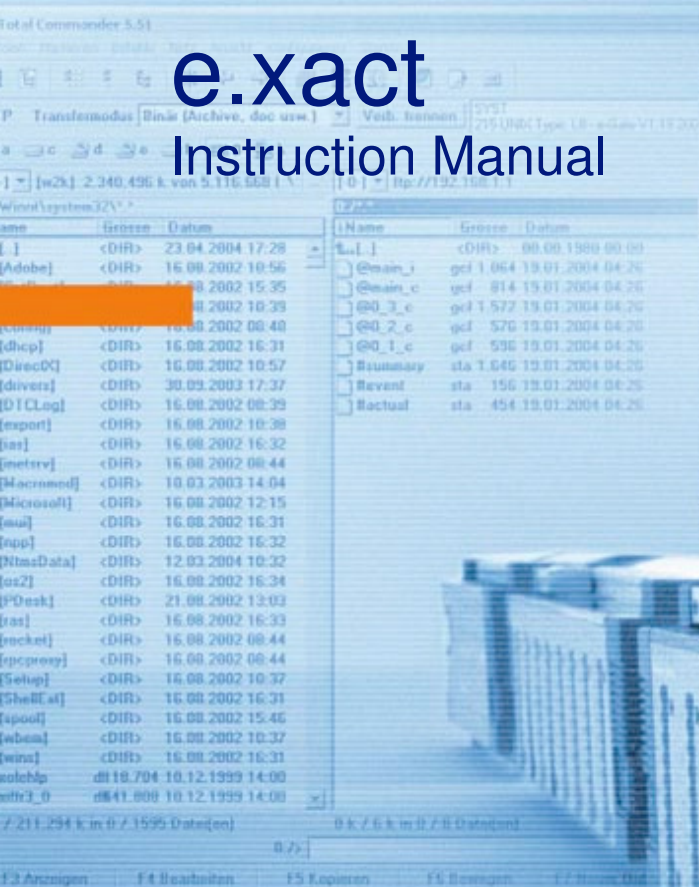


# e.xact

## Instruction Manual





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## 1. ABOUT THIS MANUAL

This manual describes the installation and setup of the **Data Acquisition Module e.xact** from Gantner Instruments Test & Measurement GmbH. The e.xact module is a concentrator terminal with integrated measurement capabilities.

The following information can be found in this manual:

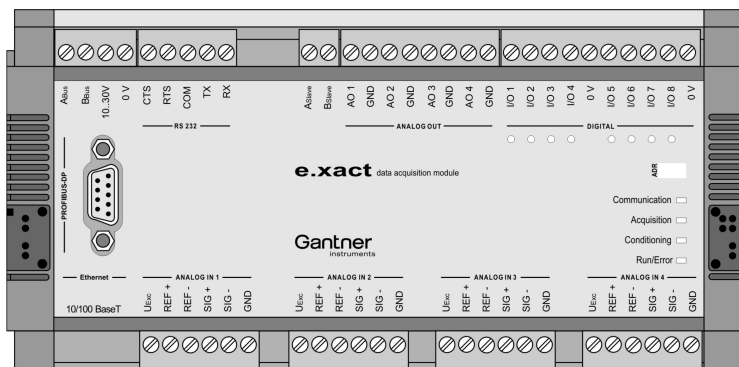
- Description of the e.xact system with detailed information on the hardware and module features.
- A start-up guide which describes how the e.xact is put into operation.
- Installation description of the e.xact and how the module is connected to the power supply and bus lines.
- Description of the different types of measurement of the e.xact.
- An introduction on how the e.xact modules are configured with the Configuration Software e.commander. This software has an integrated help including a detailed description of the configuration process.
- Introduction into the software e.con, which is used to define the functionality of an e.xact.
- Technical specifications of the e.xact.



## 2. SYSTEM DESCRIPTION

The **Data Acquisition Module e.xact** is a Test Controller, used for the industrial and experimental testing technology, especially for the multi-channel measurement of electrical signals of thermal or mechanical data at test beds and test sites.

The e.xact provides the advantages of a remote structure and at the same time high precision, dynamic and flexible PAC (programmable automation controller) functionality. Four fast analog inputs and four analog outputs as well as the possibility to define conditioning, combinations, control functionalities, sequencing, mathematical calculations and data logging independently are available. The unit provides eight configurable digital in- and outputs for thresholds, alarms, taring, trigger, aso. as well as an 8 MByte data memory, which can be divided into different memory depths, logging rates and trigger conditions. Additionally this module has a slave interface to connect up to 30 additional e.blox modules, a Profibus-DP interface and an Ethernet interface.



*Bild 2.1 - Front View of the e.xact Module*

The following instruction will show the simple setup of an e.xact system:

1. Installation, chapter 3.1
2. TCP/IP-Setup, chapter 3.4
3. Sensor connection and configuration, chapter 4
4. Read online measurement values, chapter 3.8 and measurement buffer, chapter 3.9
5. e.con application (optional), chapter 3.10

For several applications the system will be connected to a superior system. Therefore the e.xact provides several interfaces such as the Profibus-DP (gsd-files are available), Modbus TCP/IP and it can be connected to any SCADA package using one of the standardised interfaces.

For more details on the e.commander software please refer to chapter 3.2

The examples on the next two pages show a variety of possible applications of the e.xact.

**Dyno Control**

The module e.xact acts as a 3 PID combined controller for brakes used in engine test beds. Various set-up settings can be performed by digital input, connected MMI/DCS via Profibus/Modbus or PC via Ethernet.

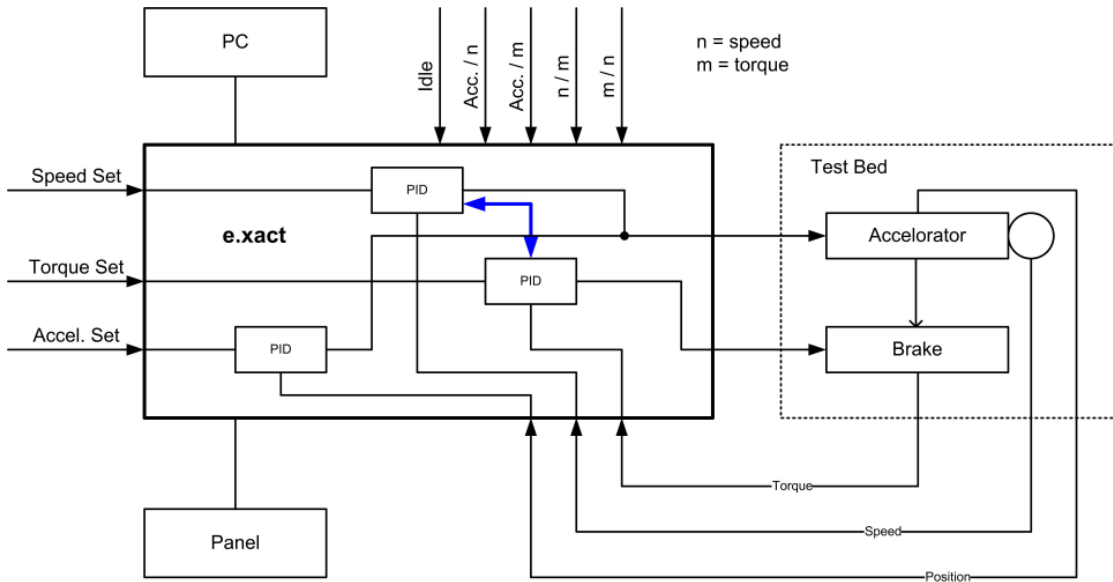


Figure 2.2 - Example Application for an e.xact (Dyno Control)

The loop cycle for data acquisition and analog output is 2,5 kHz. The PID controller's loop cycle is 1 kHz. With the e.con programming software the functionality can be adapted to the required need of the application. The result is a highly flexible solution for evaluating  $\alpha$  vs. speed,  $\alpha$  vs. torque, speed vs. torque etc.

**Test Stand for Hydraulic Components**

The test profile (time dependent pressure load) will be generated from the e.xact and it is provided to an actuator. The pressure p1 and p2 as well as the relevant displacements s1 and s2 of the valve have to be recorded to get a displacement/pressure diagram. The pressure p1 is also being used to control the PID controller in the e.xact.

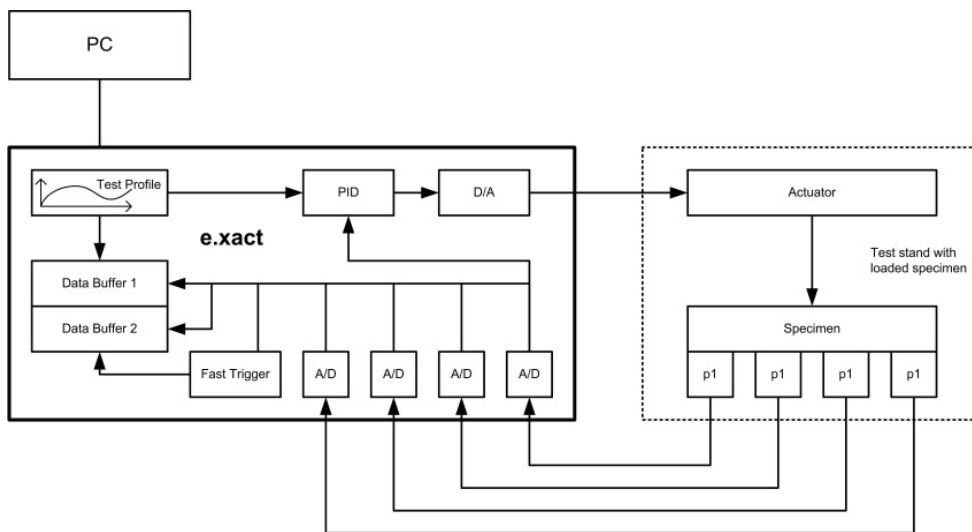


Figure 2.3 - Example Application for an e.xact (Test Stand for Hydraulic Components)

During the total test run the data storage 1 will record the measurements with a sample rate between 100 and 1000 samples/sec, controlled by the profile generator. If one of the measurements exceeds the preset limits, data storage 2 will record the signals for a period of 10 sec at a sample rate of 2500 sample/sec. After the test, the whole test file will be loaded to the PC.

### Dynamic Controlling of the Centricity of a Moulding Press

To get a constant high quality at moulding presses the force in all columns has to be measured and controlled dynamically. An online calculation of the resulting force and the coordinates of the centre have to avoid a non-centric pressing. An alarm management controls the tolerance limits and initializes the hydraulic pressure balance. Each single force, the resulting force and the x/y coordinates are stored and can be used for statistical process control.

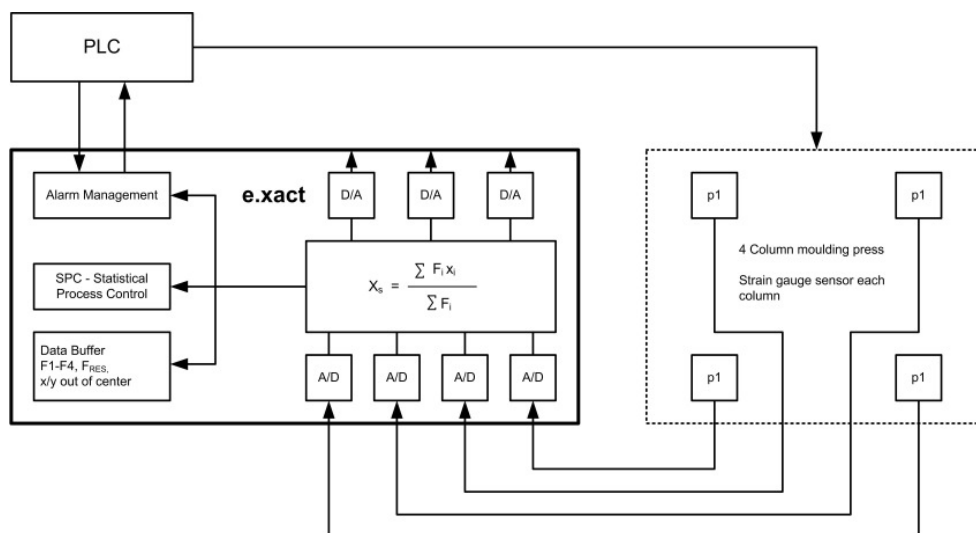


Figure 2.4 - Example Application for an e.xact (Dynamic Controlling of the Centricity of a Moulding Press)

The dynamic online centre monitoring can also be used at loading processes with aircrafts, at tilt protection on platforms or in other construction applications.

### 3. START-UP

This chapter describes how the module e.exact is set into operation, the way it is set-up and which way measurement values can be read by using the configuration software e.commander.

The chapter will just give a short introduction so it is possible to check the correct function of the e.exact module. Detailed information on the installation, set-up, the e.commander and e.con software can be found later in this manual.

In order to work with an e.exact module you need the following parts:

- e.exact module
- Configuration software e.commander
- Automation software e.con (optional)
- RS 232 connection cable ICL106 which is delivered with the e.exact module (if the IP address of the e.exact has to be changed set)
- Ethernet cable, cross wire for direct connection to PC or normal one for connection to a network

#### 3.1 Supply and Connection of the e.exact



Use the e.exact module only within the allowed environmental conditions (see technical data). The protective system is IP 20 (not water-proof) and the allowed temperature range for operation is -20 up to +60°C.

An e.exact module can be connected either to a local network or directly to a PC/laptop via RS 232 and Ethernet. The standard operation is to connect the e.exact to Ethernet for integration into a local network.

After connection the e.exact has to be supplied with a DC voltage in the range of +10 to +30 VDC. The power input of the e.exact is protected with an internal fuse (reversible) against excessive voltage and polarity connecting error. The power supply cables are connected to the screw terminals "10..30V" and "0 V".

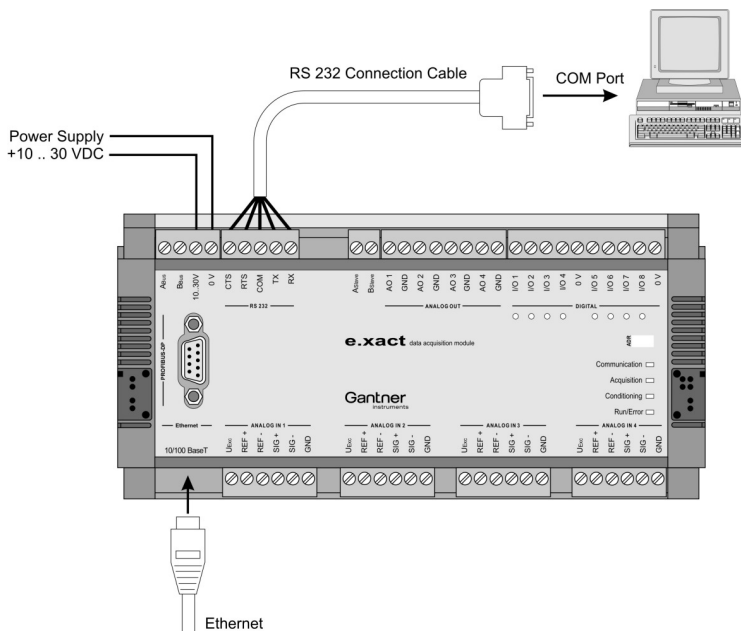


Figure 3.1 - Power Supply and Bus Connection of the e.exact

When turning on the power supply the LEDs of the e.xact will start blinking a few seconds and afterwards the LED "Run/Error" on the front of the e.xact will light up in green colour.

### 3.2 Installation of the Configuration Software "e.commander"

The e.commander software is used to define all settings of an e.xact, like the interface settings and internal settings for the memory (circlebuffer), variables (channels), synchronization and life time. This software also includes the Configuration Software ICP 100 for configuration of e.bloxx measurement modules and the visualization tool Green Eye Writer to evaluate measurement data.

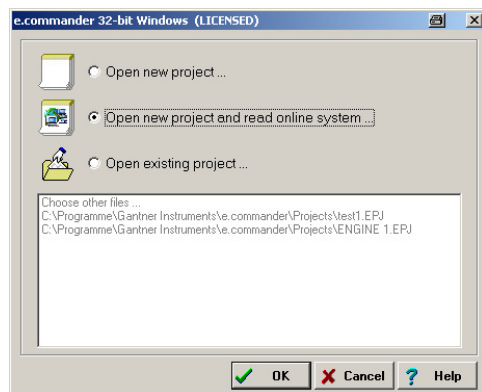
#### **Minimal System Requirements for e.commander**

- PC with Windows 98 or higher
- Min. 20 MByte of free disc space to store all projects and history data
- Connected Ethernet Interface

Install the e.commander software from the installation CD. The installer will guide you through the process. Afterwards start the e.commander. An icon will be generated on the desktop and the e.commander can also be found in the Start-Menu of Windows, section "Programs" -> "Gantner Instruments".

At the first start-up of e.commander you have to select the language you want to use. The language can be changed later on if required. Therefore edit the e.commander ".ini" file in the e.commander directory and change the number of the language (0=English, 2=German). Now the e.commander software has to be licensed, otherwise the e.commander will work in demo mode. The language selection and licensing has to be done only once when starting this software the first time.

Now the following window will open (this will be the first window when starting the e.commander next time).



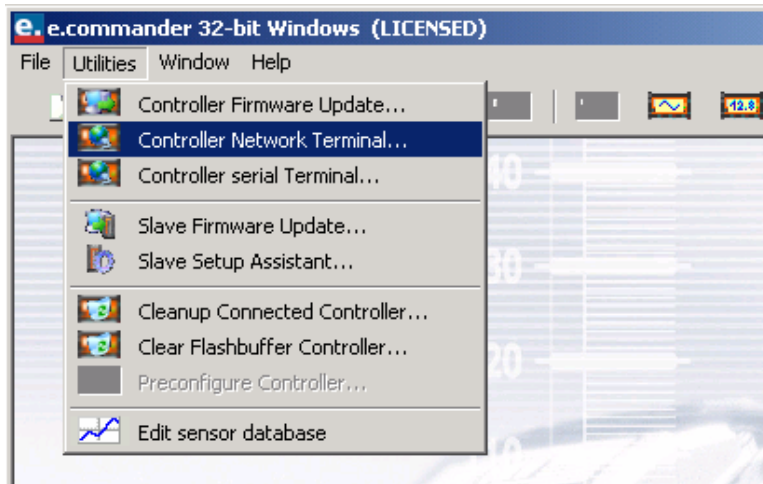
Having connected the e.xact to the local network or to the PC via a cross cable, select the option "Open new project and read online system..." and press "OK". The e.commander will scan the network for connected controllers (see chapter 3.3).

In case you have connected a new e.xact directly to the PC/laptop via the RS 232 interface you can select the option "Open new project" and press the "OK" button to proceed in setting the correct IP address (see chapter 3.4). Otherwise this functionality is being used to define an offline project.

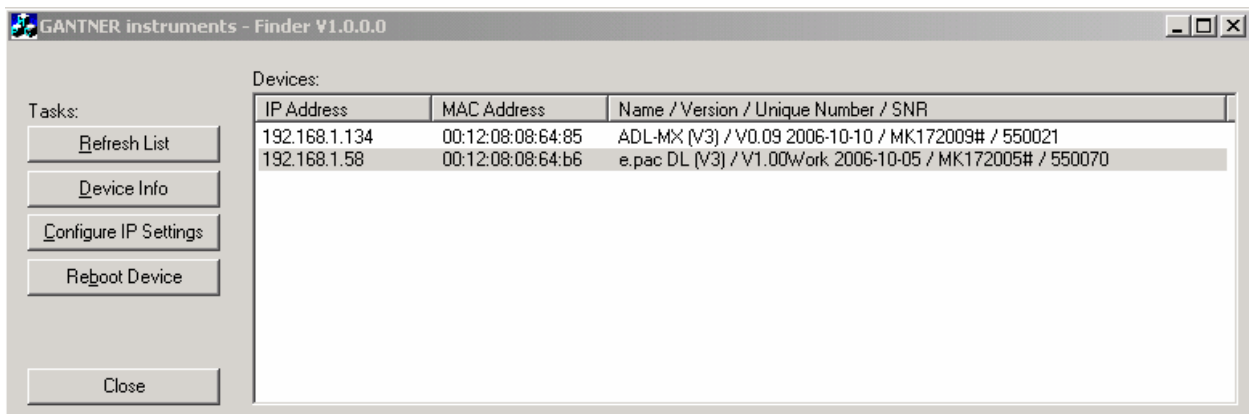
The third possibility (Open existing project...) is being used when changing an existing project offline.

### 3.3 Network Scan for connected controller

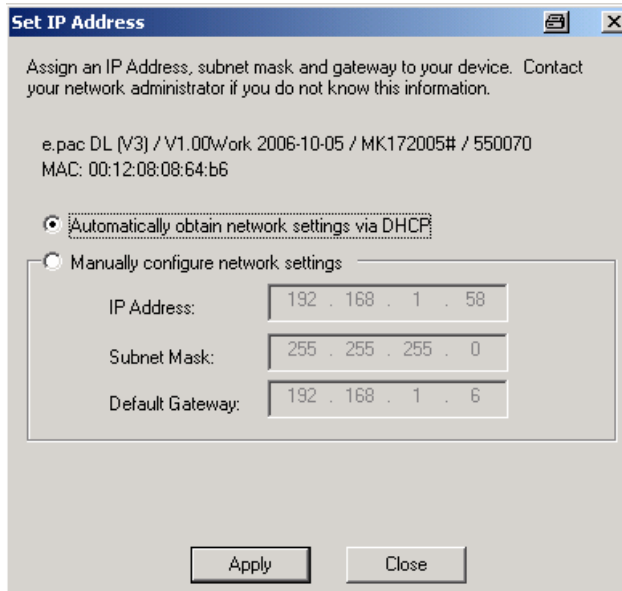
All e.xact units are being delivered with a certain default setting (IP-address). But in some cases it is necessary to handle an e.xact you do not know the settings in detail. Therefore the e.commander provides a very comfortable tool to find the required modules in the network. From the toolbar select Utilities → Controller Network Terminal...



This network scan will find any units being connected to the Ethernet, independent from its IP-Address, its type (e.gate / e.pac / e.reader / e.xact) or if DHCP is activated or not. The scan will provide the following information to be able to adapt the unit for the network it has to be placed into.



To get the required information on the controller / e.xact select the unit and click the button "Configure IP Settings". The window opening enables the user to activate DHCP or to set the correct IP address:

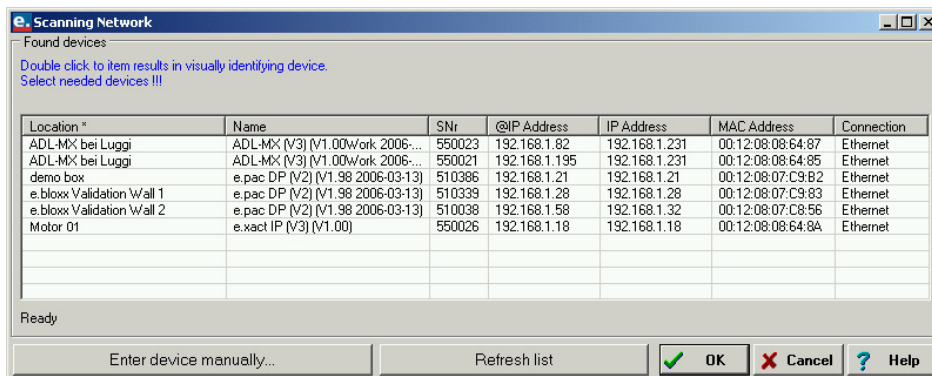


Beside this very comfortable way there is another possibility available to find an e.xact on the Ethernet. This procedure will be described in the following section:

### Finding an e.xact on the Ethernet

Each device on an Ethernet has a unique address. These addresses are used to find and communicate with the corresponding devices. On delivery the address of an e.xact is set to 192.168.1.18 as default, with DHCP set to ON.

After selecting the option field "Open new project and read online system..." in the start-up window the e.commander will search the network for all connected test controllers and show them in a new window.



If the e.xact could not be found there might be one of the following problems:

1. Connection problem: Check that the e.xact is connected correctly to the Ethernet and the power is supplied to the module (LED "RUN/ERROR" is on).
2. The IP address of the e.xact does not fit to the network it is connected to.
3. Wrong DHCP settings: By default the DHCP setting of an e.xact is set to ON. In this case the e.xact will wait for a DHCP server in the network to get an IP address assigned. If there is no DHCP server in the network or the e.xact is directly connected to the PC/laptop via an Ethernet cross-cable, then the DHCP setting must be set to OFF (see chapter 3.4).
4. The IP address of the e.xact conflicts with another device on the network: In this case refer to the next chapter 3.4 to change the IP address.

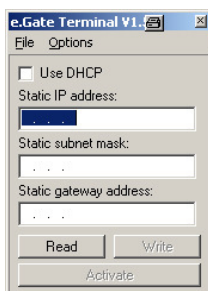
Select the e.xact you have to work with and click "OK". The e.commander will read the configuration of the e.xact module and it will be displayed on the screen (see 3.5).

**Note:** By double-clicking on an e.xact the "RUN/ERROR" LED of the e.xact will start blinking fast for a few seconds. This indicates if this is the system you are going to work with.

#### Setting the Ethernet Address of an e.xact Module via the RS 232 interface:

An e.xact can be connected directly to a COM port of a PC/laptop via the serial RS 232 interface cable that is included in the scope of supply. This way it is possible to change the IP address and the DHCP setting of the e.xact.

In the e.commander software select the menu item "Concentrator Terminal..." in the menu "Utilities". The following window will open.



The e.xact, that is connected at the COM port, will be read and the address information of it will be displayed in the window. If no module is found check the interface settings (correct COM-Port) in the "Options" Menu and click on "Read".

The actual settings of the e.xact will be shown in the window. The settings can be changed here. Enter an IP address which is not yet used in the network the e.xact shall be used later on. Also check if the field "use DHCP" is set correctly. If there is a DHCP server in the Ethernet, where the e.xact shall be used, mark this field. Otherwise keep it unmarked. A DHCP server is used to assign an IP address dynamically to the devices in the network.

**Note:** No leading zeros are to be entered in the IP-address (valid = 192.168.1.18, invalid = 192.168.001.018).



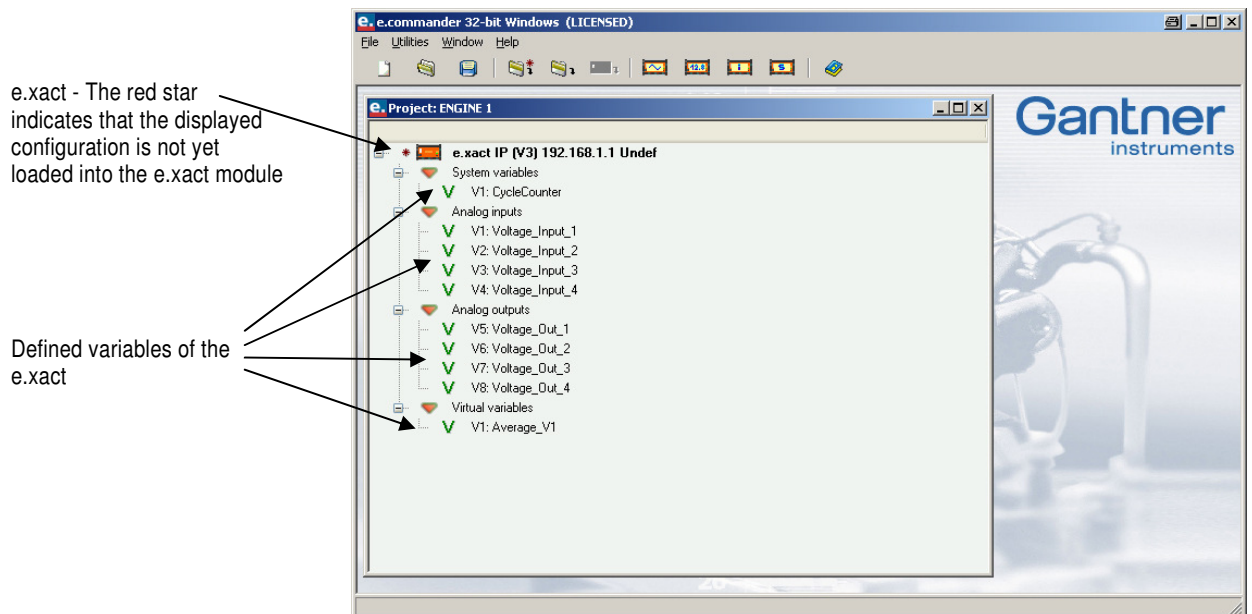
### 3.4 Read Configuration from an e.xact

To see the configuration of an existing e.xact module add the module to a project. Therefore press the right mouse button in the project window and select "Add Online Concentrators..." from the pop-up menu. The e.commander will search the network and display all test controllers on the network in a list as described in the chapter 3.3.

Select the desired e.xact and press "OK".

During the next few seconds the communication between the PC and the e.xact is checked, the configuration of the system is checked to see if the configuration correlates with the hardware, to verify the e.xact, to test the communication aso.

As a positive result of the above mentioned system check the project is displayed in a window with a list of all the defined variables.



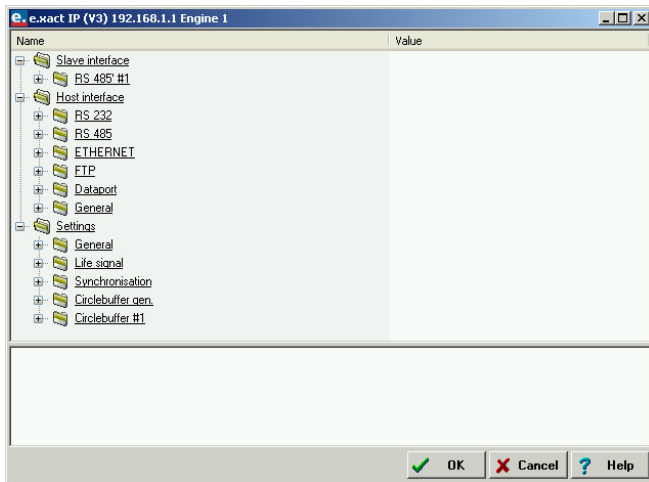
By double-clicking a variable its settings can be changed. See the chapter 5 "Configuration" for more information about that.

### 3.5 Edit a Configuration

It will be distinguished between the configuration of e.xact specific settings and the configuration of the variables of an e.xact.

#### 3.5.1 Configuration of e.xact

To configure the settings of an e.xact double-click onto the e.xact module in the project window. A new window like the following one will open.



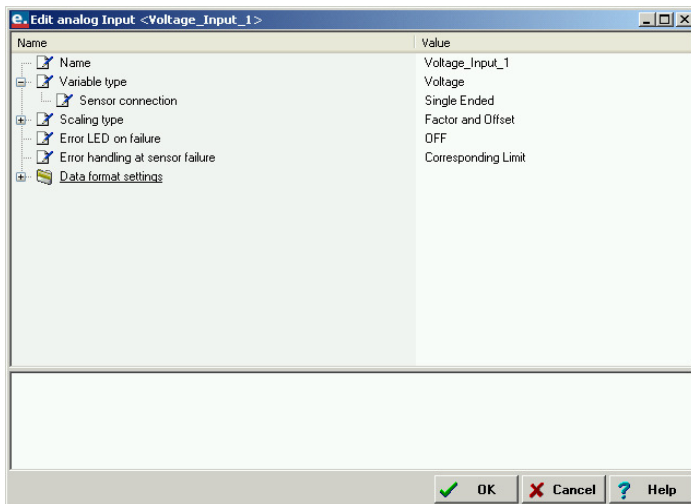
Here all the settings for the e.xact are listed in a tree view. You can change all the settings directly in this window. Beside the interfaces and setting the logging functionalities can be defined as well.

### 3.5.2 Configuration of Variables

With the e.xact three different types of variables (resp. channels) will be displayed. These are the analog variable, the digital variables and the virtual variables. Virtual variables e.g. are being used if one variable should be part of different arithmetic variables,...

To define all the settings for a variable of an e.xact double-click onto the variable in the project window.

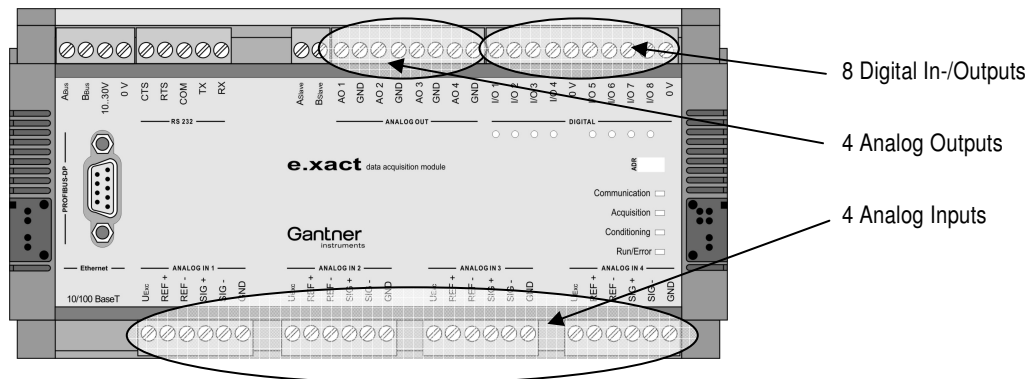
The following configuration window will open:



Here you can define the name and the kind of measurement for the variable and make much more settings like the scaling type, how the logging of the variable shall be handled, the error handling, etc..

## 3.6 Sensor Connection

The measurement sensors and output circuits are connected to the e.xact via the corresponding screw terminals. This has to be done according to the configuration of the e.xact, so that the configuration corresponds to the actually connected sensors.

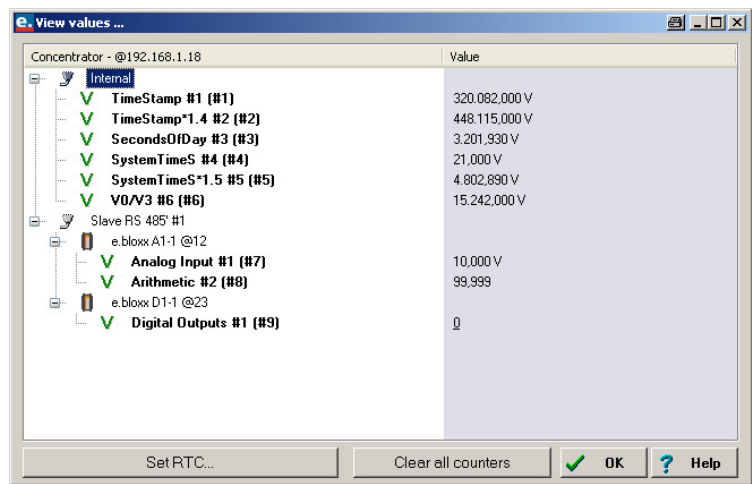


A detailed description how the different types of sensors for the different types of measurement are connected can be found in chapter 4 "Sensor Connection".

### 3.7 Display Measurement Values

After configuration and correct sensor connection the actual values of each variable can be displayed and monitored on screen in real time.

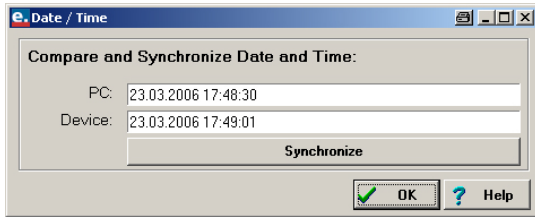
To display the real time values click on the icon "Read Online Values from Concentrator". The e.commander will scan the network and display all connected test controllers in a window. Select the desired e.xact module and press "OK". The e.xact will be read and the defined variables with their actual values will be displayed in a new window.



In the left part of the window all defined variables are listed. On the right side you can see the measurement values of each variable.

With the button "Clear all counters" all counter values of the e.xact can be reset to zero.


Each e.xact has an internal real-time clock for timing information. This clock can deviate after longer time of operation. In order to check the clock press the button "SetRTC". A window will be opened where you see the time of the e.xact and the local time of your PC/laptop.



With the button "Synchronize" you can set the clock of the e.xact to the PC/laptop time. Pay attention that this time is set correctly before you set the RTC of the e.xact.

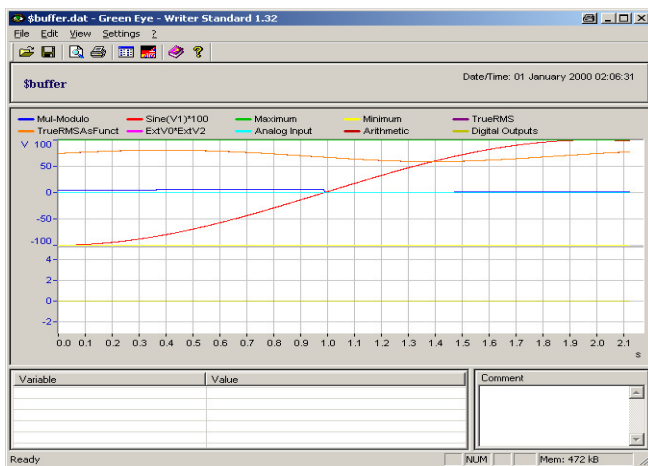
### 3.8 Read Memory

The e.xact saves all measured values in its internal memory, which is a ring buffer. If some data only have to be logged at a reduced speed this has to be programmed with the e.con software.

In order to read out the buffer of an e.xact click on the icon  "Read Online Buffer from Concentrator". The e.commander will scan the network and display all connected test controllers in a window. Select the desired e.xact module and press "OK". The buffer of the e.xact will be read. If you want to store the data locally on the PC/laptop for later evaluated and processing, select "Yes". You will be prompted to enter a file name for the data. If data have to be displayed only, press "No".

**Attention:** Reading data from the e.xact deletes all measurement data – data can be read only once! Therefore always store data if you need them for further processing!

To display data the e.commander starts the integrated tool "Green Eye" and displays data in a new window.



The licensed version of Green Eye Writer provides helpful features such as difference measurement, zoom function, many scaling and design tools etc. With an unlicensed version of Green Eye it is only possible to view the measurement data.

**Note:** A detailed description about the evaluation of measurement with Green Eye can be found in the description of the e.commander software.

### 3.9 e.con (optional)

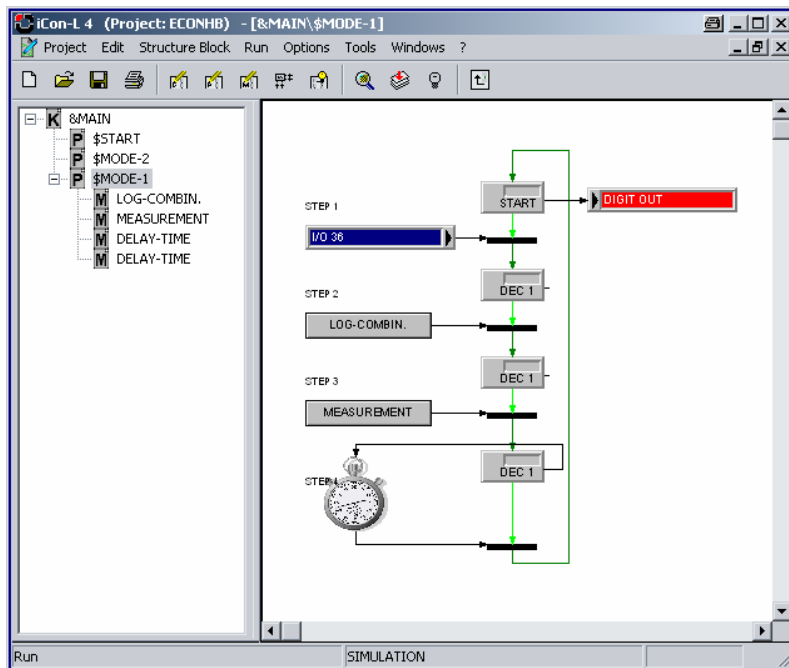
The software e.con is an easy-to-handle graphical programming system to define the functionality of an e.xact module. The programming is done by combining several "function blocks" in certain ways. The whole functionality of these function blocks is defined in the e.xact. The software e.con is just a tool for combining and "wiring" the single blocks.

Programming can be done on a data flow basis (function block language) or by following the control flow (sequences, flow charts). The presentation of graphical blocks follows existing specification and technical languages. Structure blocks permit a hierarchic structure of projects. Linked projects and export mechanisms facilitate the reuse of structure blocks that have been created earlier.

The software e.con combines programming, simulation, testing and running in one tool. Special blocks and additional tools permit online observation of signals and signal tracing as well as run-time measurements.

Detailed information on the e.con software is available in the online help, the e.con introduction manual provides an overview on its possibilities and how to define a project.

The following picture shows a structure for a test cycle.



## 4. SENSOR CONNECTION

### 4.1 General

The e.xact has integrated measurement functionality which provides all together four analog inputs, four analog outputs and eight digital in-/outputs for measurement of sensor signals and output of processed signals. Depending on the type of sensor, which is connected to the analog inputs, various numbers of terminals have to be used. The configuration of the inputs and outputs is done in the configuration software e.commander according to the requirements of the application. The in-/outputs can be configured independently from each other.

#### 4.1.1 Analog Inputs

An analog input collects and processes the signals of voltage, current and bridge sensors. Currently data of standardized and proprietary sensors are stored in the e.xact. The user can input further sensor data. The acquisition of various measuring values with these sensors may be reduced to a few principles of measurement, which are:

- Measurement of Voltage
- Measurement of Current
- Measuring with a Resistance Bridge

For some of these measurements the e.xact offers several types of measurement. Currents up to  $\pm 24$  mA may directly be measured by the e.xact. Measuring the voltage drop at an external shunt can carry out measurements of currents over  $\pm 24$  mA. Resistance measurements can be carried out with resistance bridges in 4- or 6-wire technique. This resistance bridge measuring techniques are also used for measuring other units like pressure (depending on the type of sensor).

The analog inputs are protected against excess voltages.

**Notice:** Overloads of more than  $\pm 10$  VDC will result in false measurement data at the analog input variable.

#### 4.1.2 Analog Outputs

The analog outputs can be used for controlling actors or for regulating purposes. The outputs are defined as voltage outputs and can be set with the e.commander software via the Ethernet or serial interface.

The analog outputs will be assigned by D/A-converter with a resolution of 16 bit. They are DC decoupled from the remaining device by optocouplers.

The possible refresh rate per variable is 10.000 samples/second.

**Notice:** The possible resistance load of the voltage output can be  $>5$  k $\Omega$ .

### 4.1.3 Digital Inputs

The digital inputs of the e.xact can be used for trigger functionality and synchronization purposes. The inputs have an excess voltage protection (transil diodes), which comes into action at approx. 33 V. The maximum permissible input voltage amounts to 30 V. Input voltages between 3.5 VDC and 30 VDC are interpreted as logic LOW ("0"), input voltages lower than 1.0 V as logic HIGH ("1"). The maximum fan-in current amounts to 1.5 mA.

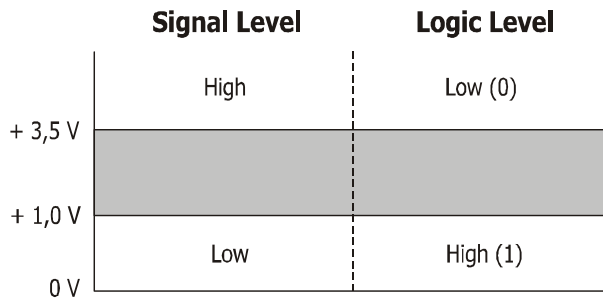


Figure 4.1. - Definition of Signal Levels and Logic Levels

### 4.1.4 Digital Outputs

The Digital Outputs can be used for alarm variables and for synchronization.

The alarm variables are configured with the e.commander software and can be used to provide signals e.g. in case of a sensor break.

As there can be several e.xact modules in one system it might be necessary to synchronize them. Therefore one e.xact module is defined as a master which provides the synchronization signal via a digital output. All other e.xact modules use this output signal as an input signal for synchronization purposes.

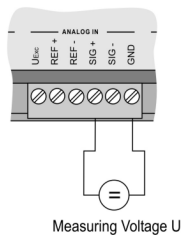
### 4.1.5 Internal Reference Voltage

An internal reference voltage serves to balance the entire analog signal processing automatically.

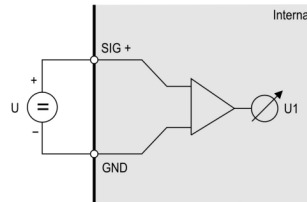
## 4.2 Analog Input

### 4.2.1 Measurement of Voltage

Connection Scheme



Circuit

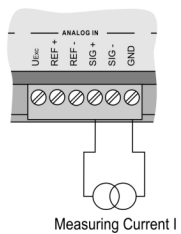


**Figure 4.2.** - Measurement of Voltage - Single-Ended

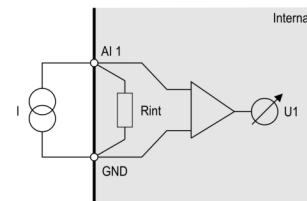
With the single-ended type of measurement the voltage to be measured is connected between the terminal "SIG +" and "GND" of an analog input (ANALOG IN 1 .. 4). The measurement voltage may not exceed 10 VDC.

### 4.2.2 Measurement of Current

Connection Scheme

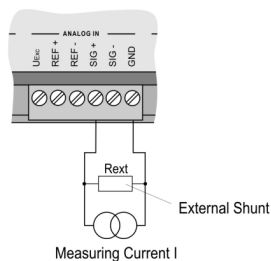


Circuit

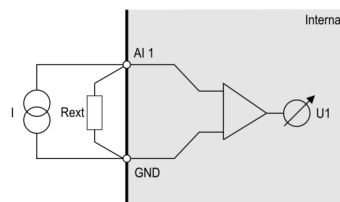


**Figure 4.3.** - Measurement of Current with Internal Shunt

Connection Scheme



Circuit



**Figure 4.4.** - Measurement of Current with External Shunt



For measurements of current with the e.xact the source of electricity is connected to the terminals "SIG +" and "GND" of an analog input (ANALOG IN 1 .. 4). For the measurement, the required load on the current source is regulated by an internal resistor  $R_{int}$  with a value of  $100 \Omega$ . The maximum power of this shunt is limited to  $0.25 \text{ W}$ , resulting in a measuring range of up to  $25 \text{ mA}$  maximum.

If higher currents need to be measured, an external resistor that is connected parallel to the source of current should be used. The power of the external shunt has to be adapted to the source of current to be measured in order to limit the voltage at the analog input to  $\pm 10 \text{ V}$ . The analog input is configured as voltage input. The voltage has to be divided by  $R_{ext}$ .

**Notice:** The precision of the current measurement with external shunt depends on the accuracy of the resistor that is used.

### 4.2.3 Measurement with a Resistance Bridge

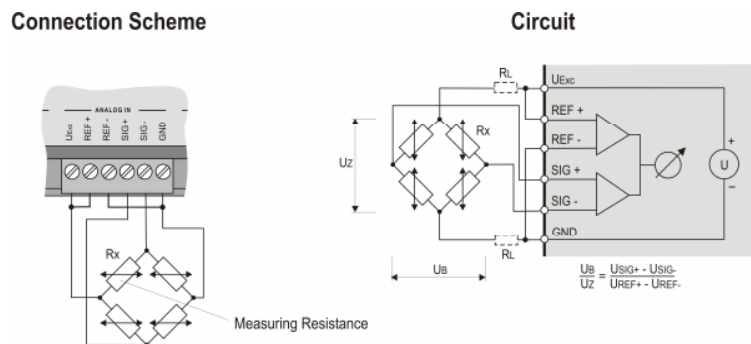


Figure 4.5. - Measurement by a Resistance Bridge in 4-Wire Technique

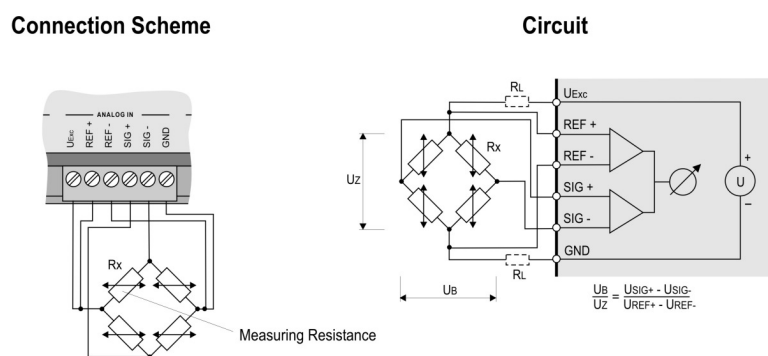


Figure 4.6. - Measurement by a Resistance Bridge in 6-Wire Technique

Bridge connections consist of 2 arms with two resistors each. The resistance bridge is supplied by a voltage output  $U_{Exc}$  at an analog input of the e.xact.

The quantity to be measured with resistance bridges is the relation between bridge voltage  $U_Z$  and the voltage between the two resistance arms  $U_B$  (ratio measurement). The measuring range is  $\pm 5 \text{ mV/V}$ .

**Notice:** At the resistance bridge in 4-wire technique the supply lines cause an additional voltage drop, which leads to a slight diminishing of the bridge voltage. This distorts the measuring result and thus influences the measuring accuracy. Therefore it is necessary to pay attention to use as low-impedance leads as possible to the sensors and to make sure that the leads are well connected with the e.xact and the sensor.  
 With the 6-wire technique the voltage drop of the supply lines don't influence the measurement since the bridge voltage  $U_Z$  is measured with the additional analog inputs REF+ and REF-.

### 4.3 Analog Output

Connection Scheme

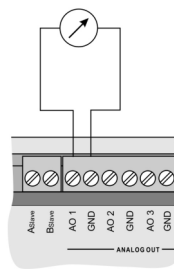


Figure 4.7. - Analog Signal Output

With the analog signal output the value, which is assigned to the analog output variable will be output as a voltage value. Thus the lowest defined value corresponds to the lower limit value of the measuring range and the highest defined value corresponds to the upper limit value of the measuring range.  
 The actualizing rate of the output values is 10.000 samples/second.

### 4.4 Digital Inputs

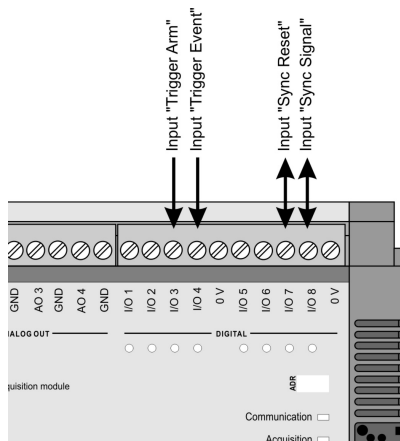


Figure 4.8 - Digital Inputs of the e.xact

The digital inputs I/O 3, 4, 7 and 8 of the e.xact can be used for triggering and synchronization purposes. The functions of the inputs are shown in the figure 4.8. I/O 7 and I/O 8 are used as in- and outputs.

The digital inputs of the e.xact can be used for the tara functionality as well. But in that case the following settings are required (only one of these has to be fulfilled)

- no ring buffer may be triggered (freerunning) – valid for I/O 3 and I/O 4
- no synchronization had been defined (I/O 7 and I/O 8 are not being used)

Therefore depending on the application either I/O 3 and I/O 4 or I/O 7 and I/O 8 can be used.

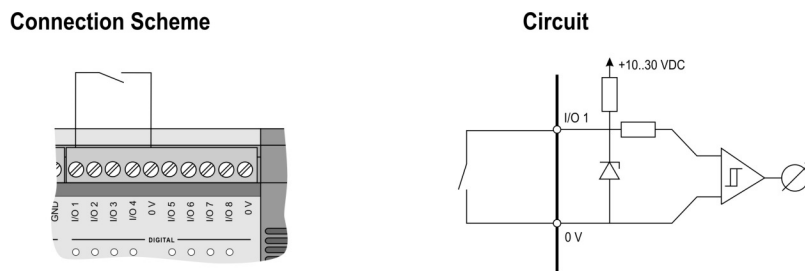


Figure 4.9 - Digital Input Connection

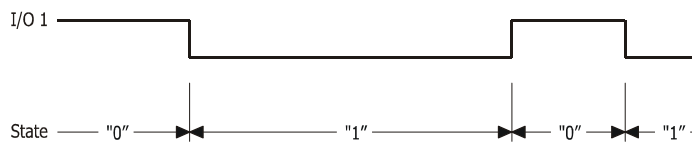


Figure 4.10 - Signal Diagram of Digital Inputs

The digital input is set (switch closed) as long as the applied signal voltage remains under the threshold value of 1 V. The digital information can be scanned as I/O information via bus.

### 4.5 Digital Outputs

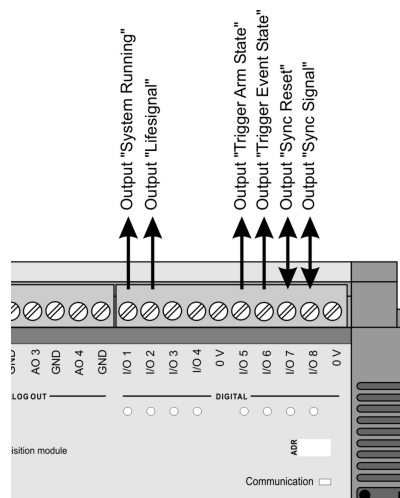
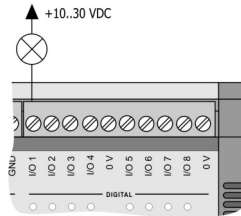


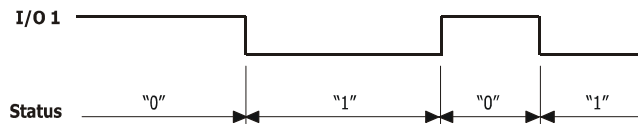
Figure 4.11 - Digital Outputs of the e.xact

The digital outputs I/O 1, 2, 5, 6, 7 and 8 of the e.xact can be used for output digital signals for information about the system and synchronization purposes. The functions are shown in the figure 4.11. I/O 7 and I/O 8 are used as in- and outputs.

**Connection Scheme**



*figure 4.12 - Digital Output Connection*



*Figure 4.13 - Signal Diagram of Digital Outputs*

The distribution voltage for the digital outputs can range from 10 to 30 VDC. It has to be either supplied externally or be picked up by the power supply of the sensor modules.

The status of the digital output can be scanned as I/O information via bus.

## 5. CONFIGURATION

To configure an e.xact and read the measured and logged values from the e.xact the Configuration Software e.commander is used. This chapter will give you an overview on how to configure an e.xact module. A more detailed description about the e.commander software can be found in the e.commander manual.

The configuration can be divided into the following processes:

- Definition of module-specific settings for the interfaces, logging, synchronization, etc.
- Configuration of the measurement variables
- Definition of the functionality of the e.xact by using the e.con software

There are two possibilities for configuring an e.xact. With the first possibility the settings and configuration of an e.xact will be read from the e.xact, adjusted and transmitted back to the e.xact.

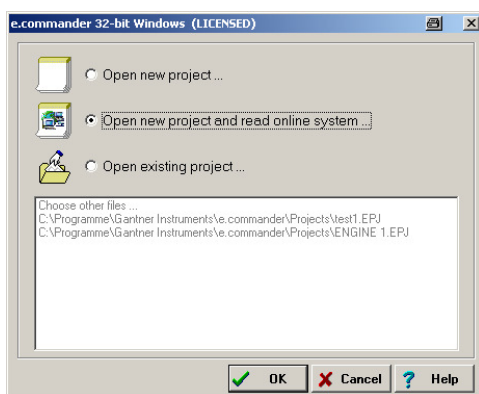
Another possibility is to define the configuration locally on the PC/laptop without the necessity that the e.xact is already connected or present in the network. The configuration can be saved and loaded into the e.xact at any time.

The entire configuration of an e.xact or a whole system of test controllers is saved in a project. Projects can be saved and loaded for further processing.

The standard way of configuring an e.xact module is to connect the e.xact into the Ethernet first. Then the e.xact will be added to a project, which will read out the actual configuration of the e.xact and the configuration is being displayed on the screen. Now it is possible to reconfigure the module and finally update the e.xact with the new configuration.

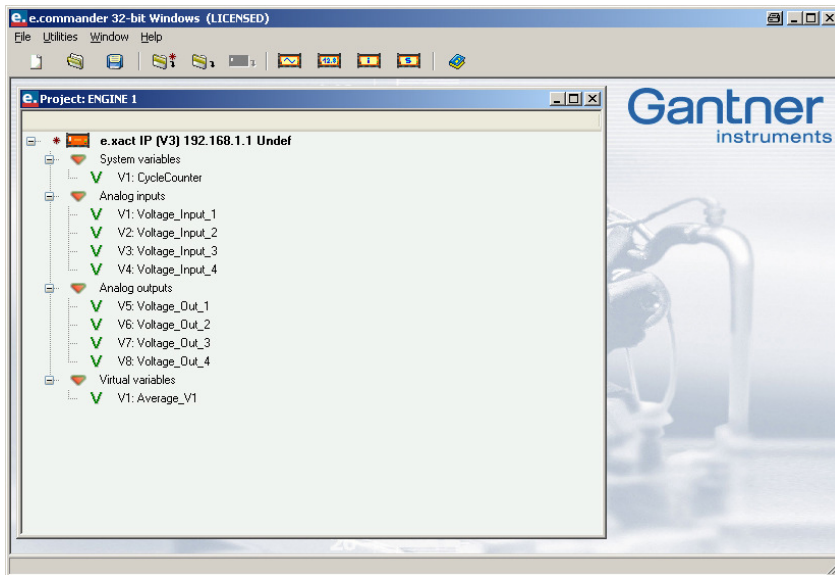
### 5.1 Open a Project

Start the e.commander software. First you have to open a project. Therefore select one of the three options in the window that will be opened after start-up of e.commander.



- With "Open new project..." you can open a new, empty project.
- Selecting "Open new project and read online system..." will open a window where e.commander displays all test controllers found on the Ethernet. You can select the e.xact you want to work with and press "OK". This will open a new project and add the selected e.xact with its actual configuration.
- With the option "Open existing project..." you can open a previously saved project.

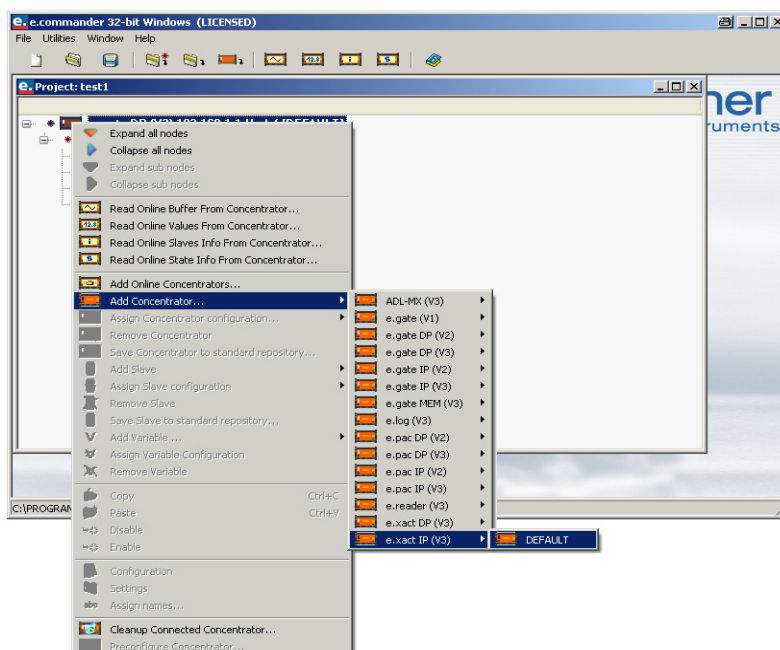
You can also open several projects at the same time. Each project will be displayed in a separate project window in e.commander.



Below each test controller in a project the variable settings of the in-/outputs of the e.xact and of the slave modules e.bloxx, which are connected to the e.xact, will be shown in list form. It is possible to add new test controllers and slave modules and to define the variable and device settings.

## 5.2 Adding an e.xact to a Project

To add an e.xact to a project click with the right mouse button below the last line of the project. A context menu appears.

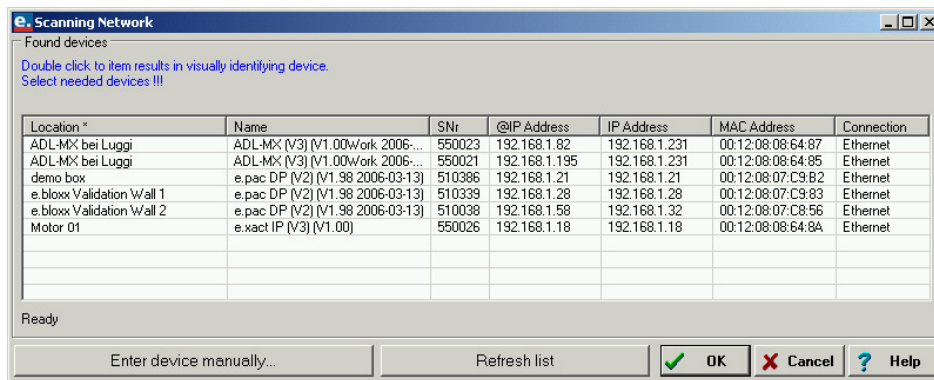


Now you have the possibility to add an e.xact which is already working and present at the Ethernet or to add a new e.xact module which is not available yet but you want to make its configuration already.

- In case you want to add a new e.xact which is not yet available on the Ethernet select the menu item "Add Concentrator..." and select the corresponding type of test controller you want to add (e.g. "e.xact"). The letters "IP" behind the e.xact indicate that the module is using Ethernet for communication. The letters "DP" indicate that the e.xact is also equipped with a Profibus-DP interface.

**Note:** The indications (V2) and (V3) behind the test controller types correspond to the device generation. Select the correct one or else the concentrator cannot be found on the Ethernet.

- If you want to add an e.xact which already exists on the Ethernet select the menu item "Add Online Concentrators...". The e.commander will then search the network and display all test controllers on the network in a list.

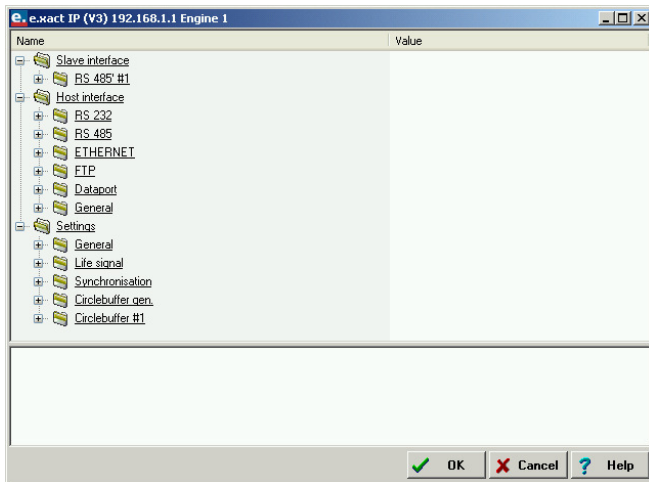


With "Enter device manually..." you can enter the IP-address of an e.xact directly. With "Refresh list" the network will be scanned again and the list of modules will be updated. Double clicking one of the e.xact in the list makes the LEDs of the e.xact blinking for a few seconds. This indicates the position of the e.xact you are going to work with. Mark the desired e.xact and press "OK".

After one of the two possibilities just mentioned the project window will be shown again and the e.xact will be added to the configuration list in that window.

### 5.3 Configuration of the e.xact

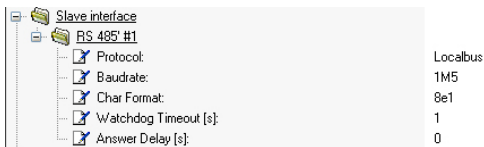
To change the settings of an e.xact double-click the mouse onto the e.xact or click on it with the right mouse button and select "settings" from the context menu. The window to define the settings will be opened.



The settings are arranged in a group for the "Slave Interfaces" (connection of e.bloxx sensor modules), the "Host Interface" and the e.xact specific settings.

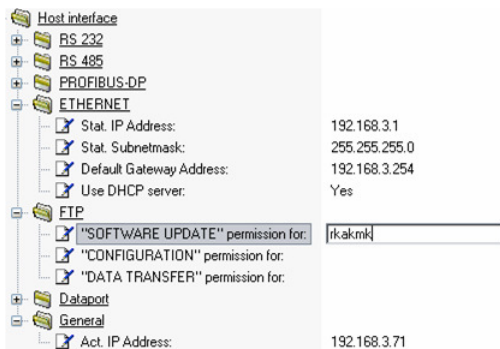
Following is a short overview of the setting possibilities. By clicking with the mouse on a setting a help text for the selected setting will be shown in the lower area of the window.

### 5.3.1 Slave Interface



The e.xact provides one slave interfaces for the connection of additional e.bloxx modules via the screw terminals A<sub>slave</sub> and B<sub>slave</sub> of the e.xact. See chapter 5.5 for information on how to add an e.bloxx to the slave interface. In the following the slave interface is indicated as UART1. The settings like baud rate and delay time are selectable. The protocol is fixed to Localbus, 8e1. This setup will overwrite the setups in the module to ensure a communication.

### 5.3.2 Host Interface





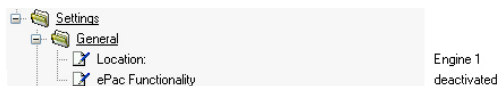
To connect the e.xact to a host there are several interfaces available. The most important interfaces are Profibus-DP and Ethernet.

By using DHCP it is necessary that the Static IP Address and the Default Gateway Address fit together. The actual dynamic IP address can be displayed in the *General* selection.

Within the function *FTP* a password protection can be activated. It is necessary to work without or with all 3 passwords. In case of forgotten passwords please contact Gantner Instruments at [office@gantner-instruments.com](mailto:office@gantner-instruments.com) to unlock the password protection.

### 5.3.3 e.xact Settings

The e.xact settings are separated into 6 sections:



In the section "General" a designation can be assigned to the e.xact. With this name it will be indicated when searching for test controllers on the Ethernet and also in the project window. As default setting the "ePac Functionality" is deactivated. If you require ePac functionality you will need the additional software package e.con. For details on this software tool please refer to chapter 6.

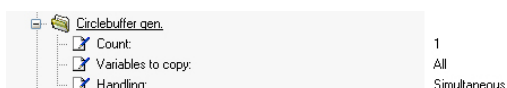
**Note:** When you change a setting, the setting will be marked in bold text. When closing the setting window the changes will be written to the project file of your PC/laptop. To activate the new configuration in the e.xact the configuration file has to be sent to the e.xact module as well sent to the e.xact.

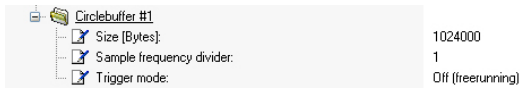


In the section "Life signal" different watchdog conditions can be defined. With "Signal type" you can select if the different error conditions set below shall be combined with logic "AND" or logic "OR".



Here the synchronization of several e.xact modules in a network can be defined. One e.xact will act as a master, all the other e.xact modules have to be defined as slaves. To synchronize e.xact modules with each other an additional wiring will be required.

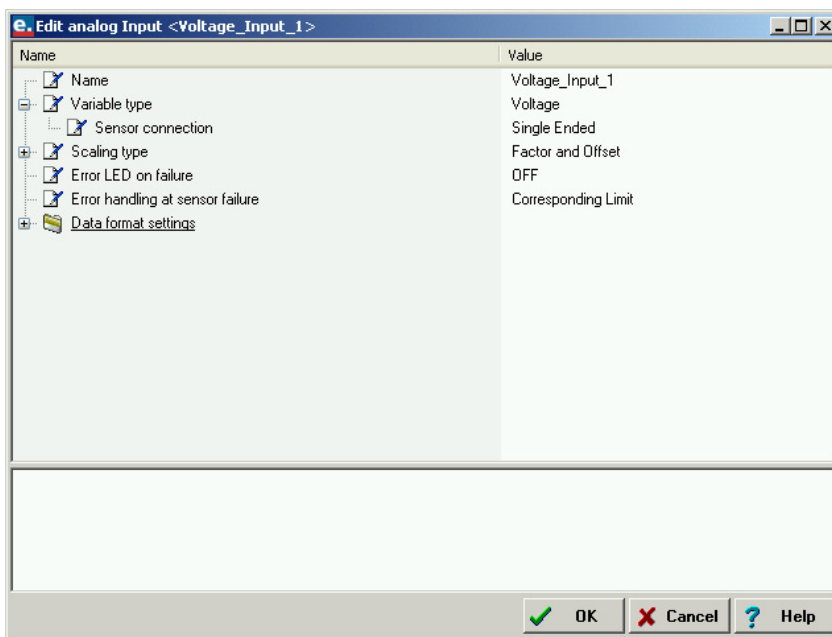




The circlebuffer in the e.xact stores measured values for later read-out and evaluation. It is possible to select the number of circle buffers (1 or 2) and set the number of variables to be stored (simultaneous or sequential storing), the buffer size, sample divider (e.g. a fast and a slow buffer), trigger mode and trigger position (pre-trigger).

## 5.4 Configuration of the Variables of an e.xact

To change the configuration of the measurement variables of the e.xact double-click on the variable in the project window or click the variable with the right mouse button and select "Configuration". A window like the example below will be opened, where you can see the actual settings of the variable. The information in the window depends on the type of variable (analog, digital, input, output).



The variable name (has to be unique for every variable in case you will work with the e.con software), the variable type, scaling and range settings, error handling and data format settings for the selected variable are indicated here. Click on a "Value" field if you want to change one of the settings.

**Note:** All the settings having been changed and not yet written into the e.xact will be marked in bold text.

When you confirm with "OK" all changes (highlighted in bold font) will be saved and written to the e.xact. The project window will be shown again.

**Note:** Pay attention that the physical sensor connection corresponds to the defined configuration.

Following is a short overview of the setting possibilities. By clicking with the mouse on a setting a help text for the selected setting will be shown in the lower area of the window.

### 5.4.1 Variable Type

Here you can define the type of measurement for the variable. Depending on the variable type (analog, digital, input, output) different types of measurement are available. The field "sensor connection" lists all measurement functions of the selected variable type.

If there is a sensor connected which requires a supply voltage from the e.xact you can select if the supply shall be on always, off or optimized (on if required).

The range of measurement can also be defined. Adjust this to the predictable maximum and minimum measurement value.

### 5.4.2 Scaling Type

It is possible to transform the measured value of a variable into another unit, which is called **scaling**. First select the type of scaling with the list field behind "Scaling Type". With "Factor and Offset" you can enter the factor (multiplication of the measured value) and offset (shifting the conversion curve) for the calculation of the measurement value. With "2 Point Calibration" enter the values of 2 measurement points one time in the measured unit and one time in the conversion unit. For example to calculate the temperature from the measured resistance given by a PT 100 temperature sensor enter two resistance values in Ohm and the corresponding temperature values in °C or °F.

### 5.4.3 Error Handling

It can be selected if the Run/Error LED on the front of an e.xact shall be switched on in case of an error (measurement range exceeded, communication interruption etc).

Also it is possible to define how the e.xact shall react on a sensor failure (e.g. line break). So in case of a sensor failure the value of the variable can be set either to a limit value, stay on the last measured value or set to a certain default value.

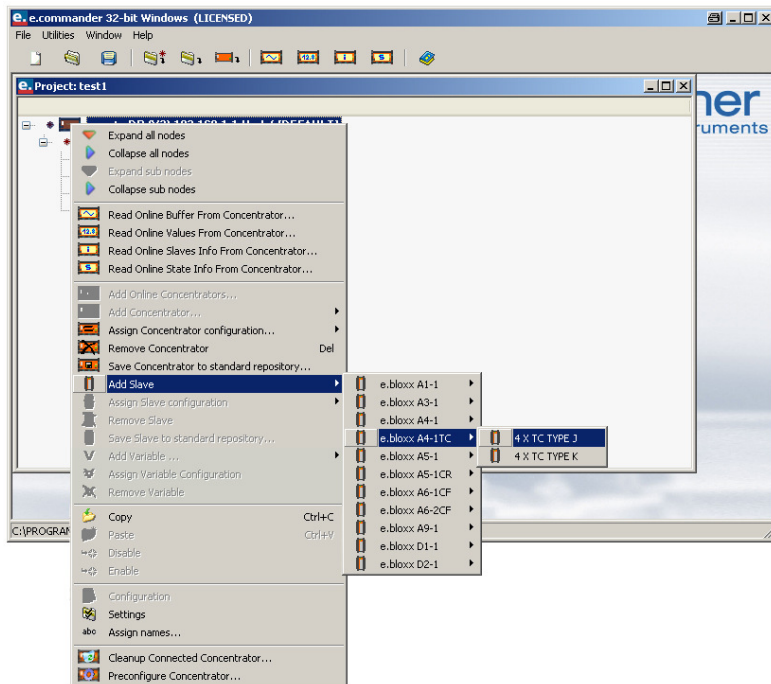
### 5.4.4 Data Format Settings

With these fields you can define the data format in which the measured values shall be transmitted via bus. Select the format of the variable (integer, floating real value, boolean, etc.), the field length and the precision. Precision indicates the number of digits after the comma and the field length is the total number of digits before and after the comma.

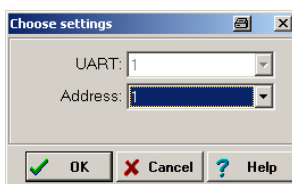
Data Direction defines if the value is an input or output value but it is possible to set it as input/output as well. Defined as empty the value of this variable will not be transferred, the variable is deactivated.

## 5.5 Adding e.bloxx modules to an e.xact

To add a new e.bloxx sensor module (slave) to an e.xact click with the right mouse button on the icon of the e.xact. From the context menu that appears select "Add Slave" and select the required module with one of the predefined configurations.



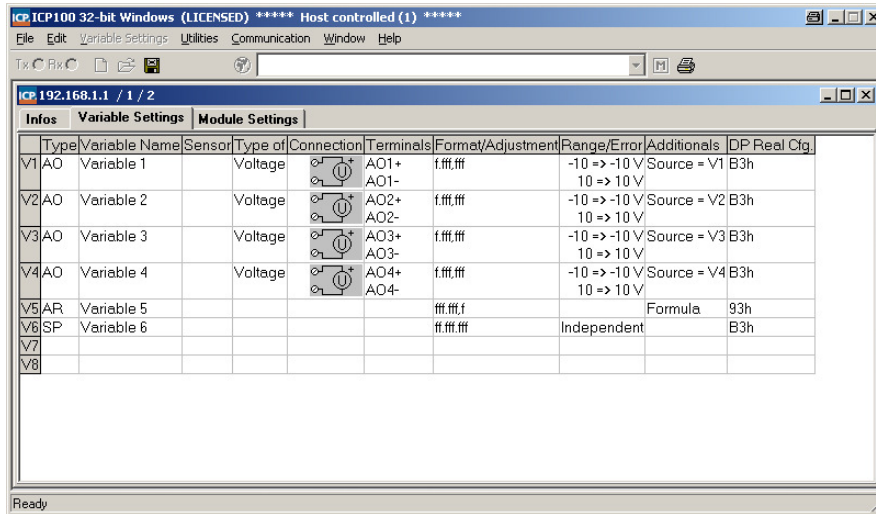
In the following window you have to define the UART interface of the test controller, where the e.bloxx module has to be connected to and the address of the e.bloxx. Since an e.xact only has one slave interface (UART) UART 1 will be selected and cannot be changed.



Now the module is added to the e.xact in the project with standard measurement settings for its in-/outputs.

### 5.5.1 Configuration of e.bloxx variables

Now configure the measurement functions of every variable of the just added e.bloxx. Therefore double-click on the e.bloxx module or a variable or click with the right mouse button and select "Configuration". The Configuration Software ICP 100, which is integrated in e.commander, will be opened. You will see the predefined variable definition.



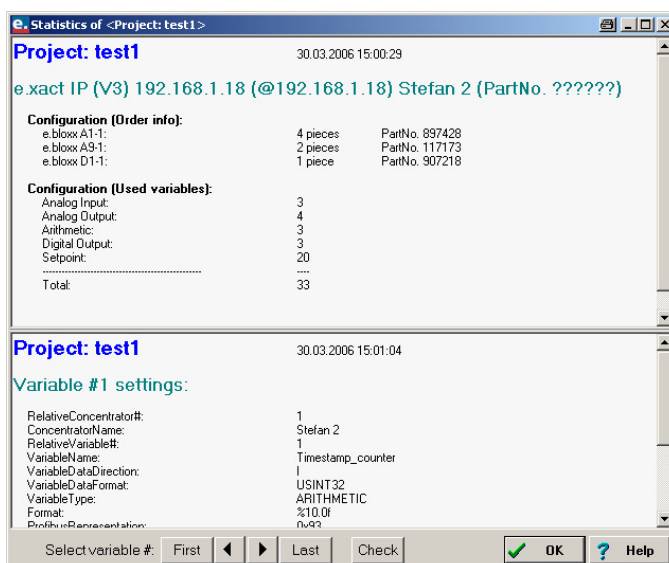
Every variable is displayed in a row. You can set a name for the variable (name will be shown in the project window) and you can select the type of measurement, the measurement range, format settings and more different settings depending on the type of variable. Click on the corresponding field (column and row) of the setting you want to change. For a more detailed description see the online help of the Configuration Software ICP 100.

After configuration close the ICP 100 Configuration Software by pressing the icon "Save to File and Exit". You will return to the e.commander project window and the variable settings will be updated.

## 5.6 Statistics

Another very useful tool is the statistics functionality. This feature can be accessed when clicking the button in the menu bar.

This functionality provides the following information:



The first part of the window shows an overview on the whole project with:

- Project name, date and time
- IP-address, name/location, part number of the e.xact
- Type and number of e.bloxx modules connected to the e.xact with its part number(s)
- The number of each type of variable like alarm, analog input, analog output,... being defined for this project.

If there are several e.xact in one system, you will find this information for each one.

The second part describes all variables being defined in the project with its most important information in the order as they are configured. With the buttons "First", "Last" and the arrows you can search for the variable you are interested in.

### 5.6.1 Design Rule Check

The performance of the system depends on the numbers of variables, number of variables, transfer rate, data format, active interfaces, etc.

So it is very helpful to check a configuration after the first setup or after having reconfigured the system by clicking the "Check" button.

The result of the test will be explained by the background colors:


- WHITE: Configuration is fine and will run after downloading.
- RED: Configuration will not run, a download is not possible.
- YELLOW: It is not definitely possible to say ok or not ok. In this boarder range it is necessary to test the setup. It is possible to download the configuration.

In praxis mostly the error state will be generated by:

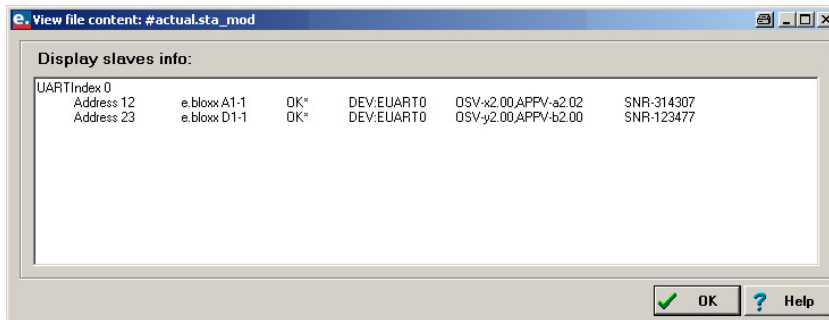
- connecting too many modules to one UART.
- defining too many variables (Att.: difference between Profibus-DP vs. Ethernet).
- selected sample rate could not be reached.

## 5.7 Display of Slave Information

Slaves are the e.bloxx measurement modules connected to a concentrator. Information about those slaves can be displayed on screen.

To read out and display the slave information click on the icon  "Read Online Slaves Info from Concentrator". The e.commander will scan the network and display all connected concentrators in a window (see chapter 5.2).

Select the desired concentrator and press "OK". The concentrator will be read out and the information about the slave modules connected to the concentrator will be displayed in a new window.

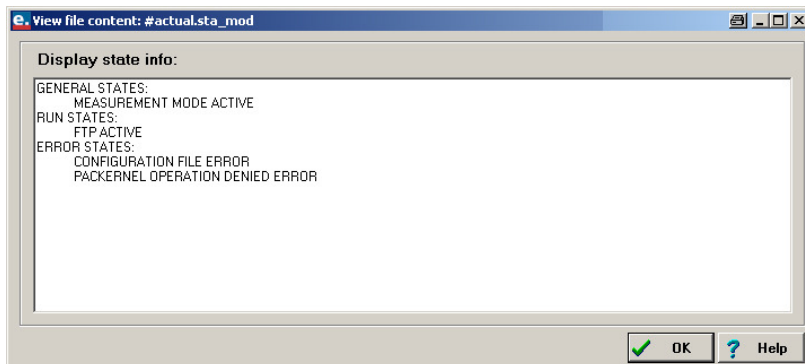


### 5.8 Display of Status Information from Concentrator

The actual state of a concentrator can be read. These information include run states, error information and general states like if the measurement mode is active, etc.

To read the status information from a concentrator click on the icon "Read Online State Info from Concentrator". The e.commander will scan the network and display all connected concentrators in a window (see chapter 5.2).

Select the desired concentrator and press "OK". The concentrator will be read out and the status information will be displayed in a new window.



## 6. FUNCTIONALITY WITH E.CON

The e.xact permits complex control functionality such as PID controller, state machine, arithmetic, numeric and logical operations, transmission terms, function generators, time functions as well as visualization and additional functionality.

The software e.con is an easy-to-handle graphical programming system to define the functionality of an e.xact. As only graphical blocks are used for the definition, time to get familiarized with the system is minimized. The presentation of graphical blocks follows existing specification and technical languages. Structure blocks permit a hierarchic structure of projects. Linked projects and export mechanisms facilitate the reuse of structure blocks that have been created earlier.

The software e.con combines programming, simulation, testing and running in one tool. Special blocks and additional tools permit online observation of signals and signal tracing as well as run-time measurements.

**Note:** This chapter will give a short overview of the e.con software. A more detailed description can be found in the e.con software manual and the online help of e.con.

### 6.1 Overview of the e.con User Interface

After in installation of e.con from the CD start the software and the main window of e.con will open.

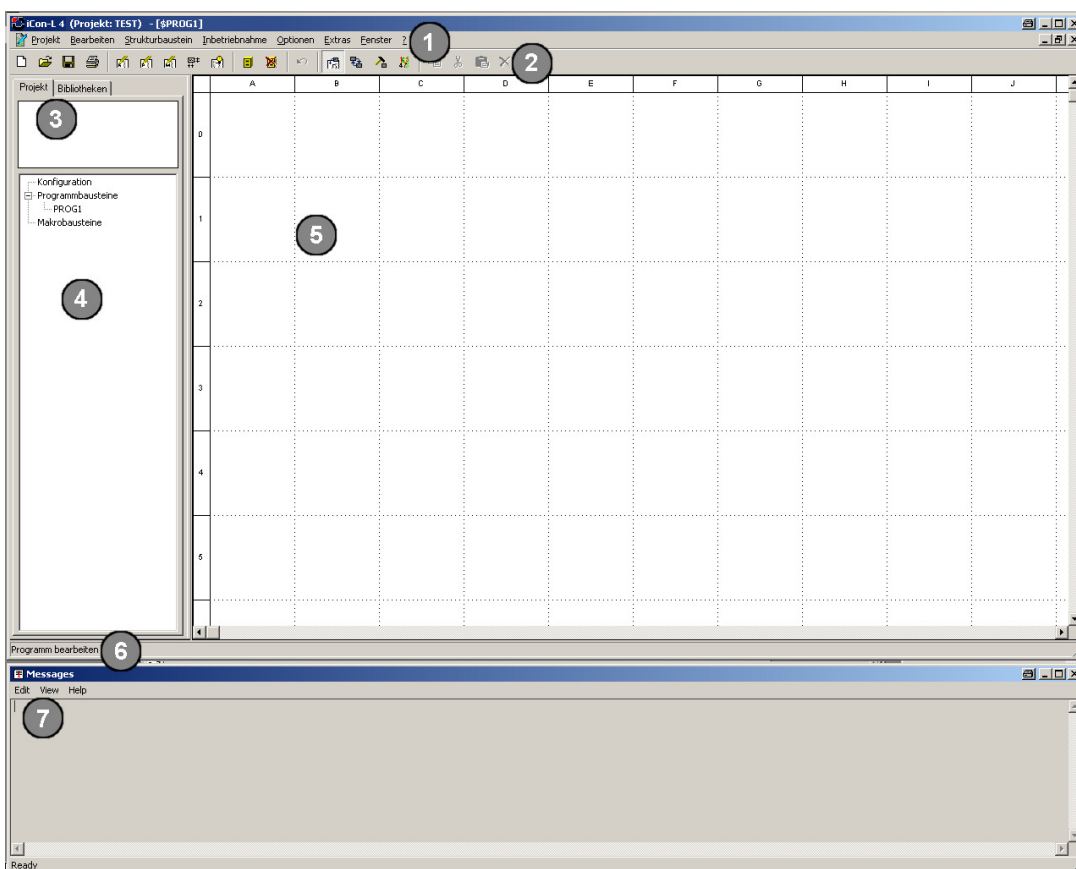


Figure 6.1 - Main Window of e.con



Commands for working with the system can be selected from the Menu ①, the Toolbar ②, the Quickstart Window, and Context Menus as well as by using Keyboard Shortcuts. The structure of the project is presented in the Project Tree ④ which is displayed when you click on the tab "Project" on top of the tree. A number of operations can also be carried out from the project tree. By selecting a structure block in the project tree a graphical preview of it will be shown in the preview area ③. From there it is possible to drag the structure block into the working area ⑤, which contains the worksheet with the presentation of the blocks and their connections. Instructions, status information and messages are displayed in the Status Line ⑥ and the Messages Window ⑦.

The whole functionality of the function blocks of the system is defined in the e.xact. The software e.con is just a tool for combining and "wiring" the single blocks.

## 6.2 Projects

A project can be subdivided into any number of hierarchic structures. However, it always comprises not less than two levels, i.e. its configuration and program blocks. A project is processed by arranging the desired structure blocks (program and macro blocks) and connecting them graphically.

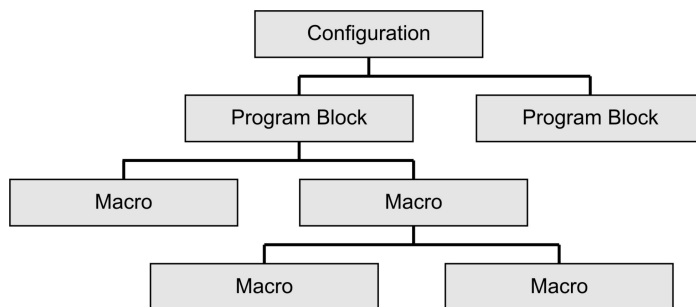


Figure 6.2 - Structure of e.con

The top level of a project is the configuration (&Main). It allows the graphical configuration of the target system tasks.

Program blocks are added to the configuration. They form the second level of the project where the functions are called and their sequence is established. Program blocks are flagged with a \$ symbol preceding its designation. By determining the priority and cycle time of program blocks the task management parameters are defined. Connections between the program blocks facilitate the asynchronous data exchange via the e.xact. The number of program blocks is limited by the number of the parallel tasks in the target system (usually 15).

Programs are structured by using macro blocks. They make it easier to call functions which are used repeatedly. Macro blocks can be inserted into program blocks and other macro blocks. However, recursive calling is not permitted. Macro blocks contain sub functions of the programs and relating local parameters. These are no subprograms. During code generation they generate the complete target code for each call.

All project levels may contain visualization blocks (without target function). For exchanging data between project levels, the Input and Output blocks from the Standard Library are used. The Enable block from the same library is used for conditional processing operations of program and macro blocks.

## 6.3 Classes and Instances

When a project is processed, there is a difference between classes and instances. Classes are generated during editing operations by combining certain structure blocks and they contain preset values. Instances are formed when changing to the "Run" mode and can be parameterized there. So it is possible to define a special functionality (class) in the "Edit" mode which can be used in different programs/macros with different parameters.

During editing operations only preset values are defined in the parameter dialogs of the blocks. During the first change to the *Run* mode they are copied into instance parameters. Thereafter, the instance parameters can be modified in the *Run* mode. However, these modifications have no effect on the preset values in the structure block classes. When returning to *Edit* and modifying preset values, the instance parameters remain unaffected. The instances of newly inserted structure blocks contain the preset values as instance parameters.

**Note:** When changing a parameter in the *Run* mode (instance parameter) it is necessary to download them into the e.xact to ensure that the new parameter is still valid in the e.xact after a power off/on, otherwise the old parameter are loaded after a new start.

To facilitate easier differentiation between structure block instances, they can be assigned to different names. The context menus for structure blocks in the *Run* mode contain the *Instance Name* command. Upon opening the dialog a designation may be entered which afterwards in the symbol of the structure block and in the project tree.

Instance names are only indicated in the *Run* mode. An exception is the configuration where the instance name of the programs remains visible even during editing operations.

## 6.4 The Four States of the e.con Software

The software e.con facilitates creating, changing, testing and running projects by using one tool only. The program distinguishes between the following 4 system states:

- Edit
- Design
- Run
- Online Observation

Each state can be obtained by using the menu, the toolbar or partly the context menu.

### 6.4.1 Edit State

"Edit" is the basic state of the system. It is the state where a project is mainly processed. The structure of a project is determined by loading and removing libraries, defining and deleting structure blocks, and inserting, removing and connecting structure blocks. In the edit mode the classes of structure blocks are processed. The values entered in the parameter dialogs of the blocks only serve as presetting for the instances visible in the run mode.

Upon entering one of the first three commands of the edit menu or closing all work sheet windows, the system changes to the edit state. This state can be easily identified through the appearance of the project tree. There, the defined structure blocks and loaded libraries are listed in two views. In addition, the grid for block positions and connections are indicated by means of dotted lines in the work sheet windows.

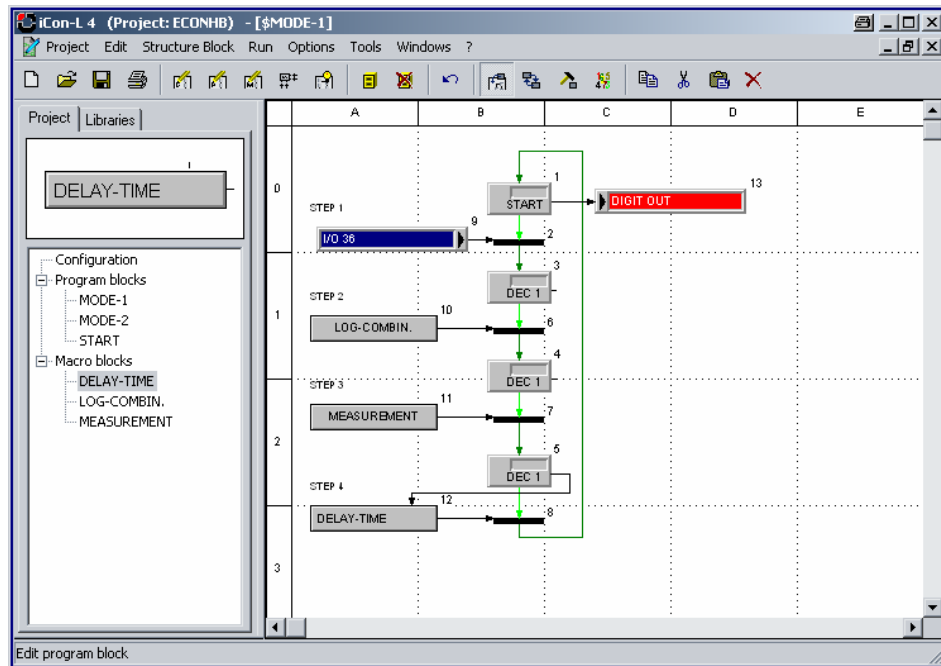


Figure 6.3 - Worksheet Edit State

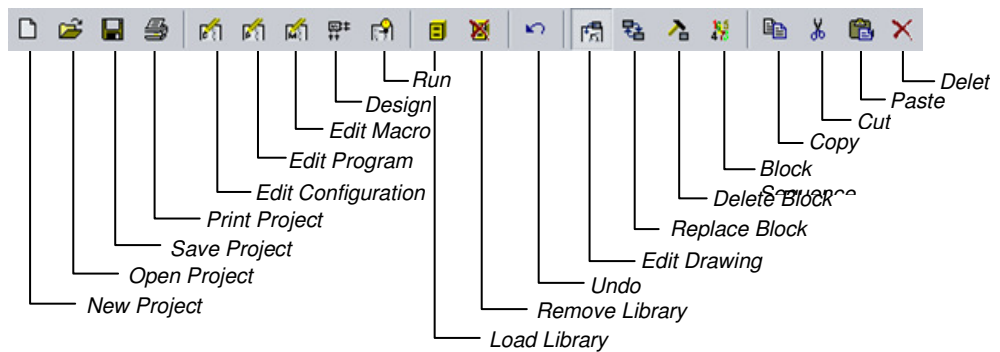


Figure 6.4 - Toolbar Edit State

### 6.4.2 Design State

Apart from the operations described above, i. e. inserting and deleting objects, also the structure block design ("Design Structure Block") can be used. From a specific work sheet window and by means of an additional toolbar, label positions, the appearance of symbols and the presentation in the work sheet window can be changed.

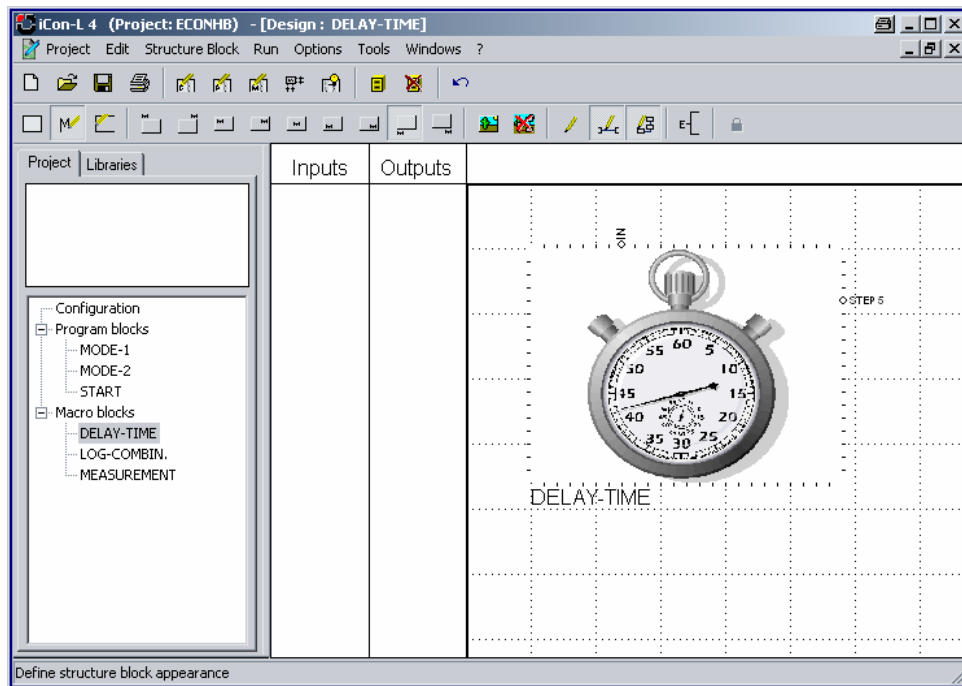


Figure 6.5 - Worksheet Design State

Additionally to the already mentioned toolbar there are some more functions available to design the appearance of the project, the programs and the macros.

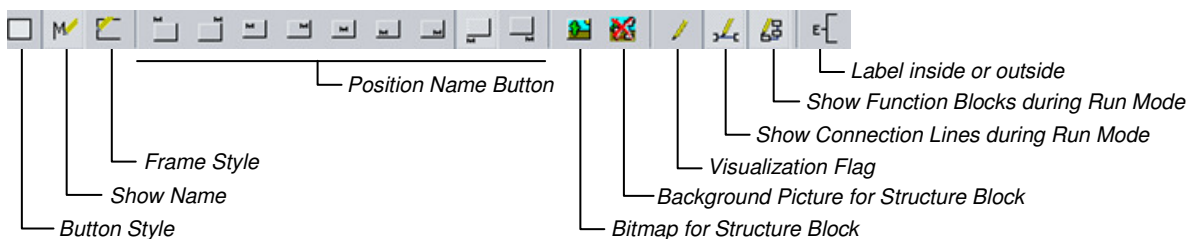


Figure 6.6 - Toolbar Design State

### 6.4.3 Run State

When using the Enter command from the "Run" submenu the program turns from the edit to the run state. During this changeover the program performs an instantiation. Instances are formed from the classes established during editing operations (refer to chapter 6.3 - Classes and Instances). When this option is chosen, a new work sheet window is opened, indicating the configuration. In contrast to the work sheet windows in the edit mode, the work sheet windows in the Run state does not contain a grid. The project tree offers one view only, presenting the hierarchic structure of the project.

The run mode serves to assign instance parameters used by the blocks later on in the e.xact. Commands for importing and exporting parameter files (refer to the submenus "Structure Block" and "Run") support this work. In addition, cycle times of tasks can be defined. In the run state structural changes of the project are no longer possible. The other commands in the run submenu serve to start simulation, establish target system connections as well as to create, load and start the program and change to online observation.

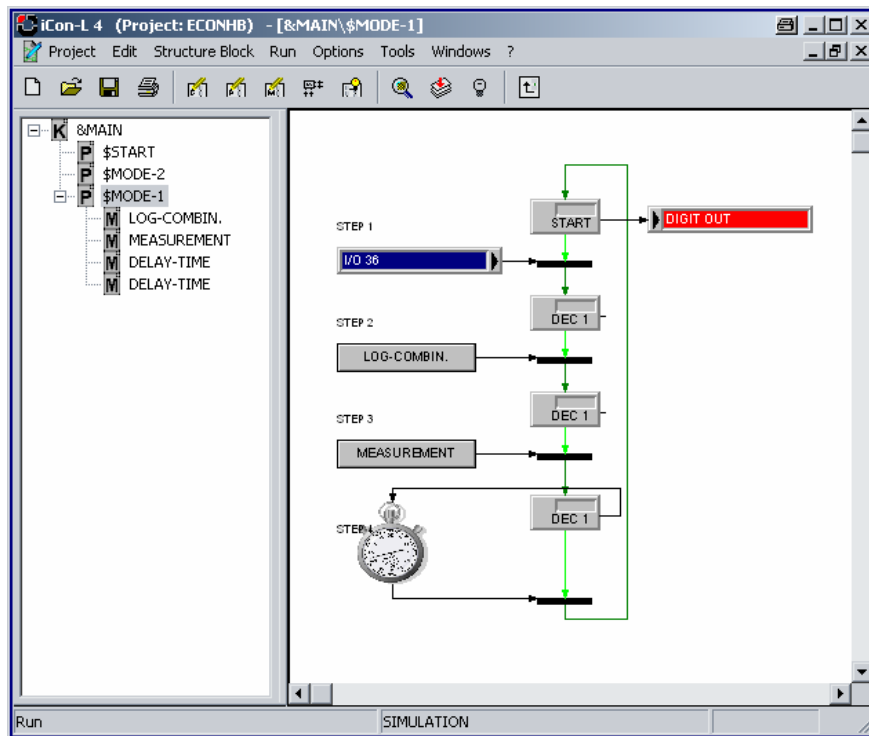


Figure 6.7 - Worksheet Run State

The toolbar of the run state is similar to that one of the edit state. The difference is shown in the next picture.

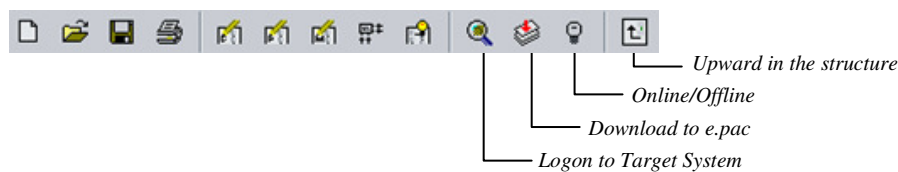


Figure 6.8 - Toolbar Run State

#### 6.4.4 Online Observation State

When a program has been successfully loaded into simulation or e.xact, online observation starts automatically. For switching from the run mode without performing a download before directly, the "online" command in the "Run" submenu is being used.

For online observation the visualization blocks indicate the current values of connected signals. Clicking the connection lines by means of the left mouse button opens a window displaying the current signal value. Via parameter blocks and signal editors values are being changed online. However, they only influence the volatile memory (RAM). For transferring the values into the nonvolatile memory of the e.xact, the "Parameter" command in the "Logon Target System" dialog is used.

If the project uses archive blocks, they record signal patterns in the e.xact. Signal patterns can be read out and displayed by means of an additional tool iTrend.

The refresh rate of value representation can be defined in the "Work Sheet Settings" dialog. The online observation can be stopped by using the "Offline" command/button or by exiting e.con.

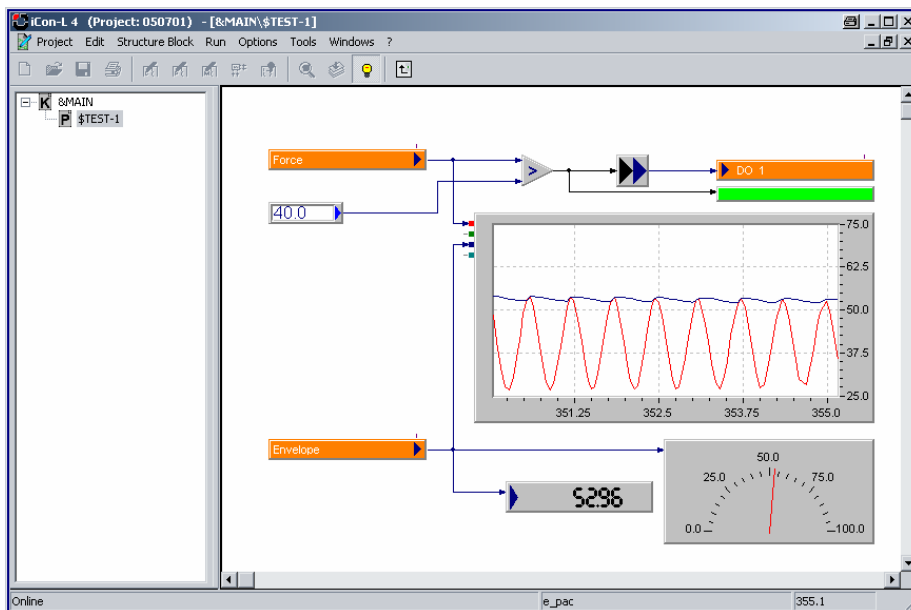


Figure 6.9 - Worksheet Online Observation State

## 6.5 Starting a Project

After the program e.con had been started it is possible

- to start a new project,
- to open an existing project,
- to upload the project from a connected e.xact or
- to load a project from the restore directory.

**Start a new project:**

Click on the button *Create a New Project* or select the menu *File - New Project* and the following window will appear:

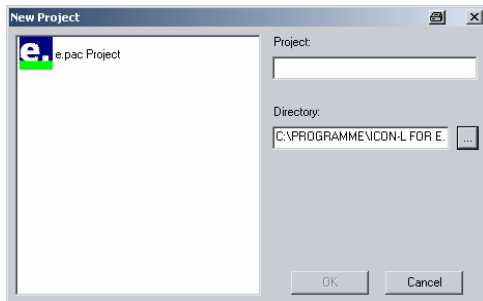


Figure 6.10 - Window New Project

Enter a project name and confirm/modify the directory where the project shall be stored.

**Open an existing project:**

Select the project and open the xxx.MDL file

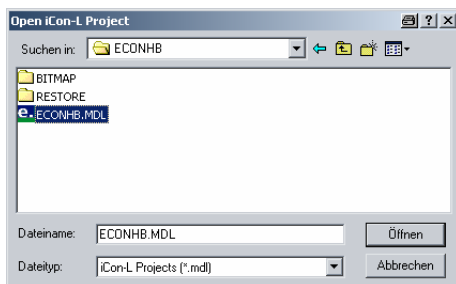


Figure 6.11 - Window Open Project

**Upload a project from e.xact:**

The window for the selection of the so called *target system* will open. There all selected e.xact modules and the PC-simulation are offered. By clicking the relevant e.pac the color will change from red to green.

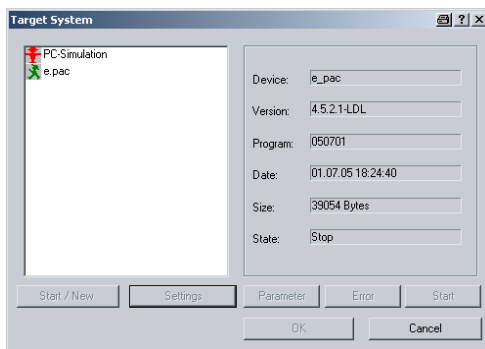


Figure 6.12 - Window Upload from e.xact

In case the icon color is yellow the settings (IP address) have to be checked.

**Load a project from restore directory (zipped file):**  
Selection of the file to be opened.

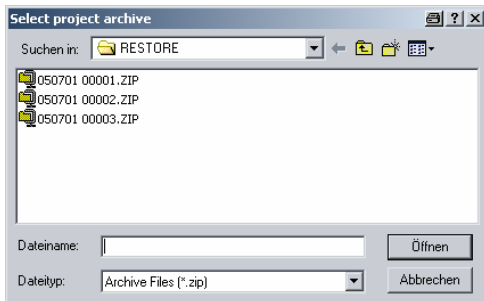


Figure 6.13 - Window Load from Restore file

## 6.6 Connecting e.xact and e.con

In a new or an already existing project open the e.con has to be selected first by using the menu *Tool - Select Device*:  
Now it is possible to select *Online* or *Offline*. In case *Offline* is selected a browser will open to select a #summary.sta file.

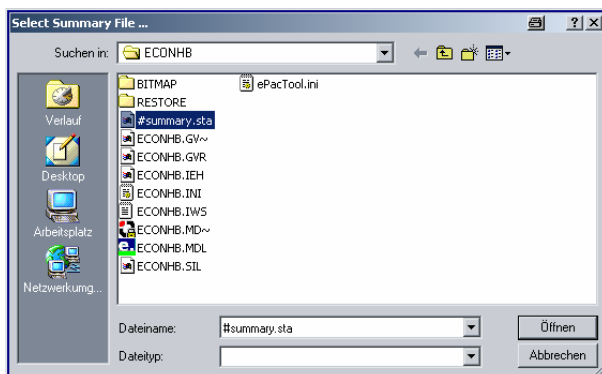


Figure 6.14 - Selection Online/Offline and Browser to choose a #summary.sta file

Selecting *Online* a network scan will be done. After selecting the e.xact the successful selection has to be confirmed.



Figure 6.15 - Successful selection of an e.xact

Now the software e.con will work with all the variables defined in the measuring and I/O system.



## 6.7 Practical Use of the Structuring

In the practical use the combined measurement, automation and control tasks consist of many sub tasks, which themselves consist of different sequences, flow parameter and evaluations resp. decisions. This chapter gives an introduction on how to layout a project. More information can be found in the online help of e.con and the e.con instruction manual.

In a first step we recommend the definition of the process inputs and the process outputs. This could be done in a macro "Inputs" and in a macro "Outputs". Due to the use of global parameter these signals will then be available in any further program and macro block.

In the next step the total function of the project should be partitioned in logical function such as Test Mode 1 and Test Mode 2. The block "START" will enable/disable the different Test Modes.

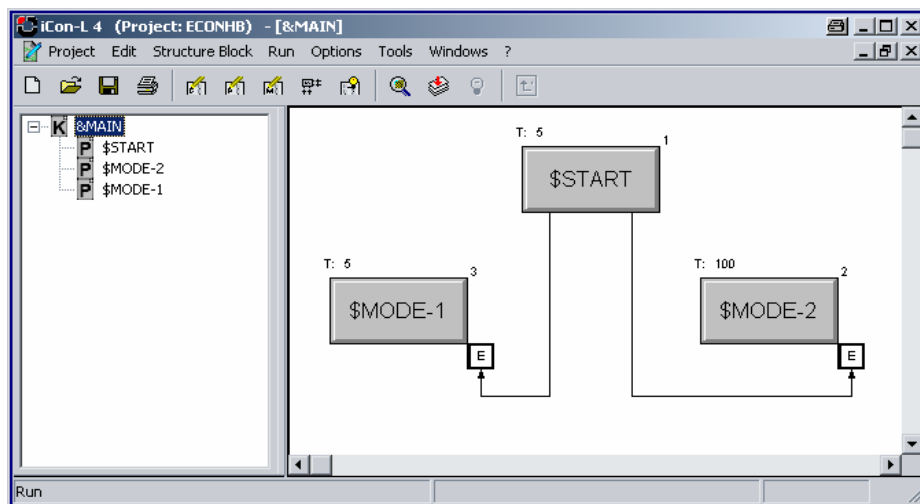


Figure 6.16 - Example: Project with Test Mode 1 and Test Mode 2

A Test Mode consists of different steps; each step can be controlled by a process I/O (host or process controlled) or by a decision made in the e.pac. The program MODE-1 could contain e.g.:

- Step 1: Proceed at an external I/O signal
- Step 2: Proceed by a combination of events which have happened
- Step 3: Proceed when a measurement signal exceeds a set point limit
- Step 4: Proceed after a special time (delay)

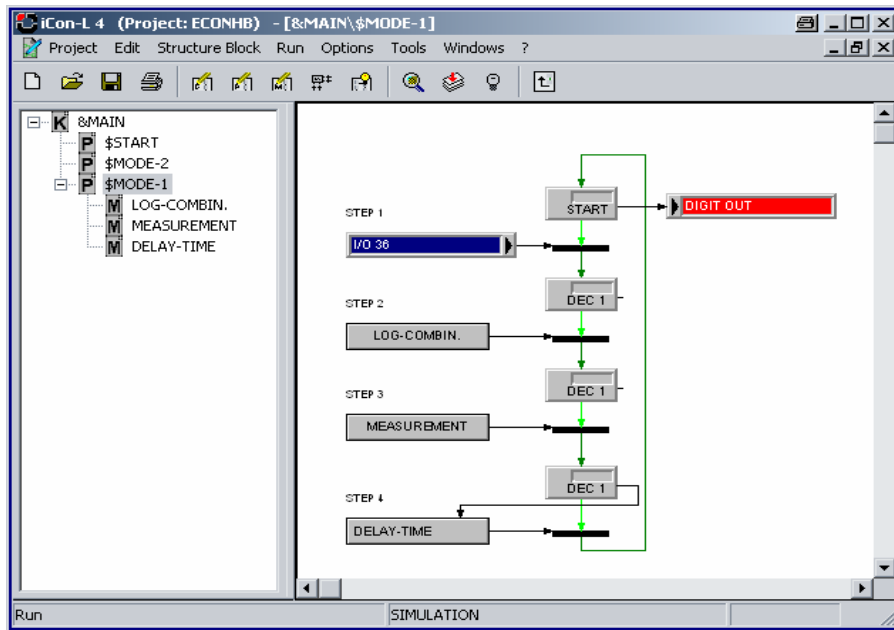


Figure 6.17 - Example: Function of Test Mode 1

In the example the macros LOG-COMBIN, MEASUREMENT and DELAY TIME have the following function:

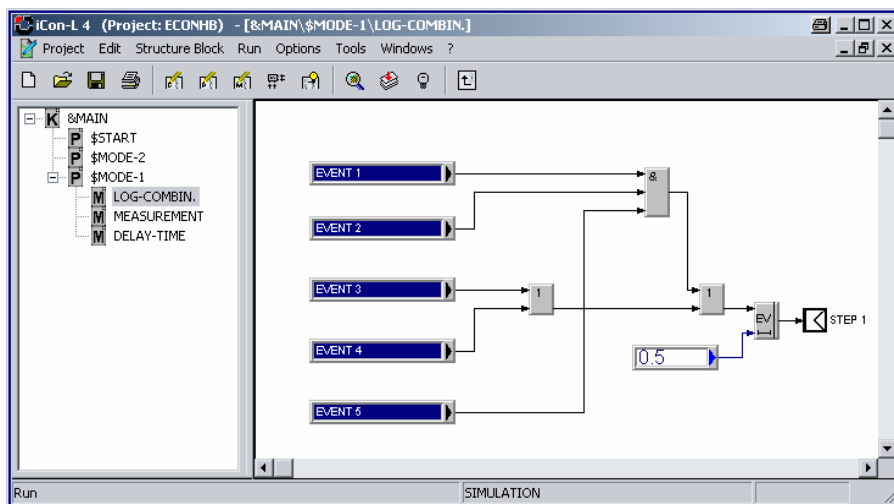


Figure 6.18 - Example: Function of macro LOG-COMBIN

Providing the events according to the logical combinations as a “true” signal at the output *STEP 1*, the condition is fulfilled and the next condition is required.

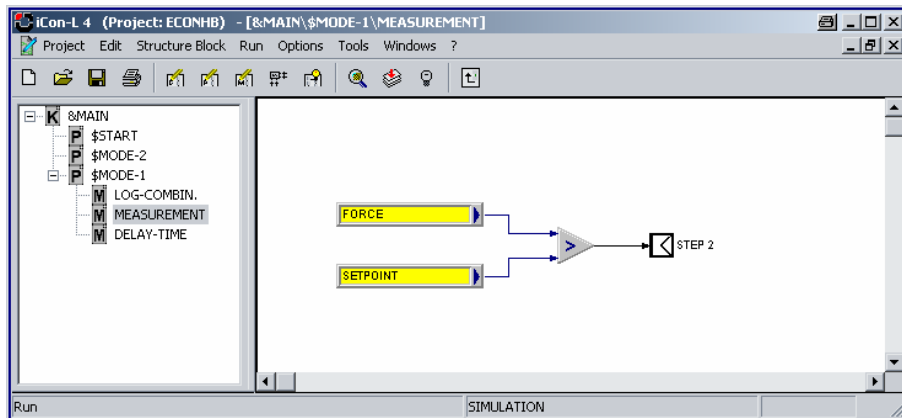


Figure 6.19 - Example: Function of macro MAESUREMENT

If *FORCE* exceeds the *SETPOINT* the output of *STEP 2* will be “true” and the next macro is in charge.

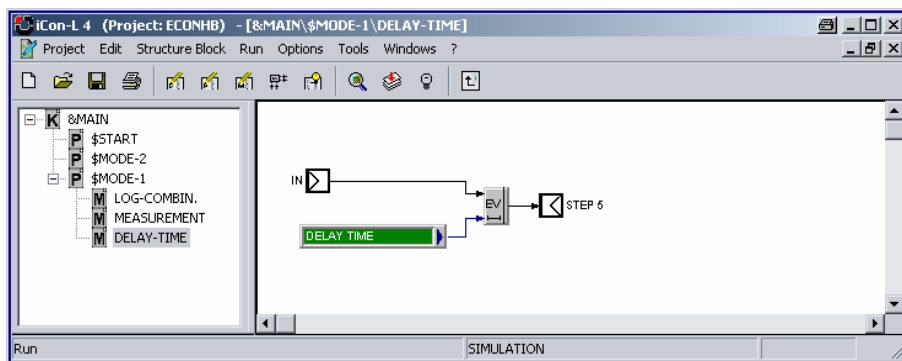


Figure 6.20 - Example: Function of macro DELAY-TIME

After a selectable *DELAY-TIME* the input will be switched to the output *STEP 3* and all three conditions are fulfilled.

This example shows how a structure can be used to setup a clear functionality by using different program and macro

## 7. HARDWARE INSTALLATION

### 7.1 Environmental Conditions

The e.xact is protected against water and dirt according IP 20. If required by the conditions of the operating site the modules have to be installed accordingly, e.g. in a water-resistant or water-proof case, compliant with the regulations of electrical engineering.

For the allowed ambient temperatures for the e.xact see the Technical Specifications at the end of this manual.

### 7.2 Mounting

The e.xact has a snap-on mounting for installation on standard profile rails 35 mm (1.4 inch) according to DIN EN 50022. The mounting on the DIN rail is performed by four straps on the reverse side of the module. First you push the two lower straps behind, the lower notch of the DIN rail and then you press the module on the DIN rail until the two upper straps snap in to the upper notch.

In order to take the module off the DIN rail either slide the module side-wards off the rail or, if it is not possible, lift the module slightly so that the straps on the top are released from the notch and the module can be taken off easily by tipping it forwards and removing it from the DIN rail.

### 7.3 Module Parts

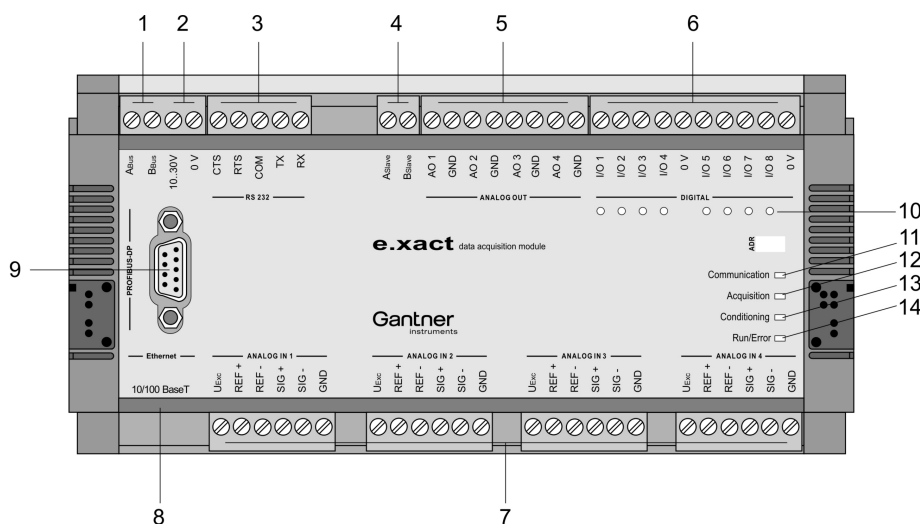


Figure 7.1. – Module Parts of the e.xact

1 to 7 ... Pluggable screw-type terminal strips:

- 1 .... RS 485 serial bus for connection to a PC/laptop
- 2 .... Power Supply +10 up to 30 VDC
- 3 .... RS 232 serial bus for connection to a PC/laptop (us the RS 232 cable included in the scope of supply)
- 4 .... Slave bus for connecting other e.bloxx measurement modules
- 5 .... Four analog outputs

- 6 .... Eight digital in-/outputs
- 7 .... Four analog inputs
- 8 ... RJ 45 plug for Ethernet connection
- 9 ... PROFIBUS-DP connection
- 10 ..Status LEDs for the digital in-/outputs
- 11 ..Status LED "Communication"
- 12 ..Status LED "Acquisition"
- 13 ..Status LED "Conditioning"
- 14 ..Status LED "Run/Error"

### 7.3.1 Front LEDs

The LED at the front of the e.bloxx modules provides the following information:

LED "Communication": Indicates the communication status

LED "Acquisition": Indicates the status of the measurement data pool

LED "Conditioning": Indicates the status of the analog inputs and outputs and the signal conditioning

LED "Run/Error": Indicates that the e.xact is supplied with power and running (green light) or an error occurred (red light). The errors are indicated by switching the LED on in different modes:

- red (permanent): General error like signal overflow, broken sense leads
- red + short off period: General error like signal overflow, broken sense leads + communication timeout
- green + short red flashing: Signal OK + communication timeout
- red fast flashing: Global error, no suitable firmware

**Notice:** The LED will get red when the signal is out of the selected range and the error checking is activated.

## 7.4 Connection Technique

The wires for the power supply, serial interfaces RS 232 and RS 485 and for the sensor signals are connected to the e.xact via screw-type terminals. The captive terminal screws are part of the terminal strips. All terminal strips are of a plug-in type and can be detached from the e.xact.

Not more than 2 leads should be connected with one clamp. In this case both leads should have the same conductor cross section. For the precise clamping of stranded wire we recommend the use of wire-end ferrules.

**Notice:** Connecting wires respectively the plugging-in and -out of the terminal strip is only allowed with an e.xact in power-off status.

In order to prevent interference with sensors, signals and modules, shielded cables have to be used for the power supply, bus connection and signal lines.

The PROFIBUS-DP cable is connected to the DB-9 plug on the front of the e.xact.

For the connection of the Ethernet a standard RJ 45 connector is provided by the e.xact.

## 7.5 Power Supply

Non-regulated DC voltage between +10 and +30 VDC is sufficient for the power supply of the modules. The input is protected against excess voltage and polarity connecting error. The power consumption remains approximately constant over the total voltage range, due to the integrated switching regulator.

Due to their low current consumption the modules can also be remotely supplied via longer lines. Several modules can be supplied in parallel within the permissible voltage range and drop in the lines. If required, the supply lines together with the bus line may be incorporated in one cable.

In order not to overload the module power supply needlessly and to avoid unnecessary line troubles, a separate power supply is recommended for sensors with a large current drain.

The distribution voltage for the e.xact modules has to be protected by a fuse with maximum 1 A (inert). The modules have an internal fuse (reversible) for protection against excess voltage, excess current and wrong polarity.

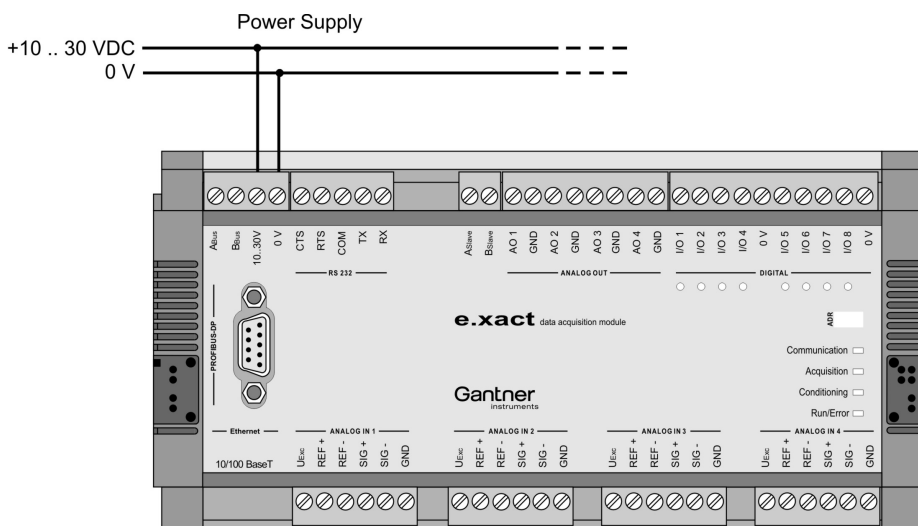


Figure 7.2. - Power Supply of the e.xact

## 7.6 Connection of e.bloxx Modules

e.bloxx modules are connected to the RS 485 slave interface (screw terminals "ASlave" and "BSlave") at the e.xact.

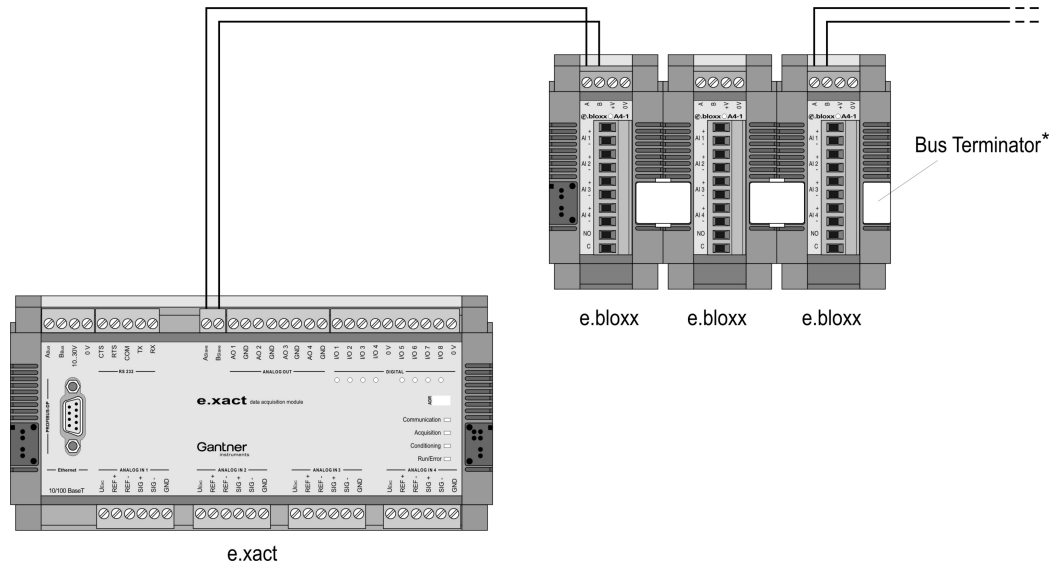


Figure 7.3. – e.bloxx Modules connected to e.xact

\* ... If the e.bloxx (here A4-1TC as an example) are used together with an e.xact, which is used to collect the data of all connected e.bloxx modules and process them for fast transmission via the further network, a bus termination must be connected to the last e.bloxx in each bus line.

## 7.7 Connection to Ethernet

The e.xact is supported with a connector 10/100 BaseT to connect the e.xact into an Ethernet. The IP address and DHCP setting must be set-up correctly (see chapter 3 "Start-Up"). Then it is possible to communicate with the e.xact via the ethernet.

It is also possible to connect the e.xact directly to a PC via the 10/100 BaseT connector. In this case a cross-wire Ethernet cable must be used.

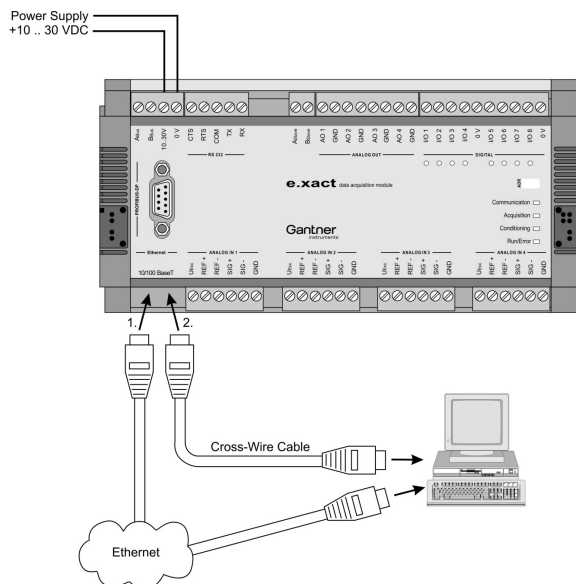


Figure 7.4. - Connection to Ethernet

## 7.8 Connection to the RS 485 Communication Bus

The e.xact has an RS 485 serial interface. The bus lines are connected to the screw terminals "A<sub>BUS</sub>" and "B<sub>BUS</sub>" of the e.xact.

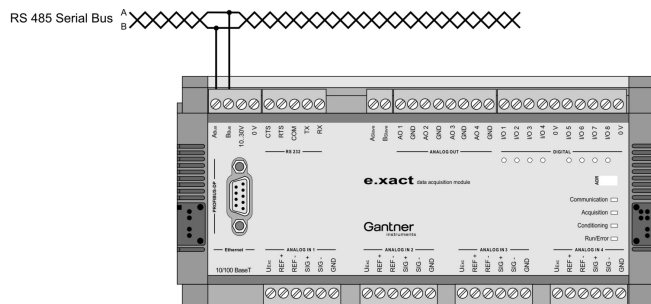


Figure 7.5. - Connection to RS 485 Serial Interface

A detailed description of the bus and the communication with the e.xact and the connected e.bloxx modules can be found in the manual "e.bloxx Communication" (Part No. 159583).

## 7.9 Connection to Profibus-DP

The Profibus-DP interface of the e.xact is used for fast online data transmission to an automation system. A detailed description of the Profibus-DP communication with the e.xact can be found in the manual "e.bloxx System Guide" (Part No. 159078).

### 7.9.1 Bus Plug

For the installation of the bus cable and bus interface for PROFIBUS-DP 9-channel D-subminiature plugs and sockets are used. The pin assignment for the RS 485 connection according to PROFIBUS is given in Table 7.1.

Plug	Pin	RS 485 Notation	Signal	Identification
 DB 9	1	-	Shield	Shield, Protective Ground
	2	-	RP	Reserved for Power
	3	B / B'	RxD/TxD-P	Receive/Transmit-Data-P
	4	-	CNTR-P	Control-P
	5	C / C'	DGND	Data Ground
	6	-	VP	Voltage Plus
	7	-	RP	Reserved for Power
	8	A / A'	RxD/TxD-N	Receive/Transmit-Data-N
	9	-	CNTR-N	Control-N

Table 7.1. - Pin Assignment D-Subminiature Plug According to PROFIBUS

The signal leads A and B (and Shield) are mandatory for a (shielded) connection. Additional signal leads may be installed if required.

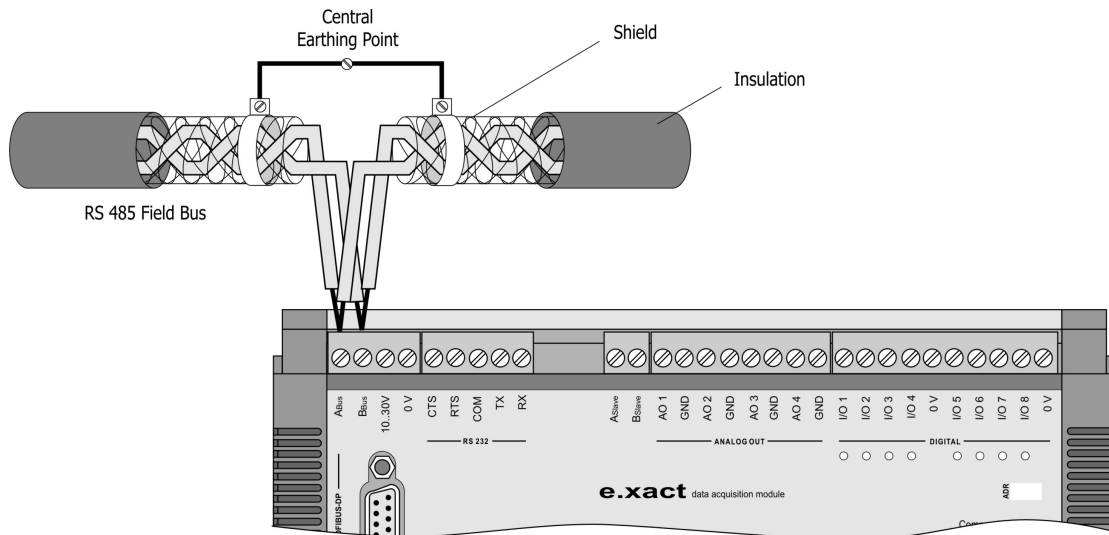


### 7.10 Shielding RS 485

In case of increased interference, such as in industrial areas, we recommend a shielding of the power supply, bus, and signal cables. In general, the shield should be connected to the protective earthing (not Data ground!) at each bus connection. If necessary, the shield should also be applied along the course of the cable several times. For shorter distances, e.g. with stub cables, the interference response is often improved if the shielding is only applied to the stub cable exit.

Bus users such as controllers (PLCs), computers (PCs), repeaters and interface converters (ISK), etc., generally feature the possibility of applying the shield directly to the appliance or to separate shield rails. Shield rails offer the advantage of preventing possible interfering signals from reaching the appliance. The shields which are connected to protective earthing conduct interference signals off before reaching the module.

The e.xact does not have a direct shield connection at the module. Here the shield of the bus cable can be connected to earth e.g. by so-called shield clamps.



**Figure 7.5.** - Earthing of the Bus Line Shield at an e.xact

**Notice:** The shielding screen must not be connected to the ground (0V) of the power supply and it should always be connected to earth with a large surface and low-inductance.

## 8. SPECIFICATIONS

All following data are valid after a warm-up time of approx. 45 minutes.

### 8.1 Analog Inputs (4 per module)

Accuracy	0.01 % typical 0.02 % in controlled magnetically environment according EN61326: 1997, appendix B 0.05 % in industrial area according to EN61326: 1997, appendix A		
Repeatability	0.003 % typical (within 24 hours)		
Type of Measurement	Range	Accuracy	Resolution
Voltage	±10 V	±2 mV	40 µV
	±2 V	±0.5 mV	10 µV
Current internal shunt 100Ω	±20 mA	±4 µA	80 nA
Bridge Excitation 5 VDC/120 Ω	±5 mV/V	±2 µV/V	0.1 µV/V
Input resistance	> 10MΩ		
Linearity deviation:	0.01% of the final value		
Signal to noise ratio	voltage measurement		
1 kHz	90 dB		
1 Hz	120 dB		
Temperature influence			
on zero	10 µV / 10 °K (at ±10V range) 0,2 µA / 10 °K (at ±20mA range) 0.1 µV / 10 °K (at ±5 mV/V range)		
on sensitivity	0.02 % / 10 °K		
Long-time drift	1 µV / 24 h; 0.1 µA / 24 h		

### 8.2 Analog Output (4 per module)

Type	Voltage output
Range	±10 VDC
Accuracy	±2 mV
Resolution	±0.3 mV
Valid load resistance	>5 kΩ
Temperature influence	
on zero	2 mV / 10 °K
on sensitivity	0.05% / 10 °K

Noise voltage in range	
0 ... 10 Hz	2 mV
0 ... 1000 Hz	10 mV
Long time drift	1 mV / 48 h
Linearity deviation	0.01 % of final value
Resolution	16 bit
Refresh rate	10,000 samples/sec for all variables
Settling time	100 µs

### 8.3 Digital In- and Output (8 per module)

Input	
Function	configurable for trigger and synchronization
Input voltage	max. +30 VDC
Input current	max. 1,5 mA
Upper switching threshold	>3.5 VDC (high)
Lower switching threshold	<1.0 VDC (low)

Output	
Function	configurable for alarm and synchronization
Type of output	Open-Collector
Output voltage	max. 30 VDC
Output current	max. 100 mA

### 8.4 Analog/Digital Conversion

Resolution	19 bit
Sample Rate	10,000 samples/sec – just measuring 5,000 samples/sec – with arithmetic channels 2,500 samples/sec – with e.pac functionality
Conversion method	Sigma Delta

### 8.5 Power Supply

Power supply	10 VDC to 30 VDC over voltage and overload protection
Power consumption:	approx. 5 W

## 8.6 Interfaces

### **Host Interface Ethernet**

Protocols:	TCP/IP, UDP, PING, ASCII, MODBUS-TCP/IP
Services:	DHCP, FTP Server
Baud Rates:	10/100 Mbit/s
Number of simultaneous clients:	Max. 10
Galvanic Isolation:	500 V

### **Host Interface RS 232**

Data Formats:	8E1 / 8O1 / 8N1
Protocols:	ASCII, MODBUS-RTU (parts)
Baud Rates:	9.6 kbit/s up to 115.2 kbit/s
Connections:	RX, TX, COM, RTS, CTS

### **Host Interface RS 485**

Data Formats:	8E1 / 8O1 / 8N1
Protocols:	ASCII, MODBUS-RTU (parts)
Baud Rates:	9.6 kbit/s up to 115.2 kbit/s
Connection devices:	Max. 32 at one line

### **Host Interface PROFIBUS-DP**

Standard:	RS 485
Data Format:	8E1
Baud Rates:	9.6 kbit/s up to 12 Mbit/s
Connectable Devices:	Max. 32 without repeater Max. 127 with repeater
Galvanic Isolation:	500 V

### **Slave Interfaces RS 485**

Standard:	RS 485, 2-wire
Data Format:	8E1
Protocols:	GANTNER LOCAL-BUS
Baud Rates:	9.6 kbit/s up to 6 Mbit/s
Connectable Devices:	Max. 32 at one line
Galvanic Isolation:	500 V

## 8.7 Mechanical

Case:	Aluminium and ABS
Dimensions (W x H x D):	189 x 90 x 83 mm (7.4 x 3.5 x 3.3 inch)
Weight:	700 g
Protective System:	IP 20
Mounting:	DIN EN-Rail

## 8.8 Connection

Plug-In screw terminals	Wire cross-section up to 1.5 mm <sup>2</sup>
Profibus-DP	Sub-D9 plug
Ethernet	RJ 45 plug

## 8.9 Environmental Conditions

Operating Temperature	-20 °C to + 60 °C (-4 °F to + 140 °F)
Storage Temperature	-30 °C to +85 °C (-22 °F to + 185 °F)
Relative humidity	0% to 95% at +50 °C (+122 °F), non-condensing

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### Notice:

Information in this manual are valid as of October 24<sup>th</sup> 2006 until revocation.  
Further changes and completion of the manual are reserved and possible without notice.

Part No. of e.xact: 438785 / 440071

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