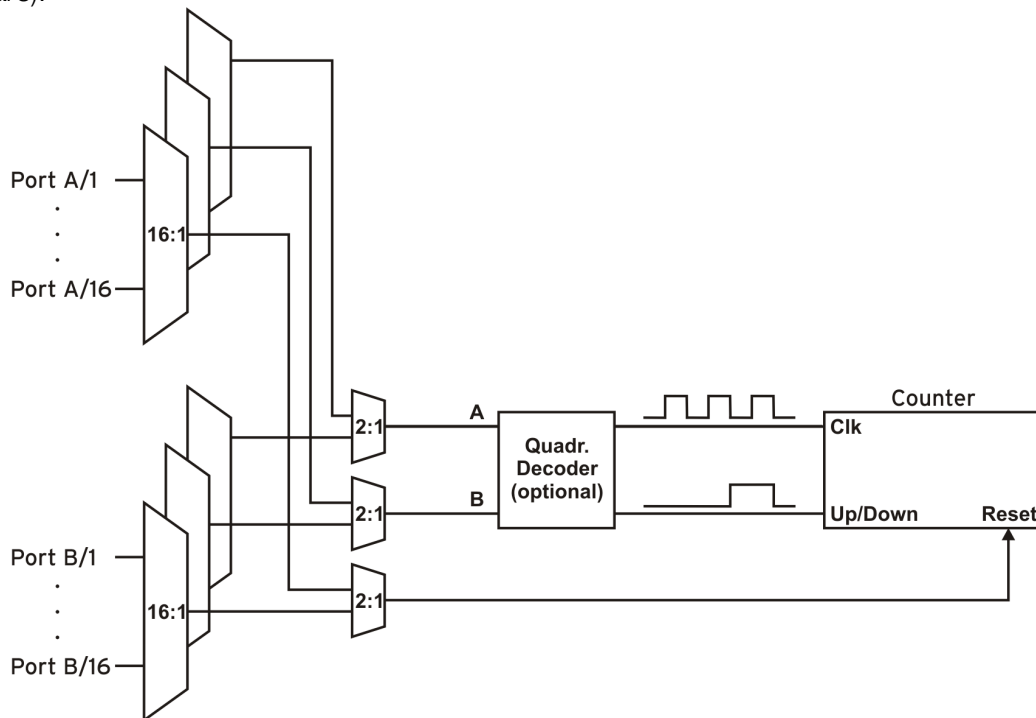
- The digital inputs and outputs are protected by serial resistors. Input voltages beyond the permitted voltage range of 0V..5V can damage the device.
- By default, port A is set to input, port B to output.
- Digital inputs are always read synchronously in time together with the analog inputs.
- Make sure the digital outputs of the device do not drive against the outputs of your signals.

2.4.2 5V Auxiliary Voltage

LAN-AD16fx provides an auxiliary voltage (e.g. for sensor supply) at pin 9, 28 of the D-Sub37 female. The 5V DC output (max. 10mA) 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 will be regenerated.

2.4.3 Counters with Pulse Time Measurement

The LAN-AD16fx features three 32-bit counters allowing the connection of incremental encoders. The counter inputs (A, B, and Reset) can be assigned to any digital lines of the two digital ports (configure by software).



The LAN-AD16fx counts the number of incoming pulses (max. 16MHz) sampled at the connection of signal A. If the maximum counting range is reached, the counter will be reset to the minimum value of the counting range. If the external counter reset is connected, the counter can be reset at any time. In comparison to a counter, the quadrature decoder used to connect an incremental encoder considers the counting direction by decoding a second phase-shifted signal. To activate the counting function, the respective digital lines of the LAN-AD16fx must be assigned to the counter via software.

| Function | Description | max. Pulse | Connection | Dig. Pins | Counting |
|------------------------|--|------------|--------------------|-----------|--|
| Counter | Count ↑ | 16MHz | Signal A | 1 | 0..2 ³² -1 |
| Up/Down-counter | Count ↑↓ | 16MHz | Signal A, Signal B | 2 | -2 ³¹ .. 2 ³¹ -1 |
| Incremental encoder | Count ↑↓ | 16MHz | Signal A, Signal B | 2 | -2 ³¹ .. 2 ³¹ -1 |
| Pulse time measurement | measure time betw. 2 edges temporal resolution 16,67ns | 16MHz | Signal A | 1 | 0 - 71,58s |

Please refer to the relevant documentation of your product for further information 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-AD16fx. Before, however, the relating digital port must have been switched to input or output (see chapter 2.4).

3.1 Interfacing Examples for Digital Inputs

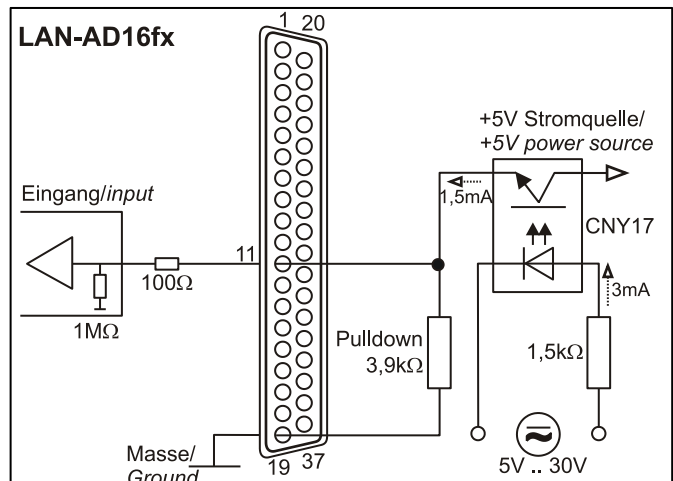
The 3.9kΩ pull-down resistor sets the input to low if no voltage is applied there.

3.1.1 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.

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

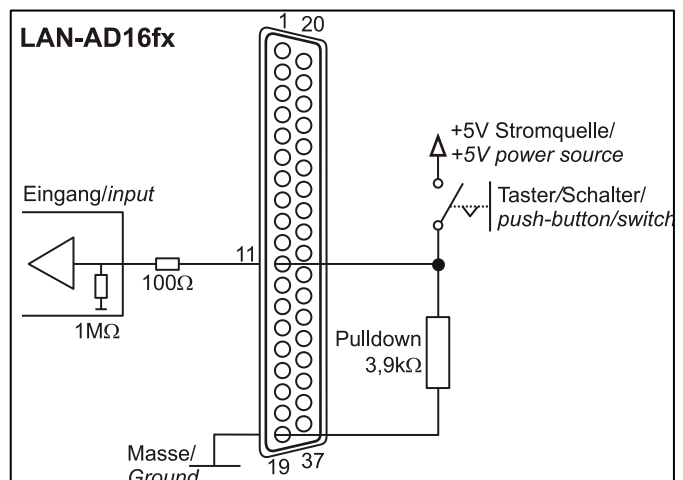
Optocoupler cards featuring 8 inputs are available at bmc.



3.1.2 Connecting a Push-Button / Switch

Please make sure to use a push-button with debounce protection, because otherwise several pulses might be recorded.

The 3.9kΩ pull-down resistor is absolutely necessary to create a defined low signal!



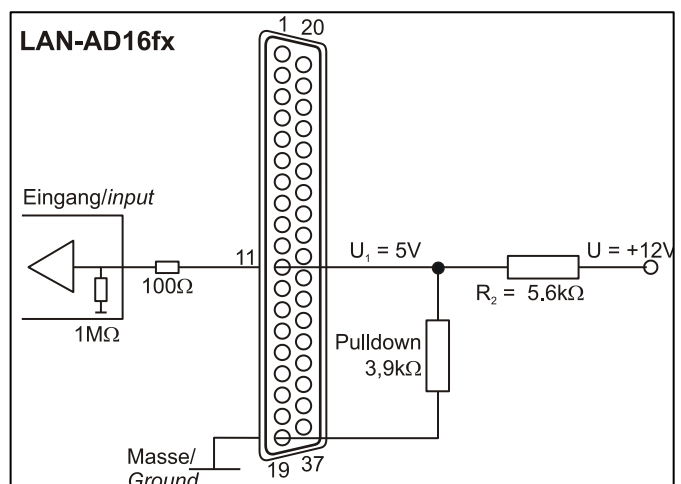
3.1.3 Connecting a Voltage Divider

If connecting a DC voltage higher than 5V, a voltage divider must be used so that 5V at the maximum are applied at the device input. Exceeding the 5V input voltage might cause damages to the device.

The relation between the two resistors to be used is calculated with the following formula:

$$U/U_1 = (R_1 + R_2)/R_1$$

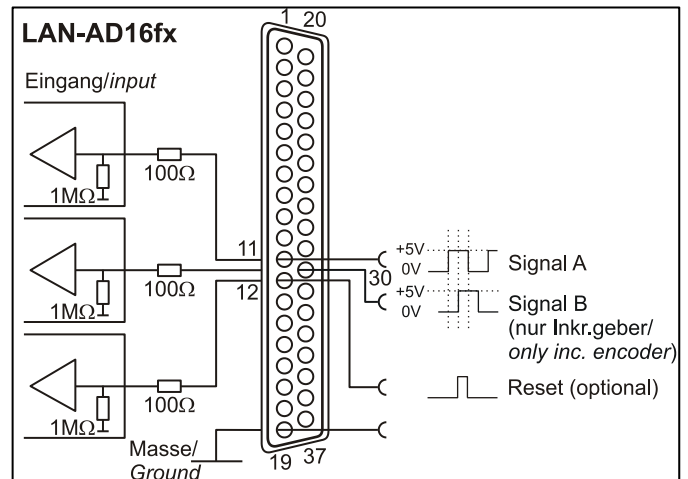
Input voltages less than 5V are also sufficient (*high* ≥ 3V).



3.2 Interfacing Examples for Counters or Incremental Encoders

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

Make sure to configure the relating digital lines as input and to assign them to the counter.



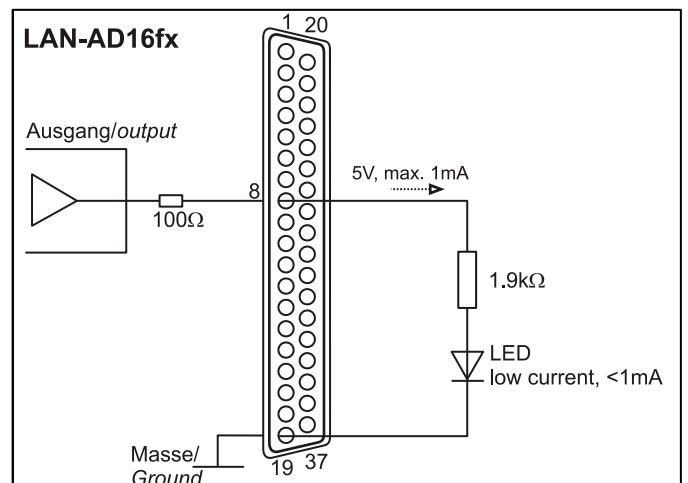
3.3 Interfacing Examples for Digital Outputs

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

3.3.1 Connecting an LED

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

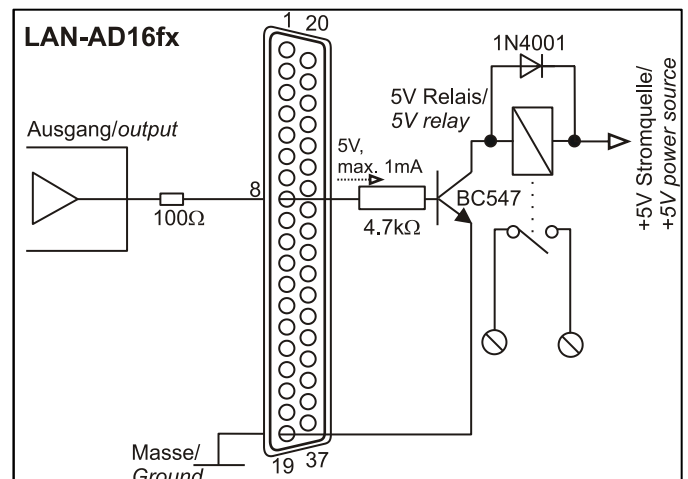
Please also observe the total current listed in the technical data (see chapter 0).



3.3.2 Connecting a Relay

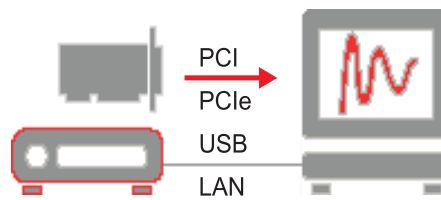
A connected relay is ideal to switch higher currents. Since the field coil of the relay requires a higher current than provided by the measurement system at one line, a transistor is connected ahead.

Relay cards featuring 8 outputs are available at bmcm.



4 LAN-AD16fx and NextView

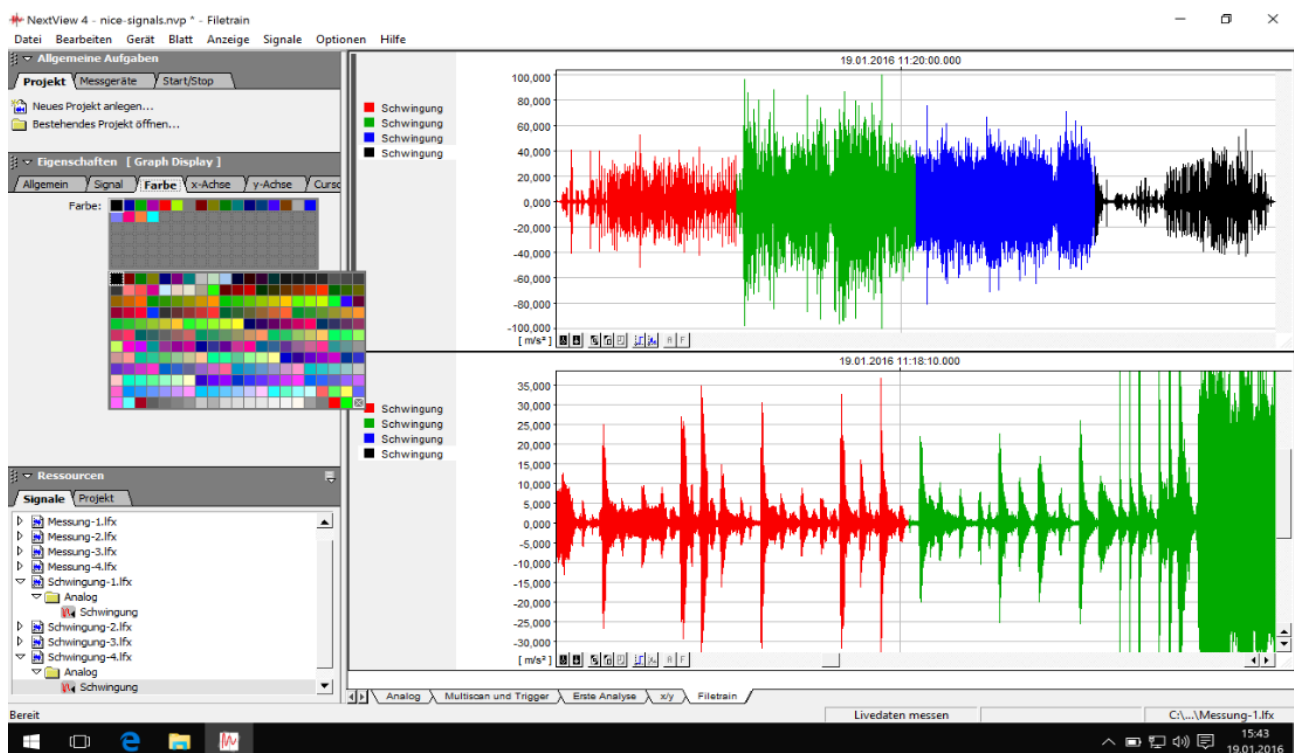
DAQ systems
Acquisition of measuring data



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- configure, scan, visualize, record, analyze, document in one software
- no programming skills required
- for further information visit : www.nextview.de



5 Important Notes for Using the LAN-AD16fx

- The device is only suitable for extra-low voltages - please observe the relevant regulations! Only use the device with housing closed. 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-pin 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. $\pm 10.24\text{V}$) than the indicated measuring ranges so that overranges can be recognized.
- 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.

6 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 // Noise: | ±10V // ±5 LSB | ±5V // ±7 LSB | ±2V // ±8 LSB | ±1V // ±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 device 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: | 2x 16 lines (bidirectional, set in groups of 8) |
| Counters: | 3x 32-bit counters with opt. counter reset, operating mode: counter, up/down counter, quadrature decoder for incremental encoder, pulsetime measurement (temporal resolution 16,67ns), connect at any digital inputs |
| Level: | CMOS/TTL compatible (low: 0V..0.7V; high: 3V..5V) |
| Resistance R _i // Output current: | 100Ω // 0.5mA |

• General Data

| | |
|--|---|
| Power supply: | via network (Power over Ethernet) with switch featuring PoE; otherwise externally: +12..40V DC, typ. 3W, max. |
| Connections analog // digital: | all channels at a 37-pin D-Sub female at the device back // front |
| LAN connection: | Twisted Pair RJ45 socket, 100Mbit, , automatic MDI/MDI-x detection |
| 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 mm // IP30 |
| Delivery: | device in aluminum housing, 3-pin DIN connector |
| Available accessories (optional): | power supply unit ZU-PW40W, current shunt ZU-CS250R, gender changer ZU37SS, connecting cables ZUKA37SB, ZUKA37SS, ZUKA-TP (Twisted Pair), D-Sub plug ZUST37, 3-pin DIN socket ZU3DIN, connector boards ZU37BB/-CB/-CO, DIN rail set ZU-SCH1, waterproof housing ZU-PBOX-LAN |
| Warranty: | 2 years from date of purchase at bmcm, claims for damages resulting from improper use excluded |

• Software

| | |
|-----------------------------------|--|
| Software free of charge download: | LIBAD4 SDK for C/C++ programming on Windows XP/7/8/10, Mac OS X, Unix (FreeBSD, Linux); trial version of the measuring software NextView® to test and operate the hardware; configuration software LAN-Admin |
| NextView® (optional): | professional software (versions: Professional, Lite) for the acquisition and analysis of measurement data on Windows- 8/10 |