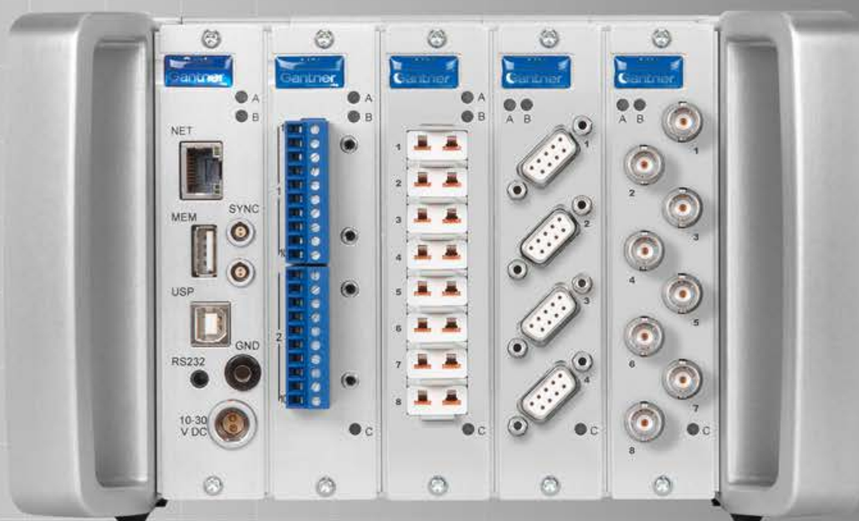
Gantner instruments

Q.series

Manual

Q.brixx



Vers. No. 2.0

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Vers. No. 2.0
Released: 5/07/2016

1 Safety Information

Before starting installation, setting up, operation and before maintenance work is carried out, it is essential to read and follow the appropriate warning and safety information given in this manual.

Installation, setting up, operation and maintenance of the modules or devices must take place as intended, i.e. under the conditions of use laid down in this manual and in the technical data for the relevant module or device.

1.1 Intended use

The products in the Q.series range are intended for use in industrial and experimental test engineering and for monitoring assembly and production processes. Transducers (sensors) for the acquisition of physical quantities such as voltage, current, resistance, temperature, force, displacement, torque, mass, strain and pressure can be connected. The modules are used exclusively for these kinds of measurement and control applications. Any application which goes beyond this scope does not fall within the intended use of the modules.

To ensure safe operation the modules and devices must only be operated according to the details given in the manuals and technical data sheets. In addition, the required legal and safety regulations covering the respective application must be followed. This applies in particular to the modules A123, A124, A127 and A128 with which input voltages of up to $1200V_{DC}$ are possible.

1.2 Checking for damage in transit

On receipt of the goods visually check that the packaging and the module or device together with the data medium are intact. Also check the shipment for completeness (accessory parts, documentation, auxiliary aids, etc.). If the packaging has been damaged in transit or if you suspect that the product is damaged or may malfunction, the product must not be put into operation. In this case contact your customer consultant or Gantner Instruments GmbH.

1.3 Personnel

The installation, operation and maintenance of the modules or devices must only be carried out by competent persons. Competent persons are those who through their professional education have sufficient knowledge in the required field and are familiar with the relevant national occupational protection regulations, accident prevention regulations, guidelines and accepted engineering rules. They must be able to reliably assess the results of their work and must be familiar with the contents of this manual.

Electrical connections must only be carried out by specialist personnel trained for the task.

In particular, pay attention to the following:

- the national installation and erection regulations (e.g. ÖVE, VDE, etc.)
- generally accepted engineering rules
- the details on transport, installation, operation, servicing, maintenance and disposal in this manual.
- the parameters, limits and the details about the operating and ambient conditions on the name-plates and in the data sheets.

1.4 Special risks

The modules A123, A124, A127 and A128 are specifically intended for measurements at high voltages. Consequently, on the modules a voltage of up to 1200 V may be present, which can lead to fatal or severe injury on touching the terminal contacts or bare parts of the connecting cables. Therefore, make sure that only qualified personnel have access to the modules or devices and that the voltages on modules can be switched off by a switch-disconnector or similar device for service purposes.

1.5 Siting locations

The devices in the Q.series range are protected to IP20 against water, dirt and small parts. If the ambient conditions require it, the modules can be fitted in water-protected or watertight housings.

Please note the admissible ambient temperatures specified in the technical data.

1.6 Modifications

Making modifications to the modules or devices is not permitted. Dirt and shrouding covers may only be removed for service and maintenance purposes.

1.7 Servicing and cleaning

The modules or devices do not need any servicing. Cleaning may only take place in the voltage-free state. Therefore follow the points below:

- Before cleaning, disconnect all connectors.
- Clean the housing with a soft, slightly moistened cloth. Never use any solvents, because these may attack the labels.
- When cleaning, make sure that no liquid enters into the device or goes onto the terminals.

Never attempt to repair nor to again operate devices which are defective, have developed a fault or are damaged. In this case it is essential to contact your customer consultant or Gantner Instruments GmbH.

1.8 Disposal

Old devices which are no longer usable must be disposed of according to national and local regulations regarding environmental protection and raw-material recycling. Electronic components must not be disposed of with the household refuse. The packaging can be recycled and should therefore be passed into the recycling system. However, we recommend that the packaging is kept until the end of the warranty period so that you can pack faulty devices or modules properly.

1.9 General hazards due to non-observance of the safety information

The modules or devices conform to the state of the art and are operationally safe. However residual risks may arise when they are used and operated improperly by untrained personnel.

Any person commissioned with the task of siting, operating, servicing or repairing a module or device in the Q.series must have read and understood the operating manual and in particular the information relating to safety.

2 Labels and warning information

2.1 Warning information

To prevent personal injury and damage to property it is essential that you follow the warning and safety information given in this operating manual.

⚠ DANGER	**Indicates a directly threatening hazard. If it is not prevented, the consequence will be fatal or serious injuries.**
⚠ WARNING	Indicates a possibly hazardous situation. If it is not prevented, the consequence may be fatal or serious injuries.
⚠ CAUTION	Indicates a possibly hazardous situation. If it is not prevented, the consequence may be injuries of slight or medium severity.
NOTICE	Indicates a situation in which the consequence may be property damage if the information is not followed.

2.2 Labels on the modules

Symbol: CE

Meaning: This symbol is the CE marking. This shows that we guarantee that our product meets the requirements of the relevant EC directives.

Symbol: **CAT I, CAT II, CAT III**

Meaning: Modules with this symbol are intended for the connection of high voltage. The maximum admissible voltage is also given.

Symbol: 

Meaning: High voltage may be present on the module connections. Connection may only be made with the insulated connecting plugs provided.

2.3 Labels in this manual

To simplify reading this manual we use – along with the warning information given above – the following labels and notation:

IMPORTANT
Paragraphs with this symbol give important information about the product or about using the product.

Tip
Contains application hints and other particularly useful information.

Symbol: 
Meaning: Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

italics	signifies highlighted text
interface	signifies entries and entry fields in program user interfaces
Options	indicates menu items in the program user interfaces
>	signifies a sequence of menu items, e.g. in **Options > Settings**
➡	indicates special features or restrictions

3 Introduction

Dear Customer,

Thank you for purchasing a product in the Q.series from Gantner Instruments GmbH. We are sure that you have obtained an excellent product which will enable you to make fast and reliable measurements with low measurement uncertainties.

The manual is included in the items supplied. Keep the manual safe or download the latest version from our web site. If you find faults on the product or errors in the accompanying documentation or if you have suggestions for improvement, please contact your customer consultant or Gantner Instruments GmbH directly. We would be glad to receive your comments and ideas.

You will find further information in the section Technical Information in our Wiki at https://dev.gantner-instruments.com/dokuwiki. The user name is ***support*** and the password is ***gins*** (not all sections are open to the public).

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3.1 The documentation of the Q.brixx family

The documentation for Q.brixx consists of this manual about the Q.brixx modules A101, A102, A103, A104, A105, A106, A107, A108, A109, A111, A116, A123, A124, A127, A128, D101, D104, D105, D107 and S104 as well as the Q.gate Test Controller. Detailed descriptions on special settings for Q.gate can be found in other Gantner Instruments Test & Measurement GmbH documentation on the Gantner CD or on our home page www.gantner-instruments.com.

You will find this manual also as a PDF file on our home page and on the Gantner CD enclosed with your system or which you can order free of charge from Gantner Instruments Test & Measurement GmbH.

3.2 About this manual

This manual describes the installation, initial operation and the configuration of the modules Q.brixx A101, A102, A103, A104, A105, A106, A107, A108, A109, A111, A116, A123, A124, A127, A128, D101, D104, D105, D107 and S104 with the Q.gate Test Controller using the program test.commander. The modules are differentiated through the number of their analog and/or digital inputs and outputs as well as by the maximum possible measuring rate.

The manual is divided into several chapters:

- Safety information in Chapter 1, from page 5 onwards.
- A description of the labels and symbols used on the modules and in this documentation can be found in Chapter 2 from page 9 onwards.
- You will find a description of the system and the main combination and expansion options in the next section.
- The description of the connection variants and the pin assignments on the inputs and outputs can be found in Chapter 4, *Connection*, from page 15 onwards.
- A comprehensive introduction to the configuration of the modules using the program test.commander is given in Chapter 5, *Configuration*, from page 81 onwards.
- Comprehensive explanation of the module measurement technology and background information about working procedures can be found in Chapter 6, *Functional Procedures*, from page 115 onwards.

3.3 System description

The modules in the Q.brixx series have been developed for industrial and experimental measurement and test engineering, in particular for multi-channel measurements of electrical, mechanical and thermal signals on engine and component test-rigs as well as for monitoring processes and long-term supervision. The modules A123, A124, A127 and A128 are specially designed for measurements at high voltages.

DANGER

Voltages of up to 1200 V may be present on the connections of the modules A123, A124, A127 and A128.

Before connecting or disconnecting cables on these modules make sure that all sources of power are Locked Out.

The individual modules can be combined to form one system as required. You can connect up 16 modules to the Q.gate Test Controller and then address them from a PC or PLC via a single interface.

On all modules the power supply, bus interface and the inputs and outputs are electrically isolated from one another.

Operating the modules via Q.gate

The Q.gate Test Controller can be operated to the far left or far right next to the Q.brixx modules (first or last slot). It cannot however be installed between the modules.

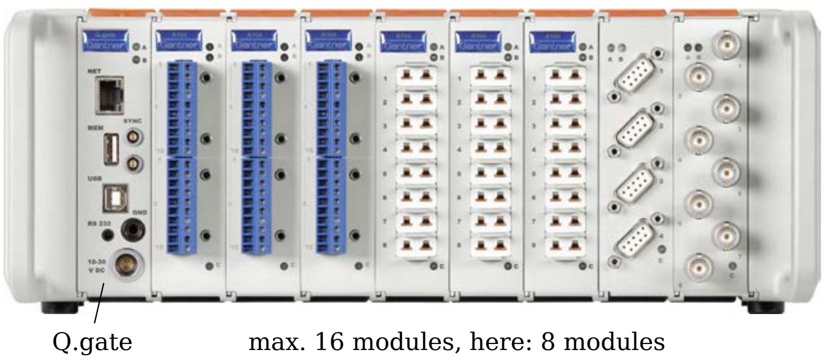

Fig. 3-1 Q.gate with 8 modules.

Depending on the operating mode of the modules, transmission rates of 1 kHz with up to 128 variables (transferred values with four byte resolution, real variables) are possible over Ethernet.

UART data throughput at 24 MBaud Measuring rate 1 kHz Measuring rate 10 kHz Measuring rate 100 kHz	 200 real variables 20 real variables 2 real variables
Ethernet data throughput (transmission rate with block transfer)	128 real variables (1 kHz) 16 real variables (10 kHz)
Ethernet data throughput (transmission rate with online transfer)	64 real variables (300 Hz)
Interfaces	Ethernet, USB, RS-232, 2 UARTs
Max. number of slaves (Q.brixx)	16

4 Connection

This chapter contains the description of the connection variants and pin assignments.

4.1 Connecting the power supply

For the power supply an unregulated direct voltage between 10 and 30volts is required, which is connected to the socket right at the bottom in the Q.gate. Fig. 4-1 shows the pin assignment. Each module requires a power of approx. 2W in addition to the power supplied for the connected transducers. The power required is almost constant over the complete voltage range.

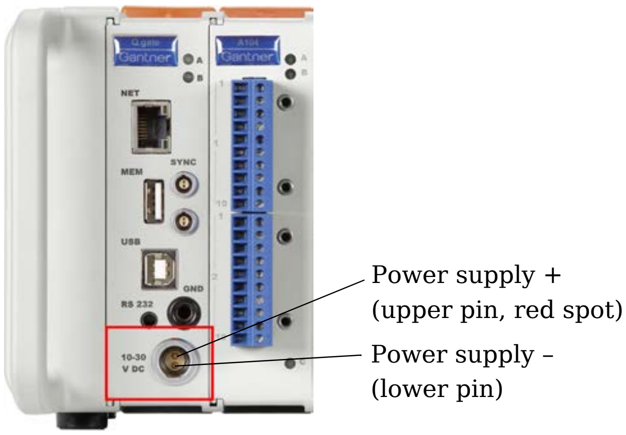

Fig. 4-1 Pin assignment on the power supply socket.

IMPORTANT

When the modules are switched on, there is an increase current demand until the modules are operating in a stable manner: In the start-up phase up to 700mA (10ms) per module is needed depending on the supply voltage. Thereafter, you should expect approx. 500mA per module for a 10V supply voltage, with a 30V supply voltage approx. 170mA. You should therefore either use power supplies which can deliver the required peak power when the voltage is switched on or – with many modules – switch the modules on in several groups.

The modules have an internal self-healing (reversible) fuse for protection against overvoltages, overcurrents and incorrect polarity.

➡ Do not use cable which is too thin for the connection so that the required power can be transferred to the module without significant losses.

4.2 Connecting interfaces

For communication (configuration and data interchange) with the modules you must connect the Q.gate Test Controller via Ethernet (Section 4.2.1, page 16) to a PC or PLC. The configuration is carried out exclusively via the Ethernet interface.

We recommend the use of cables to Cat-5e or better.

For setting an IP address or for logging purposes you can also use the RS-232 interface of the Q.gate Test Controller (Section 4.2.2, page 17).

4.2.1 Connecting /Q.gate via Ethernet to a PC/PLC

The Q.gate Test Controller uses DHCP (Dynamic Host Configuration Protocol) to obtain an address from a server in the network. In this case you only have to connect the Test Controller to an Ethernet switch. An IP address is assigned automatically.

Tip
We recommend the use of industrial Ethernet switches. Q.gate uses autonegotiation and operates, if available, with 100 Mbit/s and full duplex for the transmission.

Connection without a server

If you are not connected to a network or there is no server in the network, you should set your PC to DHCP (**Control Panel > Network**) and connect to the Q.gate Test Controller. Windows XP or Windows Vista then negotiates a suitable address so that you can communicate with the module and can set a fixed Ethernet address. Consequently, set your PC also to a fixed IP address from the same address range, because otherwise no link can be established to the module.

Tip
Refer also to Section 6.1, *Ethernet on the PC*, on page 115 for the display and setting of the PC IP address.

If the Test Controller does not receive an IP address from a server, then it adjusts to its static IP address after a few seconds. The factory setting of the static IP address of the Test Controller is 192.168.1.28.

Connection in a network with a server

In the factory setting the Test Controllers use DHCP, i.e. they receive a valid network address from a server which is present in the network. Connect the PC or the PLC to the same network. Then you can establish the link immediately via test.commander and can therefore also assign a fixed address to the Test Controller. Refer also to Section 6.1 on page 115.

Procedure

Setting an Ethernet address (IP address)

1. Make sure that the current version of the test.commander software is installed on your PC.

   You will find the current version in the download section of our home page. If necessary, install the current version; refer to Section 5.1 on page 82.
2. Start the software.
3. Using the menu **Utilities > Controller network terminal** call the dialog for finding Test Controllers.
4. Click on ***Configure IP settings***.
5. Select ***Manually configure network settings*** and specify the required IP address (***IP address***), the subnet mask (***Subnet mask***) and – if necessary – the gateway address (***Default gateway***). If in doubt, details can be obtained from your network administrator.
6. Click on ***Apply*** to accept the changes.

Example

Selected new IP address for the Test Controller: 192.168.169.85
Possible PC IP address: 192.168.169.10
Subnet masks of the PC and module: 255.255.255.0

Tip
Alternatively, you can also use the wizard for the initial operation in the test.commander program.

Section 6.1, *Ethernet on the PC* on page 115 contains further information about the use of Ethernet addresses and subnet masks.

4.2.2 Using the RS-232 interface of Q.gate

The RS-232 interface is used for the output of protocol information and for setting the IP address if this is not possible elsewhere.

The RS-232 interface of the Q.gate Test Controller is located below the USB interface at the front. For the link to a PC you require the supplied cable with the 3.5 mm stereo jack plug.

Fig. 4-2 Pin assignment for RS-232 on the jack plug.

Procedure

Setting an Ethernet address (IP address) via RS-232

1. Make sure that the current version of the test.commander software is installed on your PC.

   You will find the current version in the download section of our home page. If necessary, install the current version; refer to Section 5.1 on page 82.
2. Start the software.
3. Using the menu **Utilities > Controller serial terminal** call the dialog for finding Test Controllers.
4. Specify the required IP address (***IP address***), the subnet mask (***Subnet mask***) and – if necessary – the gateway address (***Default gateway***). If in doubt, details can be obtained from your network administrator.
5. Click on ***Apply*** to accept the changes.

Example

Selected new IP address for the Test Controller: 192.168.169.85
Possible PC IP address: 192.168.169.10
Subnet masks of the PC and module: 255.255.255.0

Section 6.1, *Ethernet on the PC* on page 115 contains further information about the use of Ethernet addresses and subnet masks.

4.2.2.1 Establishing connection with the test.commander setup wizard

1. Make sure that the current version of the test.commander software is installed on your PC.

   You will find the current version in the download section of our home page. If necessary, install the current version; refer to Section 5.1 on page 82.
2. Start the software and select the **Utilities > Module setup assistant**

   Another program window opens.
3. Select **Options > Communication settings**.
4. Under ***Interface type*** select the ***RS-232 direct connection*** and under ***ComPort*** the PC connection you are using.

5. Close the dialog with ***OK***.

   Further interface parameters are not needed.

6. Click on ***Find modules***.

   The program searches the specified interface for connected modules and displays all the modules found in the program window. If there are addressing conflicts, they are also displayed. Specify unique addresses for the modules; refer to Section 5.2 on page 83.

4.2.2.2 Establishing connection with ICP 100

1. Make sure that the current version of the ICP 100 software is installed on your PC.

   You will find the current version in the download section of our home page. If necessary, install the current version; refer to Section 5.1 on page 82.

2. Start the software and select **Communication > Parameters**.

3. Under ***Interface type*** select the ***RS-232 direct connection*** and under ***ComPort*** the PC connection you are using.

4. Close the dialog with ***OK***.

   The program searches the specified interface for connected modules and displays all the modules found in the program window. If there are addressing conflicts, they are also displayed. Specify unique addresses for the modules; refer to Section 5.2 on page 83.

4.3 Synchronization of several systems

The synchronization of the Q.brixx modules in one housing (one system) is provided through the Test Controller. The Test Controller ensures that all subordinate modules operate synchronously with the maximum jitter being approximately ±2 µs over all modules.

You have various methods of obtaining synchronization, even with several *systems* (refer also to Fig. 4-3 on page 21):

1. Use the time signal in the Test Controllers based on the IRIG standard (Inter Range Instrumentation Group) to synchronize all other Test Controllers to one master controller.

   The master controller (first device in the chain of devices) uses its internal clock for the date/time stamp (gray path in Fig. 4-3). For this type of synchronization you must lay synchronization lines between the Test Controllers; the maximum length of all lines together is 1000 m. The order of connection is not important. The master controller transfers the time stamp via an RS-485 link to the other Test Controllers.

This method achieves the best time synchronization with the smallest jitter (approx. ±2 µs) between the individual modules, because the time information passes simultaneously to all Test Controllers.

2. You connect a radio receiver for time signals, e.g. for DCF77 which converts the received time signal to IRIG-B, to a Test Controller.

   As master controller this then synchronizes all other Test Controllers using IRIG (orange colored path in Fig. 4-3) as with Variant 1. If it is not possible to connect the individual Test Controllers via synchronization lines or this is not desired, you can also connect a receiver to each Test Controller (Variant 2b).

3. You connect an NMEA-0183 compatible GPS receiver (Global Positioning System) to a Test Controller, which then, similar to Variant 1, synchronizes as master controller all other Test Controllers.

   With this method the time information of the GPS signal is evaluated instead of a pure time signal. In addition you can also process the position details of the GPS receiver in the system and assign the measurements (light blue path in Fig. 4-3). If it is not possible to connect the individual Test Controllers via synchronization lines or this is not desired, you can also connect a receiver to each Test Controller (Variant 3b).

4. You define a PC as an SNTP time server which can distribute the NTP time stamp to all Test Controllers (dark blue path in Fig. 4-3).

The absolute accuracy of the time information depends on the method used. If you do not want to use or cannot use any time synchronization lines, e.g. because the spacing of the systems is too large, you must expect greater deviations. In the variant 2b the deviations lie in the range from a few milliseconds up to about 100 milliseconds, but this depends on various factors, e.g. how often the time information is received. In the variant 3b the time accuracy of the GPS signal is decisive, which is only approx. 1 second absolute.

The fourth method uses, for example, the SNTP protocol (Simple Network Time Protocol) used in the Microsoft Windows operating system to transfer the date and time via Ethernet. However, the individual Test Controllers must always query the time server in order to be able to synchronize their times to the time server. The achievable accuracy is therefore not as good as for the three other methods. If required, you can also set up a (full) NTP time server on a PC and synchronize it with a time server in the Internet. You will find further information about this at http://

www.meinberg.de (here you can also downloaded a time server program) and at http://www.pool.ntp.org. The time accuracy is then only dependent on the response times in your network.

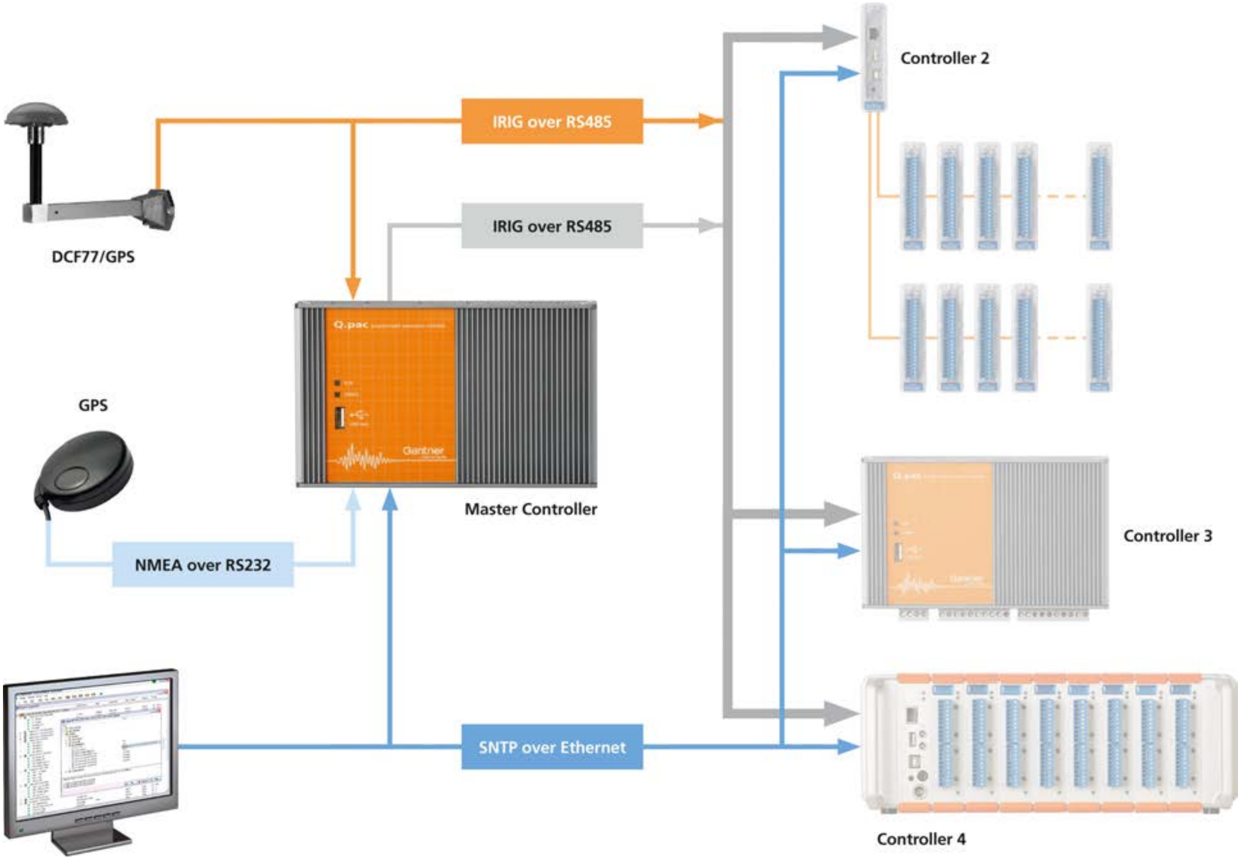

Fig. 4-3 Possible types of time synchronization.

If you combine several synchronization methods, the best possible one is always used from those available:

1. Hardware synchronization (synchronization of the Q.series, IRIG-B using a time signal, e.g. DCF77)
2. Time signal from GPS (NMEA-0183)
3. SNTP

The configuration of the synchronization in all cases occurs via the test.commander program, refer to Section 5.8.3.3, *Synchronization*, page 103.

4.3.1 Connection of a radio receiver for time signals

A radio receiver, e.g. for DCF77, is connected through the “Sync” socket (Lemo plug on Q.gate). The variant is only possible when the receiver has an RS-485 interface, because the sync input uses this interface. Contact Gantner Instruments GmbH to obtain a suitable connecting lead and other information.

The configuration is carried out using the program test.commander and the menu **Settings > Synchronization > Sync. settings**. **Protocol**; refer also to Section 5.8.3.3, page 103.

4.3.2 Connection of a GPS receiver

NMEA-compatible GPS receivers normally have a serial interface and are therefore connected through RS-232 to the Q.gate Test Controller (RS-232 input at the front).

The configuration is carried out using the program test.commander and the menu **Settings > Synchronization > Sync. settings**. **Protocol**; refer also to Section 5.8.3.3, page 103.

4.4 Module flashing frequency

The modules have three LEDs: one blue LED on the upper edge (A) and one red LED per connector strip (B and C). In normal operation the blue LED lights, but the red LEDs do not light. Depending on the error, the LED of the affected connector strip or the blue LED lights or all LEDs flash in a certain order. In the following illustrations a short dash corresponds to short flash and a long dash to a long flash.

4.4.1 SOS

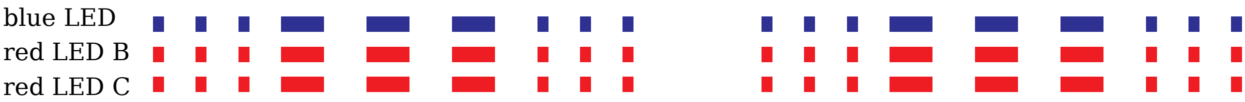

Fig. 4-4 Flashing sequence with an incorrect module or when there are no settings in the base.

Cause: The configuration saved in the base does not match that in the module.

There may be two reasons for this:

1. There is no configuration in the base yet.
2. The module type saved in the base configuration differs from the plugged-in module, therefore the configuration cannot be accepted.

Consequently, either change the module for the correct module type or reconfigure the module (Chapter 5, *Configuration*, page 81). The (new) configuration is then automatically saved in the base.

4.4.2 Firmware download

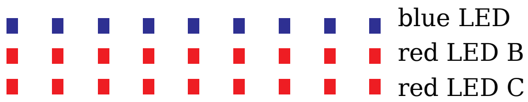

Fig. 4-5 Flashing sequence on downloading the module firmware.

The LEDs flash as long as the download runs.

4.4.3 FPGA download

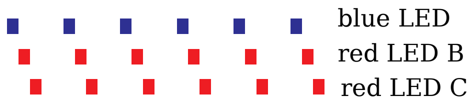

Fig. 4-6 Flashing sequence on downloading the FPGA firmware.

The LEDs flash as long as the download runs.

4.4.4 Problems during data transmission

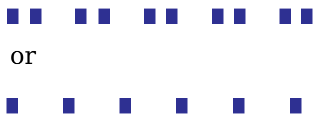

Fig. 4-7 Flashing sequence for problems during the data transmission.

These flashing sequences indicate a problem with the communication.

Restart the system (by switching off, waiting one minute and then switching on again). If these measures do not rectify the error, a hardware fault is probably present. Contact your customer consultant or Gantner Instruments GmbH directly.

4.4.5 LED displays in normal operation

For modules with analog inputs a red illuminated LED indicates that the measurement range has been exceeded on at least one input. You can suppress this indication in the module configuration.

For modules with digital inputs or outputs an orange illuminated LED indicates that an input or output is active.

4.5 The modules and their connection options

Modules:	A 101	A 102	A 103	A 104	A 105	A 106	A 107	A 108	A 109	A 111	A 116
Signal inputs											
Voltage	X	X	X	X			X	X		X	
Current	X	X	X				X	X			
Potentiometer	X						X				
Resistance	X				X		X				
Pt100, Pt1000	X				X		X				
Thermocouple	X			X			X				
(Strain gauges) full + half bridge	X	X				X	X 1)				X
Strain-gauge quarter bridge	X 2)	X 2)				X 2)	X 2)				X
Inductive full and half bridge						X					
LVDT, RVDT						X					
IEPE/ICP® Sensor	X	X								X	
Digital input: frequency, pulse width, counter									X		
Digital input: Status	X	X	X			X		X	X		
Signal outputs											
Voltage		X				X			X		
Current		X							X		
Digital output: frequency, pulse width									X		
Digital output: Status	X	X	X			X		X	X		
Number of channels	2	1	8	8	4	2	4	8	4	4	8
Data rate (in Hz)	100k	100k	100	100	10	10k	10k	10k	100k	100k	10k
For description refer to page	26	31	35	37	40	42	46	52	54	56	58

1) Half bridge only with Q.brixx Terminal
2) Quarter bridge with Q.brixx Terminal

Modules:	A123	A124	A127	A128	D101	D104	D105	D107	S104
Signal inputs									
Voltage	X	X	X	X					
Current									
Potentiometer									
Resistance									
Pt100, Pt1000									
Thermocouple		X							
(Strain gauges) full + half bridge									
Strain-gauge quarter bridge									
Inductive full and half bridge									
LVDT, RVDT									
IEPE/ICP® Sensor									
Digital input: frequency, pulse width, counter					X			X	
Digital input: Status					X	X		X	
Signal outputs									
Voltage									
Current									
Digital output: frequency, pulse width					X				
Digital output: Status					X		X		
Number of channels	4	4	4	4	8	16	16	6	
Data rate (in Hz)	100k	10k	100k	100k	up to 100k	10k	10k	1M	
For description refer to page	62	64	66	68	70	73	74	75	78

4.6 Q.brixx A101: Connecting sensors and I/O

The Q.brixx Module A101 has two electrically isolated analog inputs and two digital inputs or outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections.

GND identifies the measurement ground of an input, 0V and +V refer to the (external) supply voltage connections. Measurement ground and (module) supply voltage are electrically isolated in the module.

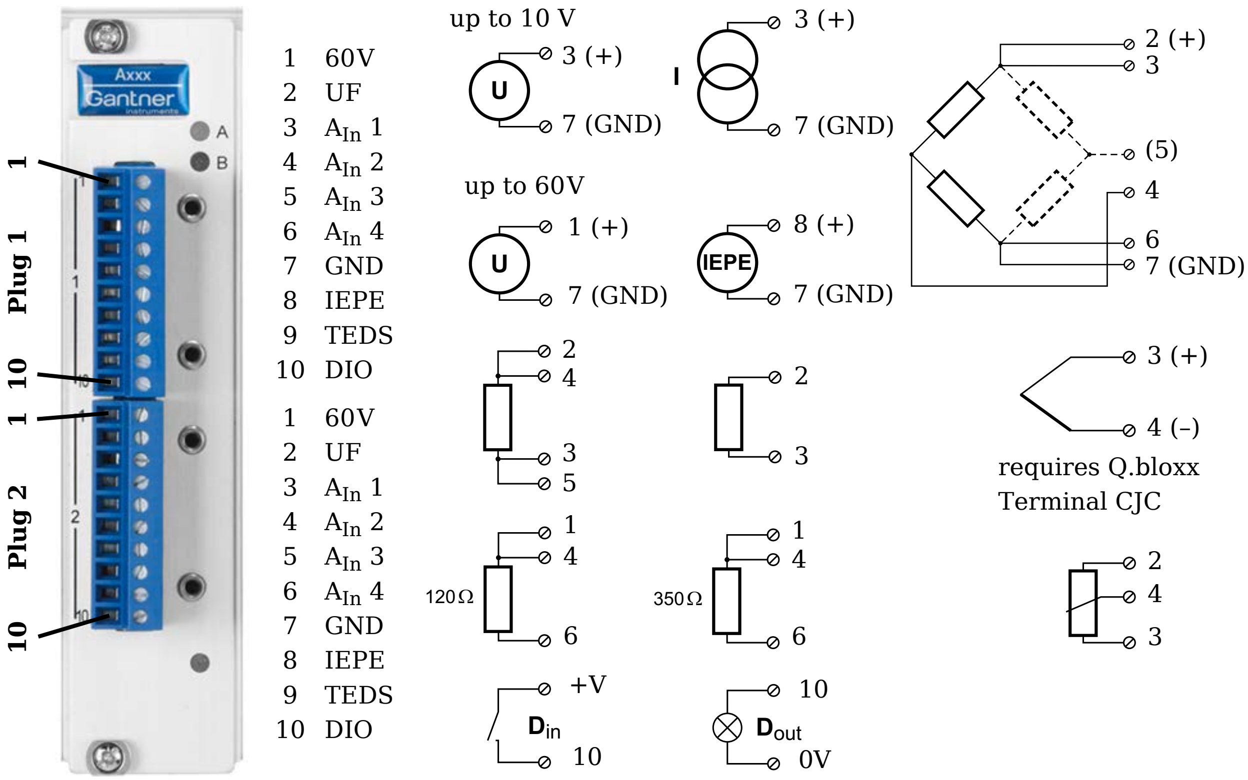

Fig. 4-8 Pin assignment for Q.brixx Module A101.

> **Tip**
> Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.6.1 Voltage

With voltage measurements two connection variants are possible, depending on the level of the voltages to be measured: up to 10V and up to 60V.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

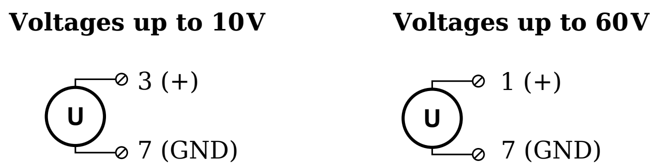

Fig. 4-9 A101, measurement of voltage.

4.6.2 Current

A shunt resistance of 50Ω is integrated into the Q.brixx Module A101 for current measurement. This facilitates the measurement of currents of up to 25 mA. For higher currents use a voltage measurement and an external shunt; refer to Section 6.4, page 124.

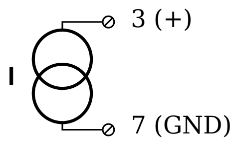

Fig. 4-10 A101, measurement of current.

4.6.3 Potentiometer

Potentiometers with resistances between 1 kΩ and 10 kΩ are connected in a three-wire configuration.

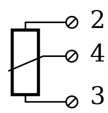

Fig. 4-11 A101, measurement with potentiometers.

4.6.4 Resistance, Pt100, Pt1000

You can connect resistances and Pt100/1000 probes in two-wire or four-wire circuits. You specify the selected type of circuit during the module configuration (**Type** column).

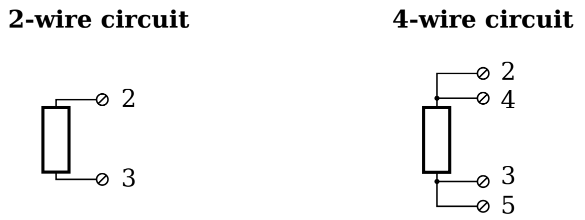

Fig. 4-12 A101, measurement of resistance and Pt100/1000 probes.

Tip
Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.6.5 Thermocouple

For connecting thermocouples you need a special connecting plug which contains the comparative measuring point (cold point compensation) required for thermocouples. The plug can be obtained under the designation Q.bloxx Terminal CJC-A101 from Gantner Instruments GmbH. You can connect the following types of thermocouple: B, E, J, K, L, N, R, S, T and U.

Alternatively, you can also use two thermocouples or a reference temperature source.

Tip
You will find information on the comparative measuring point and on the measurement with a reference temperature source in Section 6.5, *Measuring with thermocouples*, page 125.

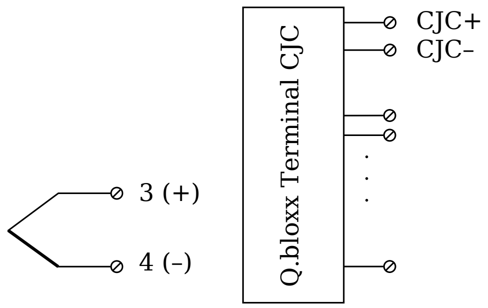

Fig. 4-13 A101, measurement with thermocouple using Q.bloxx Terminal CJC-A101.

4.6.6 Full and half-bridge transducers

With (resistive) full bridges (strain-gauge full bridges) all connections are occupied. If the sensor has no sensing leads, you specify this during the module configuration (**Type** column). With half bridges the side drawn in dashes and the connection 5 are omitted.

The bridge excitation voltage is 2.5V.

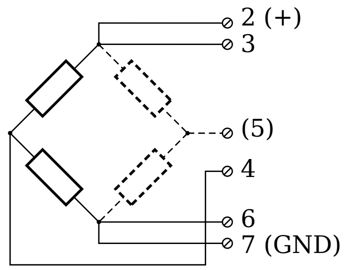

Fig. 4-14 A101, measurement with full and half bridges.

Tip

Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.6.7 Strain-gauge quarter bridges

For the connection of strain-gauge quarter bridges you need a special connecting plug which contains the completion resistances. The plug can be obtained under the designation Q.bloxx Terminal B4/120-A101 with120Ω or B4/350-A101 with 350Ω from Gantner Instruments GmbH.

The bridge excitation voltage is 2.5V.

IMPORTANT

The plug must have the same resistance values as the strain gauges used, because otherwise no measurement is possible. Since, for reasons of stability, all necessary completion resistances are located in the Q.bloxx Terminal, you have to select a full bridge circuit as the bridge type for the channel.

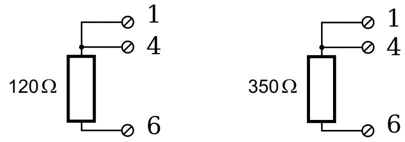

Fig. 4-15 A101, measurement with strain-gauge quarter bridge using Q.bloxx Terminal B4.

4.6.8 IEPE/ICP® sensor

The sensor is supplied with 4mA of current from the module (current supply).

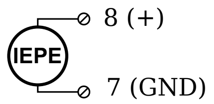

Fig. 4-16 A101, measurement with IEPE or ICP® sensors.

4.6.9 Digital input and output

On each connecting plug a contact is available for an input or output. You can use the appropriate function depending on the wiring.

Fig. 4-17 A101, digital input and output.

The digital input is active (high level) when the applied signal voltage lies above the threshold of 10V.

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4.7 Q.brixx A102: Connecting sensors and I/O

The Q.brixx Module A102 has one electrically isolated analog input, one analog output and two digital inputs or outputs electrically isolated from the analog section. The assignment of both connector strips is *not* identical. The plug number is specified in the following. The connection terminals have numbers for identifying the connections.

GND identifies the measurement ground of an input, 0V and +V refer to the (external) supply voltage connections. Measurement ground and (module) supply voltage are electrically isolated in the module.

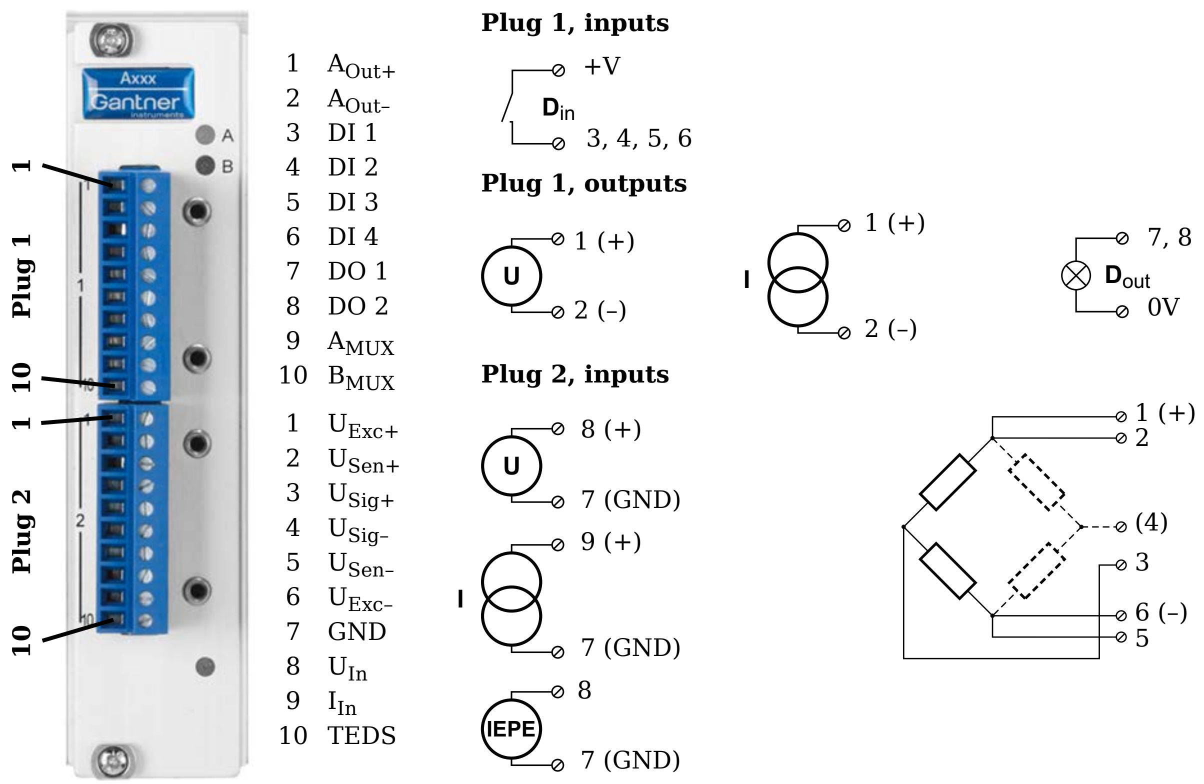

Fig. 4-18 Pin assignment for Q.brixx Module A102.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.7.1 Voltage

You can measure voltages of up to 10V via Plug 2.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

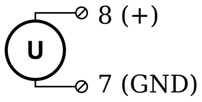

Fig. 4-19 A102, measurement of voltage, Plug 2.

4.7.2 Current

A shunt resistance of 50Ω is integrated into the Q.brixx Module A102 for current measurement. This facilitates the measurement of currents of up to 25mA via Plug 2. For higher currents use a voltage measurement and an external shunt; refer to Section 6.4, page 124.

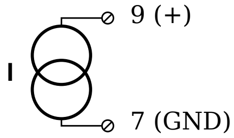

Fig. 4-20 A102, measurement of current, Plug 2.

4.7.3 Full and half-bridge transducers

With (resistive) full bridges (strain-gauge full bridges) all connections are occupied. If the sensor has no sensing leads, you specify this during the module configuration (**Type** column). With half bridges the side drawn in dashes and the connection 4 are omitted.

The bridge excitation voltage is switched via software between 1V, 2.5V, 5V and 10V.

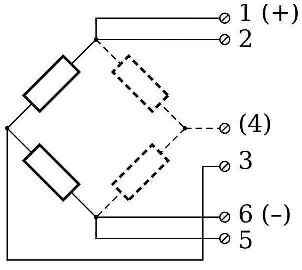

Fig. 4-21 A102, measurement with full and half bridges, Plug 2.

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Tip
Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.7.4 Strain-gauge quarter bridges

For the connection of strain-gauge quarter bridges you need a special connecting plug which contains the completion resistances. The plug can be obtained under the designation Q.bloxx Terminal B4/120-A102 with120 Ω or B4/350-A102 with 350 Ω from Gantner Instruments GmbH.

The bridge excitation voltage is switched via software between 1 V, 2.5 V, 5 V and 10 V.

IMPORTANT
The plug must have the same resistance values as the strain gauges used, because otherwise no measurement is possible. Since, for reasons of stability, all necessary completion resistances are located in the , you have to select a full bridge circuit as the bridge type for the channel.

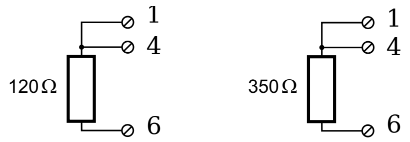

Fig. 4-22 A102, measurement with strain-gauge quarter bridge using Q.bloxx Terminal B4 on Plug 2.

4.7.5 IEPE/ICP® sensor

The sensor is supplied with 4 mA of current from the module (current supply).

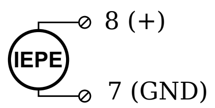

Fig. 4-23 A102, measurement with IEPE and ICP® sensors, Plug 2.

4.7.6 Analog output

An analog output for voltage or current is available on Plug 1. The selection between voltage and current is made via software.

Fig. 4-24 A102, output of voltage or current, Plug 1.

4.7.7 Digital input and output

Contacts for four inputs and two outputs are available on Plug 1.

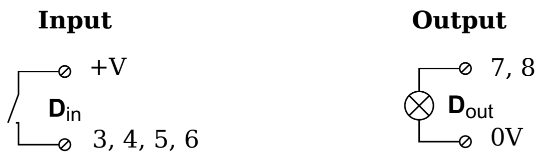

Fig. 4-25 A102, digital input and output, Plug 1.

The digital input is active (high level) when the applied signal voltage lies above the threshold of 10V.

4.8 Q.brixx A103: Connecting sensors and I/O

The Q.brixx Module A103 has eight electrically isolated analog inputs and two digital inputs and outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The designations 0V and +V refer to the (external) supply voltage connections. Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

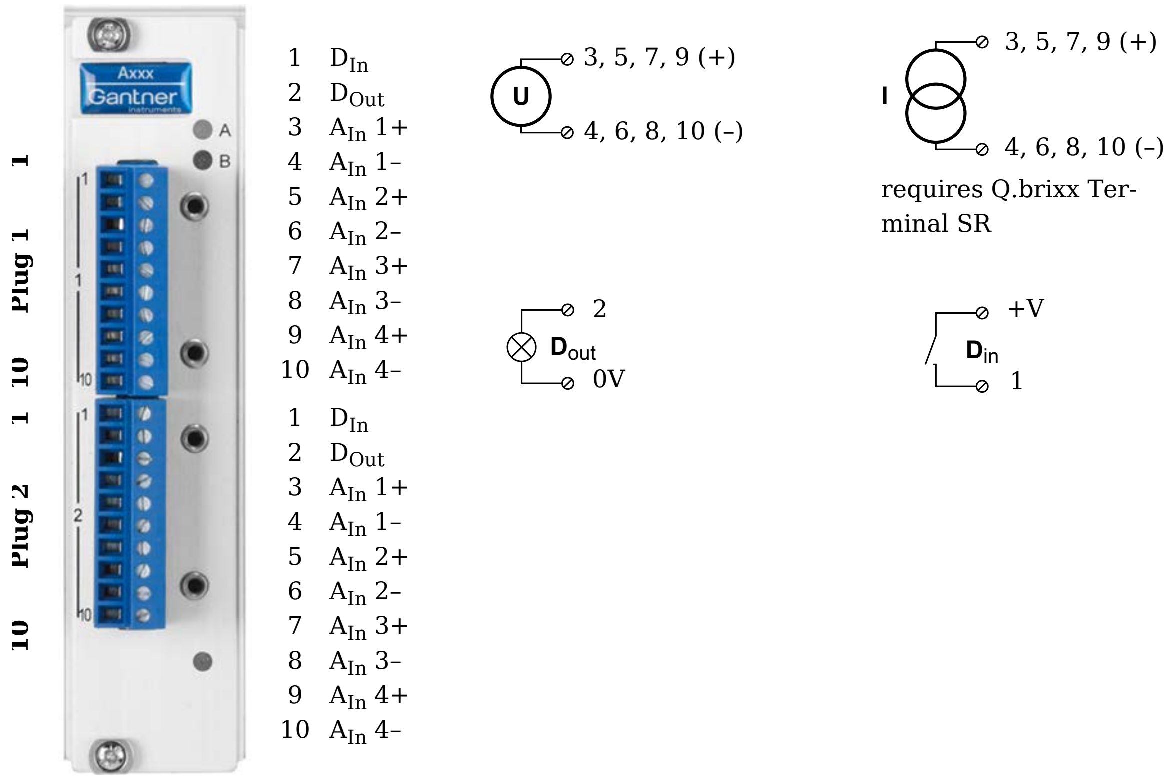

Fig. 4-26 Pin assignment for Q.brixx Module A103.

Tip
Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.8.1 Voltage

You can measure voltages of up to ±10V.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

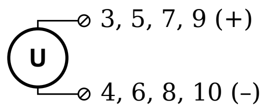

Fig. 4-27 A103, measurement of voltage.

4.8.2 Current

For current measurement you need the connecting plug Q.brixx Terminal SR containing the shunt resistances. This facilitates the measurement of currents of up to 25 mA.

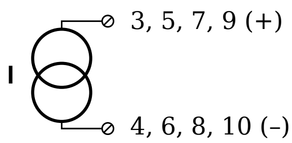

Fig. 4-28 A103, measurement of current via Q.brixx Terminal SR.

4.8.3 Digital input and output

On each connecting plug two contacts are available for an input and an output.

Fig. 4-29 A103, Digital Input and Output.

The digital input is active (high level) when the applied signal voltage lies above the threshold of 10 V.

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4.9 Q.brixx A104: Connecting sensors

The Q.brixx Module A104 has eight electrically isolated analog inputs for thermocouples or voltages. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The module can also be obtained with other connections, e.g. with Mini TKC sockets. In this variant no Q.bloxx Terminal CJC-A104 is needed.

Tip

To secure the thermocouple plug-in connector against falling out, perforated metal nipples are fitted over the sockets in the version with TKC sockets. After inserting all thermocouple plug-in connectors, insert, for example, a wire through the holes in the plugs and the metal nipples and twist the ends of the wire.

Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

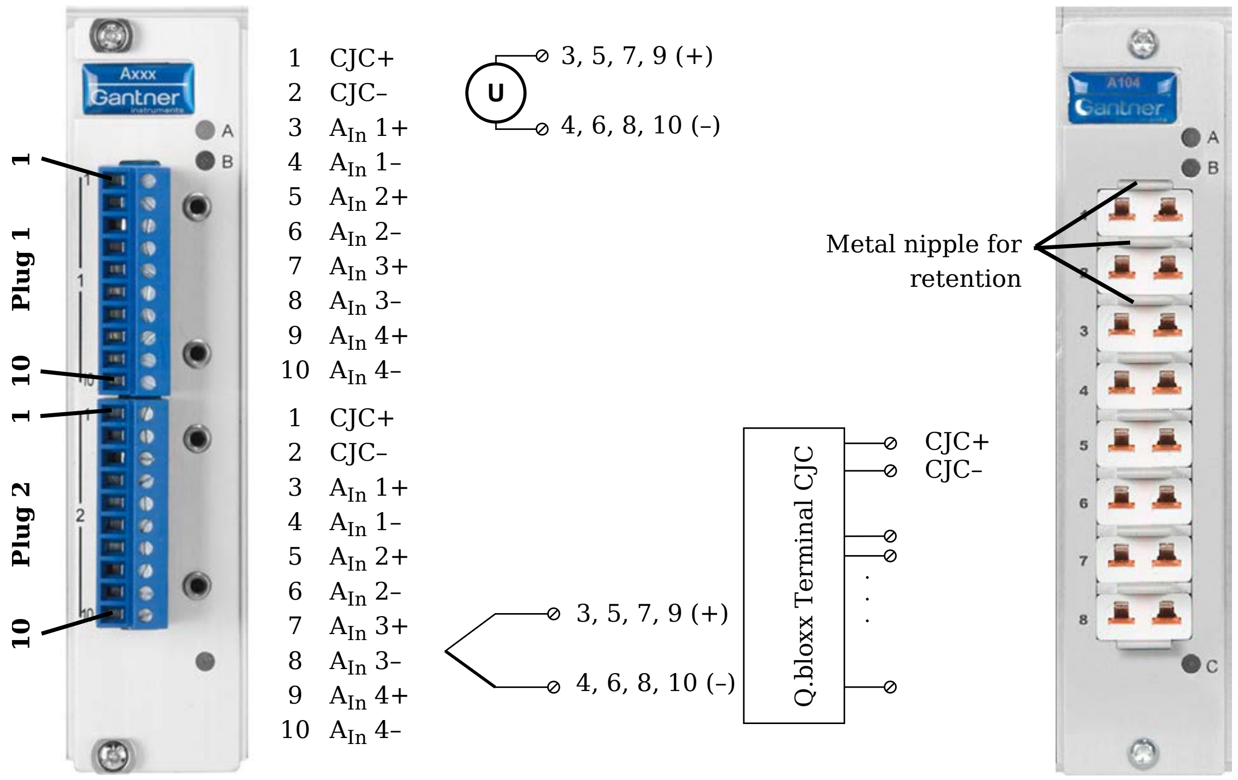


Fig. 4-30 Pin assignment for Q.brixx Module A104 (left), version with Mini TKC sockets on the right side.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.9.1 Voltage

You can measure voltages of up to 80 mV.

IMPORTANT

Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

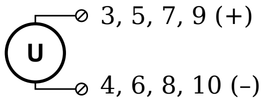


Fig. 4-31 A104, voltage measurement.

4.9.2 Thermocouple

For connecting thermocouples you need a special connecting plug for the terminal version which contains the comparative measuring point (cold junction compensation) required for thermocouples. The plug can be obtained under the designation Q.bloxx Terminal CJC-A104 from Gantner Instruments GmbH. The plug is not needed in the version with the Mini TKC sockets. You can connect the following types of thermocouple: B, E, J, K, L, N, R, S, T and U.

Alternatively, you can also use two thermocouples or a reference temperature source.

Tip

You will find information on the comparative measuring point and on the measurement with a reference temperature source in Section 6.5, *Measuring with thermocouples*, page 125.

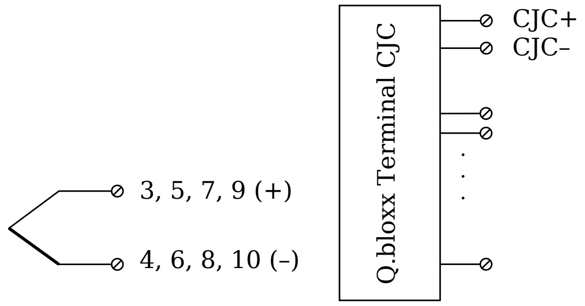
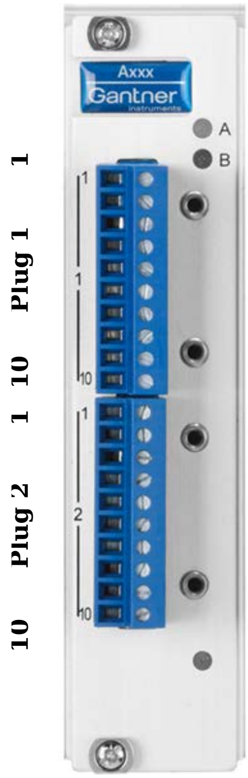


Fig. 4-32 A104, measurement with thermocouple using Q.bloxx Terminal CJC-A104.

4.10 Q.brixx A105: Connecting sensors

The Q.brixx Module A 105 has four electrically isolated analog inputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

GND identifies the measurement ground of an input; measurement ground and the (module) supply voltage are electrically isolated in the module.



Plug	Pin	Assignment
Plug 1	1	–
	2	A_{In} 1
	3	A_{In} 2
	4	A_{In} 3
	5	GND
	6	–
	7	A_{In} 4
	8	A_{In} 5
	9	A_{In} 6
	10	GND
Plug 2	1	–
	2	A_{In} 1
	3	A_{In} 2
	4	A_{In} 3
	5	GND
	6	–
	7	A_{In} 4
	8	A_{In} 5
	9	A_{In} 6
	10	GND

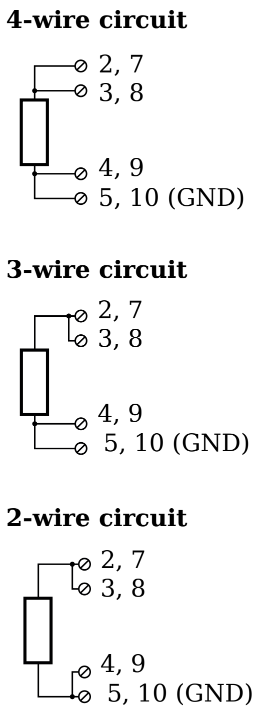


Fig. 4-33 Pin assignment for Q.brixx Module A105.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.10.1 Resistance, Pt100, Pt1000

You can connect resistances and Pt100/1000 probes in two-wire, three-wire or four-wire circuits. However, you must in each case connect *all* the terminals, i.e. you specify the circuit used for the type of circuit when configuring the module (**Type** column), but with two and three-wire circuits the unused terminals must be bridged.

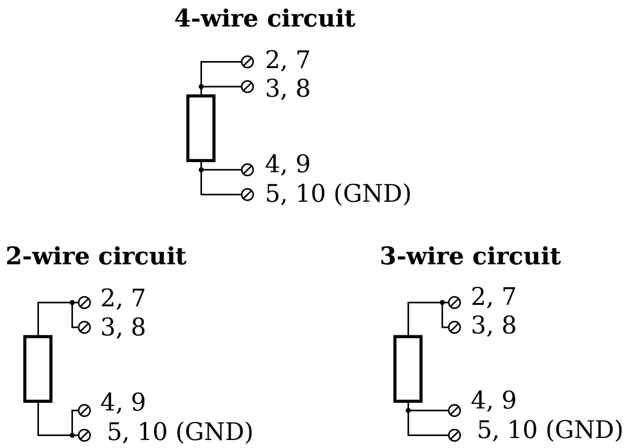


Fig. 4-34 A105, measurement of resistance and Pt100/1000 probes.

Tip

Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.11 Q.brixx A106: Connecting sensors and I/O

The Q.brixx Module A106 has two electrically isolated analog inputs, two analog outputs and four digital inputs and outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections.

GND identifies the analog and the measurement ground, 0V and +V refer to the (external) supply voltage connections. Measurement ground/GND and (module) supply voltage are electrically isolated in the module. The measurement ground for input and the analog ground (output) are identical.

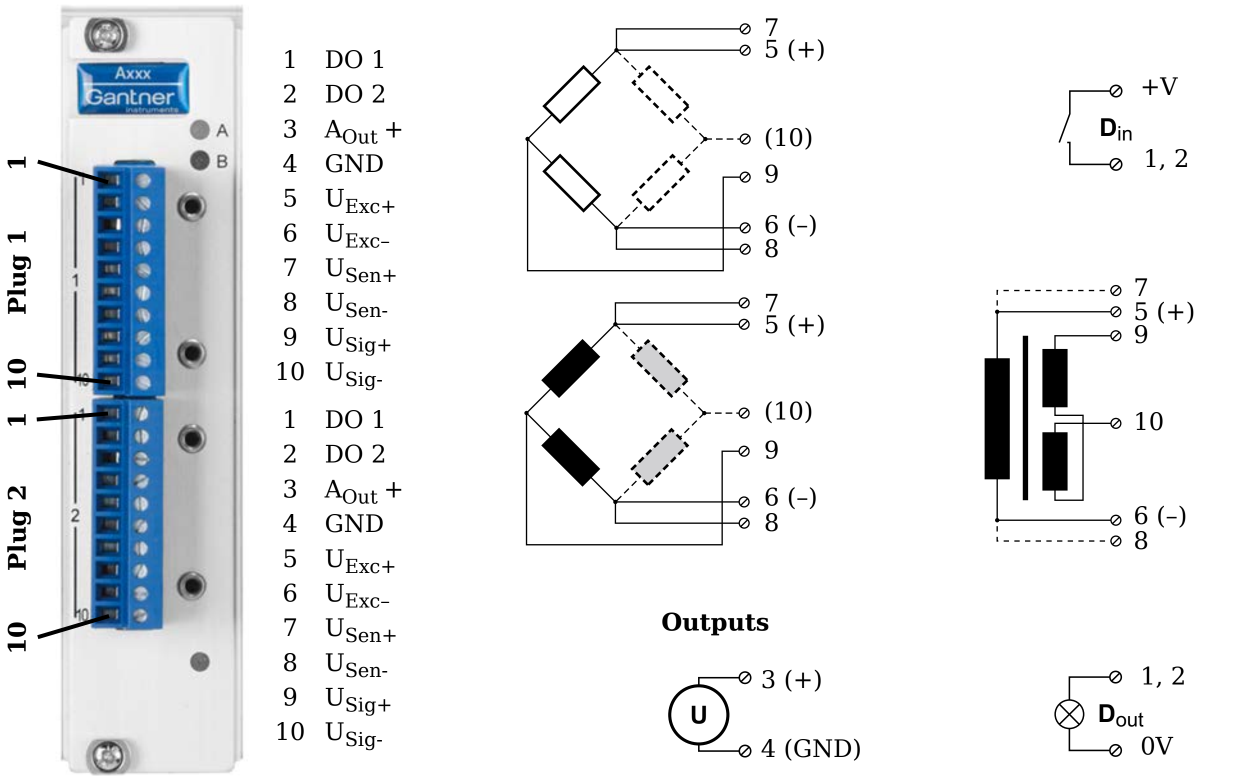


Fig. 4-35 Pin assignment for Q.brixx Module A106.

Tip
Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.11.1 Full and half-bridge transducers

With (resistive) full bridges (strain-gauge full bridges) all connections are occupied. If the sensor has no sensing leads, you specify this during the module configuration (**Type** column). With half bridges the side drawn in broken lines and the connection 10 are omitted.

The bridge excitation voltage can be 2.5V or 5V (DC or CF).

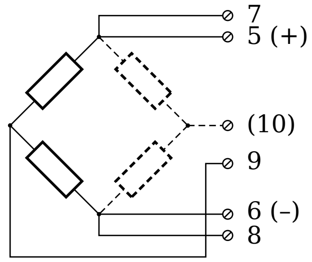


Fig. 4-36 A106, measurement with full and half bridges.

Tip
Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.11.2 Strain-gauge quarter bridge

For the connection of strain-gauge quarter bridges you need a special connecting plug which contains the completion resistances. The plug can be obtained under the designation Q.bloxx Terminal B4/120-A106 with120Ω or B4/350-A106 with 350Ω from Gantner Instruments GmbH.

The bridge excitation voltage can be 2.5V or 5V (DC or CF).

IMPORTANT
The plug must have the same resistance values as the strain gauges used, because otherwise no measurement is possible. Select a half-bridge circuit as the type of bridge for the channel.

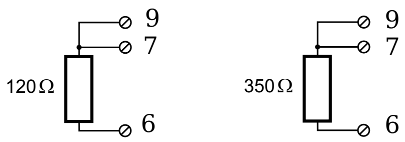


Fig. 4-37 A106, measurement with strain-gauge quarter bridge using Q.bloxx Terminal B4.

4.11.3 Inductive full and half bridges

With inductive full bridges all connections are occupied. If the sensor has no sensing leads, you specify this during the module configuration (**Type** column). With half bridges the side drawn in broken lines and the connection 10 are omitted.

The bridge excitation voltage can be 2.5V or 5V.

IMPORTANT
During the configuration set ***CF 4800Hz*** (carrier frequency) in the **Type** column; inductive sensors cannot be operated with direct voltage (DC) or 600Hz carrier frequency.

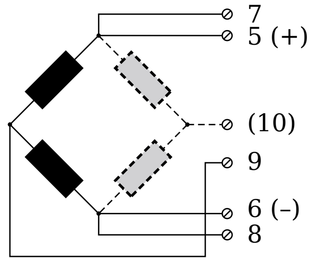


Fig. 4-38 A106, measurement with inductive full and half bridges.

4.11.4 LVDT, RVDT

With (inductive) LVDTs or RVDTs all connections can be occupied, but you can also connect without sense leads and state this in the **Type** column when configuring the module.

The bridge excitation voltage can be 2.5V or 5V.

IMPORTANT
During the configuration set ***CF 4800Hz*** (carrier frequency) in the **Type** column; inductive sensors cannot be operated with direct voltage (DC) or 600Hz carrier frequency.

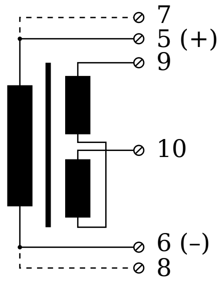


Fig. 4-39 A106, measurement with LVDTs and RVDTs.

4.11.5 Analog output

An analog voltage output is available on each connecting plug.

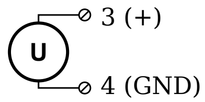


Fig. 4-40 A106, analog output.

4.11.6 Digital input and output

On each connecting plug two contacts are available for an input or output. You can use the appropriate function depending on the wiring.

Fig. 4-41 A106, Digital Input and Output.

The digital input is active (high level) when the applied signal voltage lies above the threshold of 10V.

4.12 Q.brixx A107: Connecting sensors

The Q.brixx Module A 107 has four electrically isolated analog inputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

GND identifies the measurement ground. The four inputs (UF to GND) are electrically isolated in the module one to the other and to the (module) supply voltage.

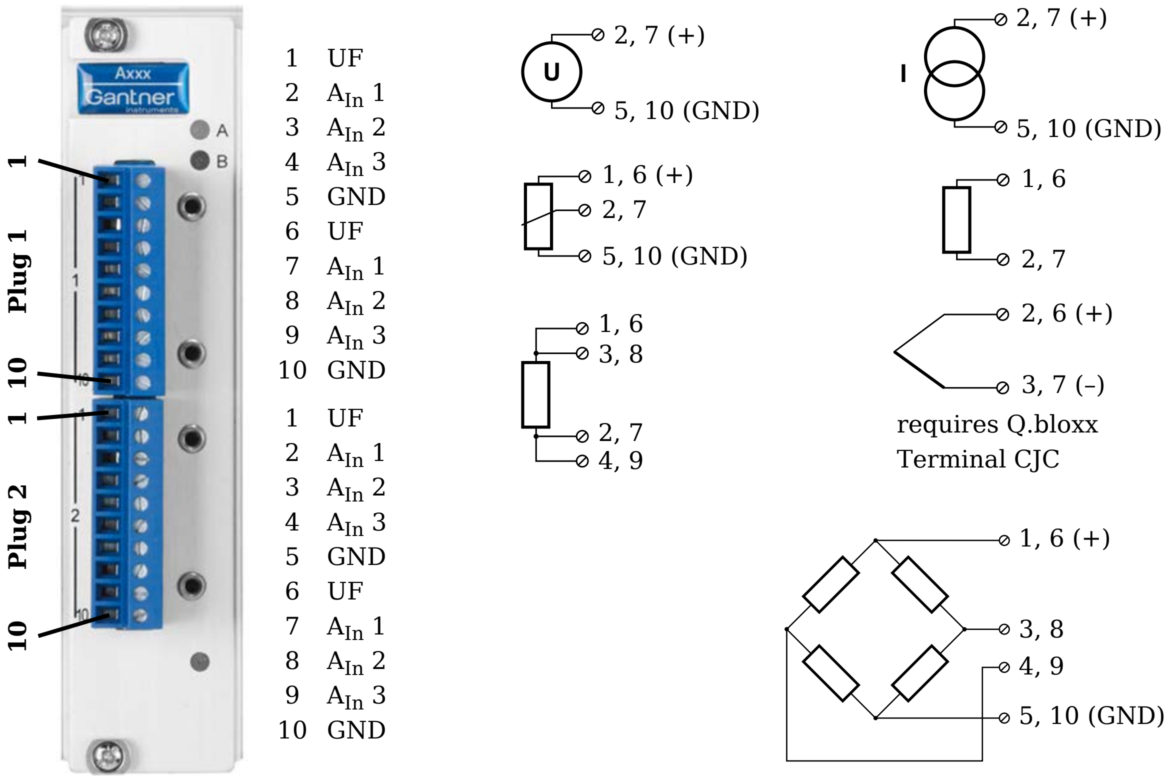
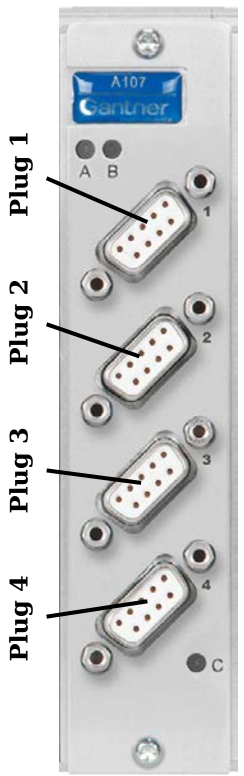


Fig. 4-42 Pin assignment for Q.brixx Module A107 (terminal version).

The module can also be obtained in a connection variant with four 9-pole D-sub sockets (A107 DB9, refer to Fig. 4-43). With this version the module power supply (+V and 0V) is available on the D-sub sockets. GND identifies the measurement ground. The four inputs are electrically isolated in the module one to the other and to the (module) supply voltage.



1	UF
2	A_{In} 2
3	NC
4	0V
5	+V
6	NC
7	A_{In} 3
8	GND
9	A_{In} 1

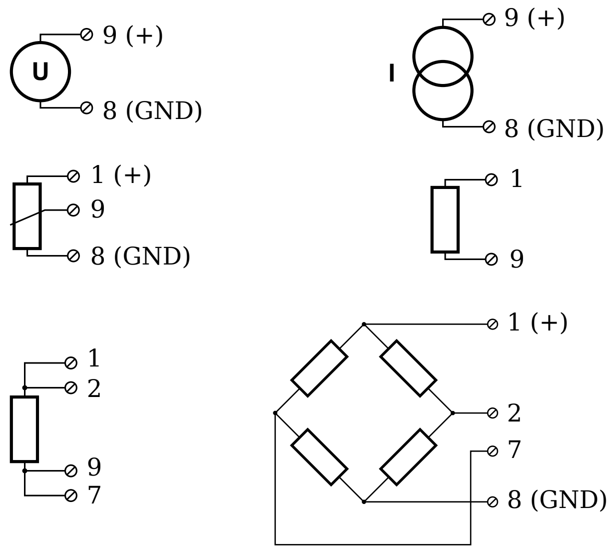


Fig. 4-43 Pin assignment for Q.brixx Module A107, version with D-sub sockets.

Tip
Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.12.1 Voltage

You can measure voltages of up to 10V.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

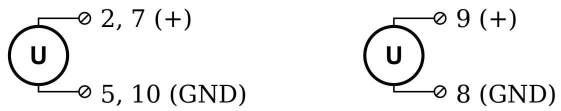


Fig. 4-44 A107, measurement of voltage: left: terminal version; right: D-sub sockets.

4.12.2 Current

A shunt resistance of 50Ω is integrated into the Q.brixx Module A107 for current measurement. This facilitates the measurement of currents of up to 25 mA. For higher currents use a voltage measurement and an external shunt; refer to Section 6.4, page 124.

Fig. 4-45 A107, measurement of current; left: terminal version; right: D-sub sockets.

4.12.3 Potentiometer

Potentiometers with resistances between 1 kOhm and 10 kOhm are connected in a three-wire configuration.

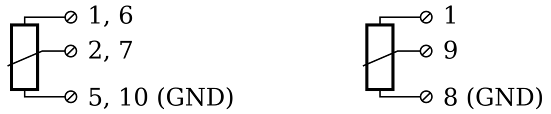


Fig. 4-46 A107, measurement with potentiometers; left: terminal version; right: D-sub sockets.

4.12.4 Resistance, Pt100, Pt1000

You can connect resistances and Pt100/1000 probes in two-wire or four-wire circuits. You specify the selected type of circuit during the module configuration (**Type** column).

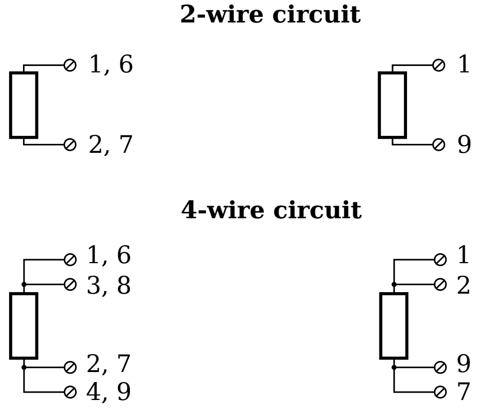


Fig. 4-47 A107, measurement of resistance and Pt100/1000 probes; left: terminal version; right: D-sub sockets.

Vers. No. 2.0
Released: 5/07/2016

Tip
Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.12.5 Thermocouple (only with terminal version)

For connecting thermocouples you need a special connecting plug which contains the comparative measuring point (cold junction compensation) required for thermocouples. The plug can be obtained under the designation Q.bloxx Terminal CJC-A107 from Gantner Instruments GmbH. You can connect the following types of thermocouple: B, E, J, K, L, N, R, S, T and U.

Alternatively, you can also use two thermocouples or a reference temperature source.

Tip
You will find information on the comparative measuring point and on the measurement with a reference temperature source in Section 6.5, *Measuring with thermocouples*, page 125.

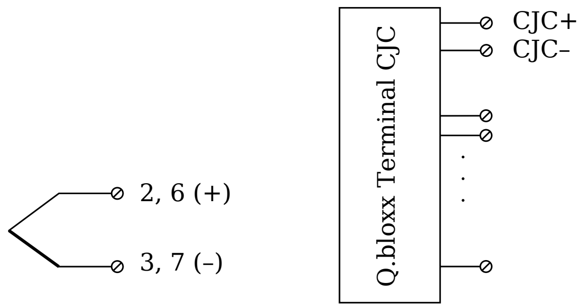


Fig. 4-48 A107, measurement with thermocouple using Q.bloxx *Terminal CJC-A107.*

4.12.6 Full-bridge transducer

With (resistive) full bridges (strain-gauge full bridges) four connections are occupied. If the sensor has sense leads, you should connect them to the relevant supply lines: in the terminal version to terminals 1 and 5 or 6 and 10, with D-sub sockets to pins 1 and 8.

The bridge excitation voltage is 2.5V.

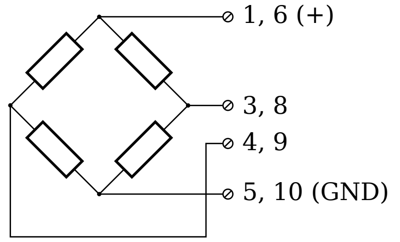


Fig. 4-49 A107, measurement with full bridge; left: terminal version; right: D-sub sockets.

4.12.7 Strain-gauge half and quarter bridges

For the connection of strain-gauge half or quarter bridges you need a special connecting plug which contains the completion resistances. The plug for the terminal version can be obtained under the designation Q.bloxx Terminal B4/120-A107 with120Ω or B4/350-A107 with 350Ω from Gantner Instruments GmbH. An adapter plug is available for the version with D-sub sockets (Fig. 4-50).

Fig. 4-50 Adapter plug for D-sub version.

The bridge excitation voltage is 2.5V.

IMPORTANT
For strain-gauge quarter bridges the plug or the terminal must have the same resistance values as the strain gauges used, because otherwise no measurement is possible.
Since, for reasons of stability, all necessary completion resistances are located in the Q.bloxx terminal, you always have to select a full bridge circuit as the bridge type for the channel.

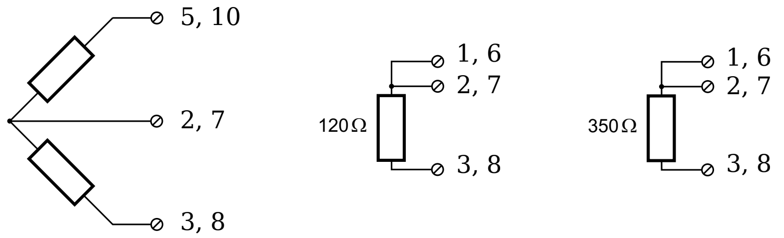


Fig. 4-51 A107, measurement with strain-gauge half bridge and quarter bridge using Q.bloxx Terminal B4 (terminal version).

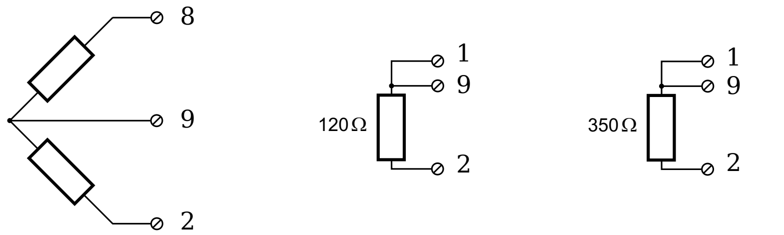


Fig. 4-52 A107, measurement with strain-gauge half bridge and quarter bridge through adapter plug on the version with D-sub sockets.

4.13 Q.brixx A108: Connecting sensors and I/O

The Q.brixx Module A108 has eight electrically isolated analog inputs and two digital inputs and outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The module is also available in the connection variant with eight BNC sockets (A108 BNC).

The designations 0 V and +V refer to the (external) supply voltage connections. Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

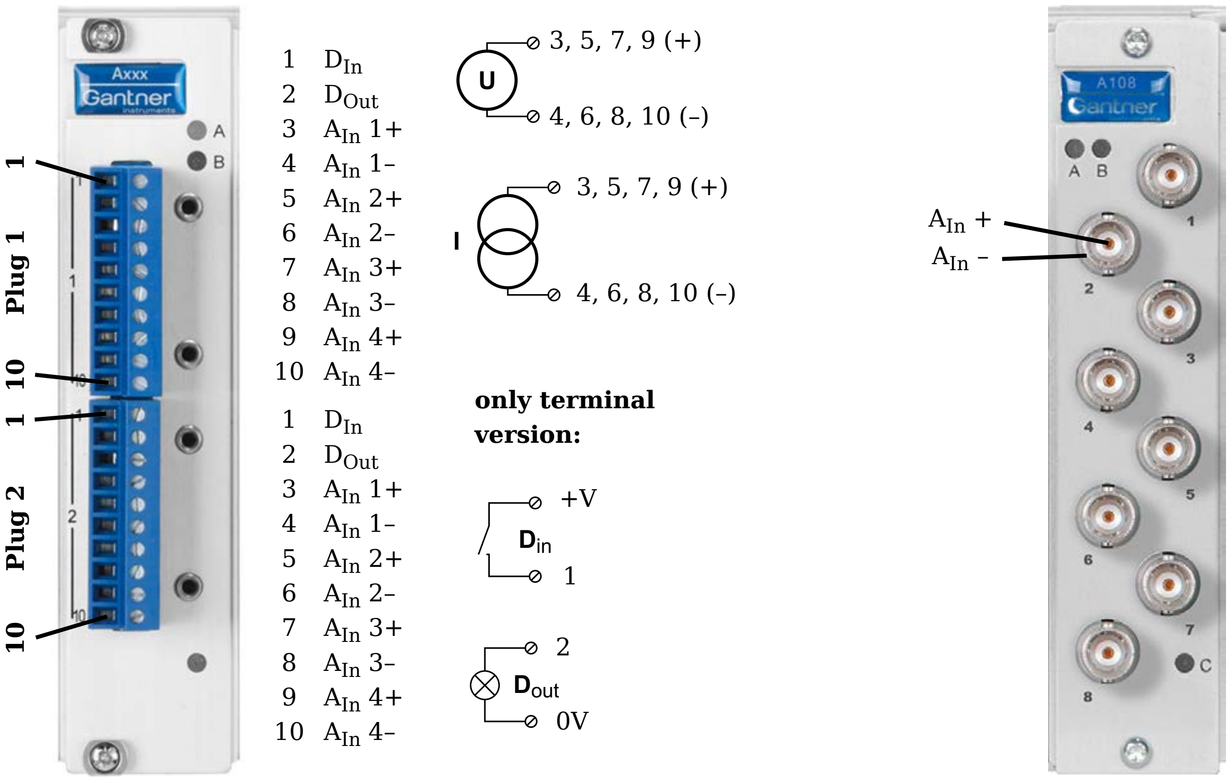


Fig. 4-53 Pin assignment for Q.brixx Module A108 (left), version with BNC sockets on the right side.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.13.1 Voltage

You can measure voltages of up to 10V.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

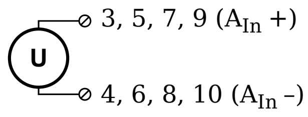


Fig. 4-54 A108, voltage measurement (terminal version); in the version with BNC sockets the (inner) pin contact has to be connected to +. The outer conductor is connected to –.

4.13.2 Current

For current measurement you need the Q.bloxx Terminal SR connecting plug containing the shunt resistances for the terminal version. This facilitates the measurement of currents of up to 25 mA. In the version with BNC sockets you must use a suitable shunt resistance and determine the current from the voltage drop and the resistance value of the shunt. The connection is made as for the voltage measurement.

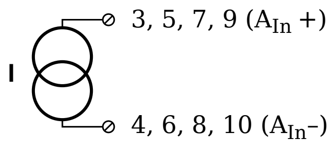


Fig. 4-55 A108, current measurement using the Q.bloxx Terminal SR.

4.13.3 Digital input and output

On each connecting plug of the terminal version two contacts are available in each case for one input and one output.

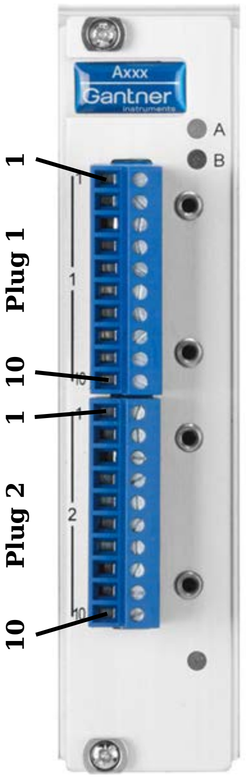
Fig. 4-56 A108, digital input and output.

The digital input is active (high level) when the applied signal voltage lies above the threshold of 10V.

4.14 Q.brixx A109: Connecting I/O and outputs

The Q.brixx Module A109 has four electrically isolated analog outputs, four digital inputs and four digital outputs. The assignment of both connector strips is *not* identical. The plug number is specified in the following. The connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

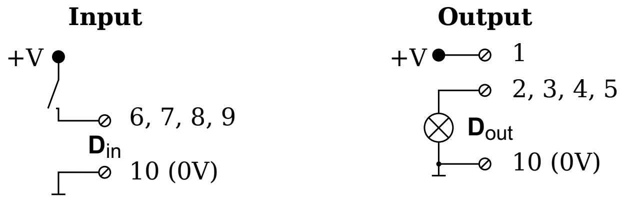
The designations 0 V and +V refer to the (external) supply voltage connections, NC indicates “not assigned”. Analog ground (–) and the (external) supply voltage (0V) are electrically isolated in the module.



1 +V
2 D_{Out} 1
3 D_{Out} 2
4 D_{Out} 3
5 D_{Out} 4
6 D_{In} 1
7 D_{In} 2
8 D_{In} 3
9 D_{In} 4
10 0V

1 NC
2 NC
3 A_{Out} 1+
4 A_{Out} 1–
5 A_{Out} 2+
6 A_{Out} 2–
7 A_{Out} 3+
8 A_{Out} 3–
9 A_{Out} 4+
10 A_{Out} 4–

Plug 1, digital inputs and outputs



+V must be between 12 V and 30 V

Plug 2, analog outputs

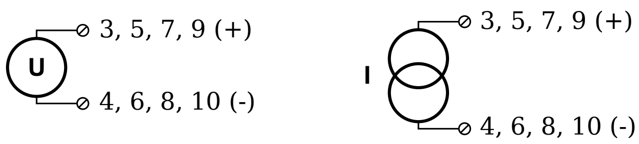


Fig. 4-57 Pin assignment for Q.brixx Module A109.

4.14.1 Digital input and output, Plug 1

On Plug 1 contacts for four inputs and four outputs are available. Since the inputs and outputs of this module are electrically isolated from the supply voltage, you must also connect 0V for the inputs and 0V and a supply voltage (+V) for the outputs.

Fig. 4-58 A109, digital input and output, Plug 1.

The digital input is active (high level) when the applied signal voltage lies above the (programmable) threshold.

Possible combinations of contact assignments for the inputs are shown in the following table; refer also to the block diagrams for Module D101.

<table>
<tr><th>6</th><th>7</th><th>8</th><th>9</th></tr>
<tr><td>status</td><td>status</td><td>status</td><td>status</td></tr>
<tr><td>status</td><td>status</td><td colspan="2">2-channel signal[1)]</td></tr>
<tr><td colspan="2">2-channel signal[1)]</td><td colspan="2">2-channel signal[1)]</td></tr>
<tr><td colspan="4">4-channel signal[2)]</td></tr>
</table>

1) e.g. counter with additional input for counting direction or 2-phase counter signals or frequency measurement with direction detection (torque transducers)

2) e.g. counter with additional inputs for counting direction, zero reference and reset/enable for zero reference

4.14.2 Analog output, Plug 2

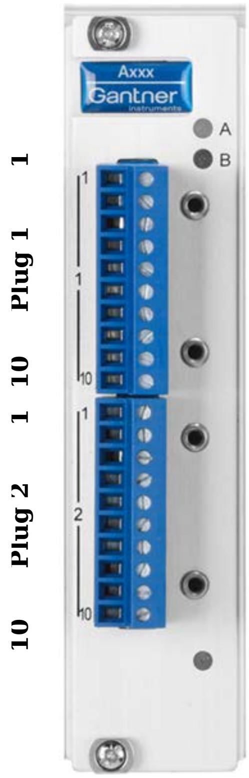
The analog outputs on Plug 2 supply voltage or current. Selection is made via software.

Fig. 4-59 A109, output of voltage or current, Plug 2.

4.15 Q.brixx A111: Connecting sensors and I/O

The Q.brixx Module A 111 has four electrically isolated analog inputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method. NC signifies “No Connection”.

Measurement ground and (module) supply voltage are electrically isolated in the module.



1 NC
2 A_{In} 1+
3 NC
4 A_{In} 1–
5 NC
6 NC
7 A_{In} 2+
8 NC
9 A_{In} 2–
10 NC

1 NC
2 A_{In} 3+
3 NC
4 A_{In} 3–
5 NC
6 NC
7 A_{In} 4+
8 NC
9 A_{In} 4–
10 NC

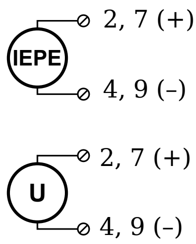


Fig. 4-60 Pin assignment for Q.brixx Module A111.

Tip
Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.15.1 Voltage

You can measure voltages of up to 10V.

IMPORTANT
Voltages which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

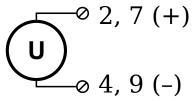


Fig. 4-61 A111, measurement of voltage.

4.15.2 IEPE/ICP® Sensor

The sensor is supplied with 4 mA of current from the module (current supply).

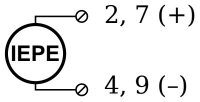
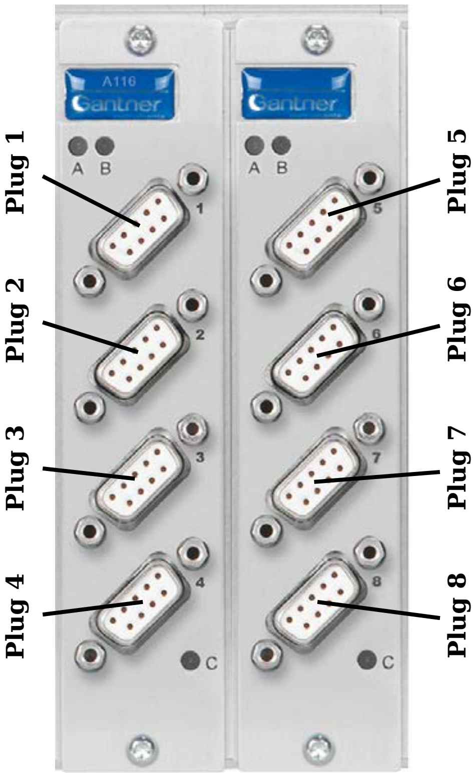


Fig. 4-62 A111, measurement with IEPE or ICP® sensors.

4.16 Q.brixx A116: Connecting sensors

The Q.brixx Module A116 has eight analog inputs.

The channels (measurement ground) are electrically isolated against the (module) supply voltage and the interface.



1 U_{Exc+}
2 U_{Sig+}
3 U_{Sen-}
4 NC
5 NC
6 U_{Sen+}
7 U_{Sig-}
8 U_{Exc-}
9 NC

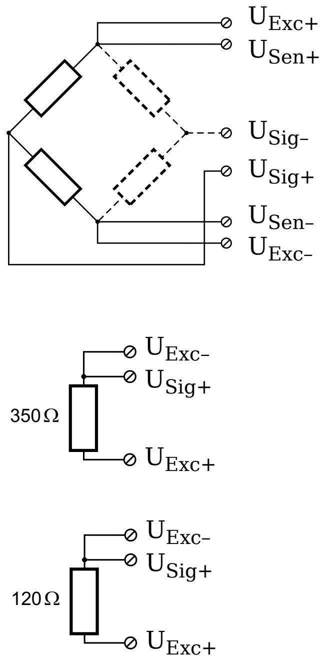


Fig. 4-63 Pin assignment for Q.brixx Module A116.

4.16.1 Full and half-bridge transducers

With (resistive) full bridges (strain-gauge full bridges) six connections are used per measuring point. If the sensor has no sensing leads, you specify this during the module configuration (**Type** column); the U_{Sen} inputs then remain open. With half bridges the side drawn in dashes and the U_{Sig-} connection are omitted.

The bridge excitation voltage is $2V_{DC}$; with 350Ω sensor resistance you can also use $4V_{DC}$. The internal shunt resistance can be activated also with full and half bridges.

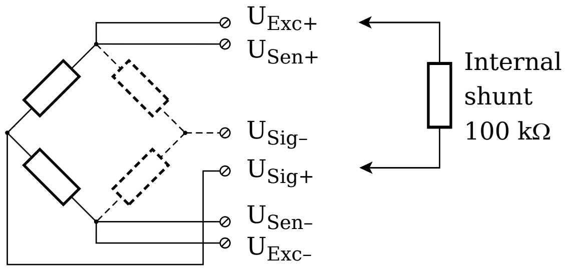


Fig. 4-64 A116, measurement with full and half bridges; U_{SIG} = signal voltage (output signal), U_{SEN} = sense lead, U_{EXC} = excitation voltage

For the activation of the shunt resistance refer to Section 4.16.3.

Tip
Information about the types of circuit and the respective advantages and disadvantages can be found in Section 6.2, *Connecting sensors with sensing leads*, page 120.

4.16.2 Strain-gauge quarter bridge

With this module, for the connection of strain-gauge quarter bridges you do not need any special connection plugs as the 120Ω and 350Ω completion resistances are present in the module and only need to be activated. In addition you can activate the internal shunt resistance for test purposes.

The bridge excitation voltage is $2V_{DC}$; with 350Ω sensor resistance you can also use $4V_{DC}$.

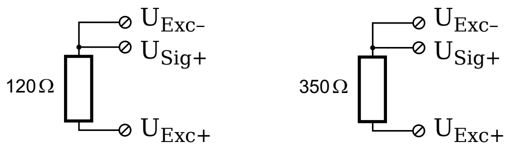


Fig. 4-65 A116, measurement with a strain-gauge quarter bridge, direct connection.

For the activation of the shunt resistance refer to Section 4.16.3.

With the three-wire circuit the internal completion resistance is used in this module to determine the voltage drop over the cable and to correct the result accordingly. In this way not only can the influence of the temperature on the cable (normal three-wire circuit) be compensated, but also the loss of sensitivity due to the cable resistance over a wide range.

4.16.3 Activating the shunt resistance

You can activate the shunt both via a variable and manually via a button.

Open the module settings dialog(Fig. 4-66), activate the tab **Variable definition** and click in the column **Format/balance**. The dialog of Fig. 4-67 opens.

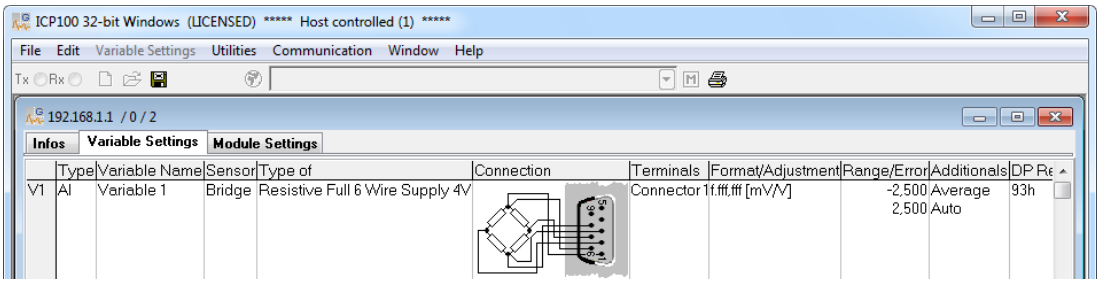


Fig. 4-66 Module configuration dialog.

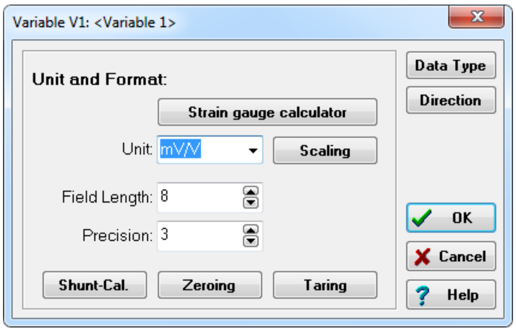


Fig. 4-67 Dialog for format settings.

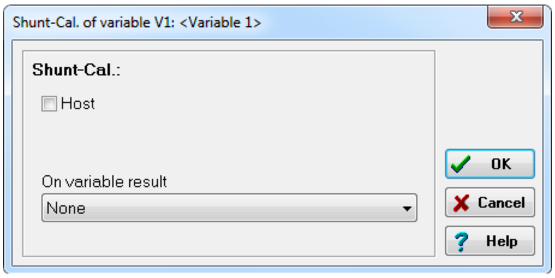


Fig. 4-68 Dialog for shunt activation.

Manual activation

Define the ***Direction*** for the variable on ***Input/output*** (Fig. 4-67) and click on ***Shunt cal***. Activate ***Control computer*** in the dialog (Fig. 4-68).

Setting a value of ***16*** for the variable (the channel) activates the shunt and ***0*** deactivates it again.

Activation via variable

Click on ***Shunt cal***. Activate ***At variable value*** in the dialog (Fig. 4-68) and specify the variable to be used.

Any variable value > 0.5 activates the shunt.

4.17 Q.brixx A123: Connecting sensors

DANGER

The cables to be connected or disconnected may carry voltages of up to 1200V!

Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

The Q.brixx module A123 can be used in the categories CAT II up to 1000V and CAT III up to 600V and has four electrically isolated analog inputs.

With this module the connection is provided through four BNC sockets. The outer side of the BNC sockets is isolated and the electrical connection is made through the inner side of the socket.

Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

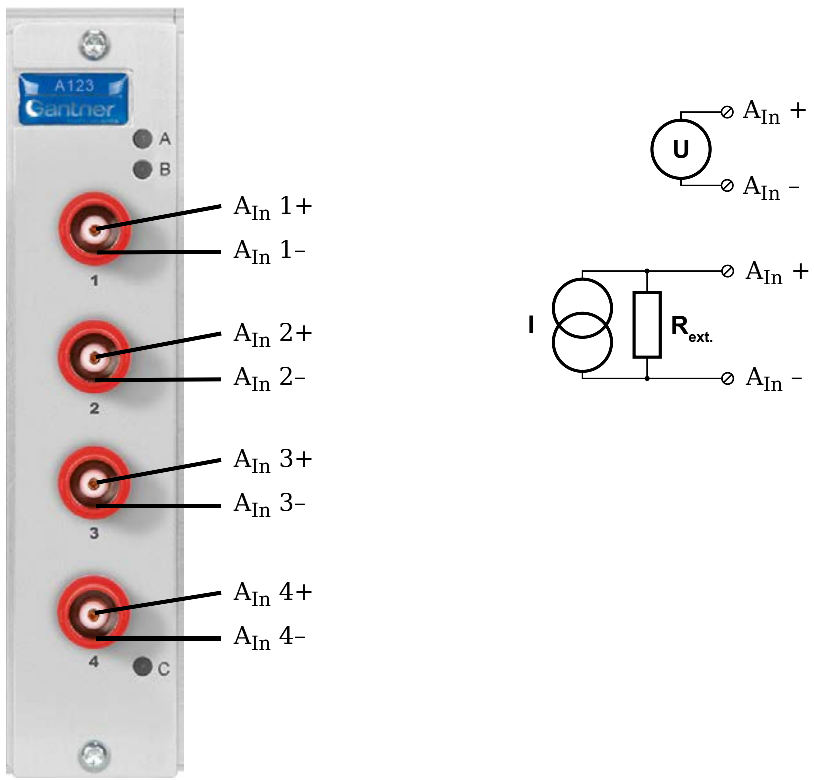


Fig. 4-69 Pin assignment for Q.brixx Module A123.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.17.1 Voltage

You can measure voltage differences of up to ±10V. The voltage level (the potential) may be up to $1200V_{DC}$.

IMPORTANT
Voltage differences which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

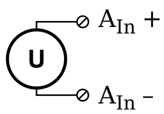


Fig. 4-70 A123, voltage measurement.

4.17.2 Current

You need an (external) shunt resistance for the current measurement.

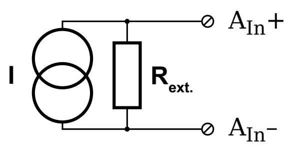


Fig. 4-71 A123, current measurement using an external shunt resistance.

4.18 Q.brixx A124: Connecting sensors

DANGER

The cables to be connected or disconnected may carry voltages of up to 1200V!

Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

The Q.brixx module A124 can be used in the categories CAT II up to 1000V and CAT III up to 600V and has four electrically isolated analog inputs for thermocouples. The terminal assignment is identical and the connection terminals have numbers for identifying the connections.

Measurement ground (–) and the (module) supply voltage are electrically isolated in the module. The plugs for the A124 module are 2-way plugs with push-in spring technology, i.e. you can insert a solid wire or a fine-stranded wire with a wire-end sleeve directly without screwing (max. 1.5mm^2). The plugs are permanently joined to the housing and cannot be removed. With a screwdriver press on the white opener to be able to remove the connection -

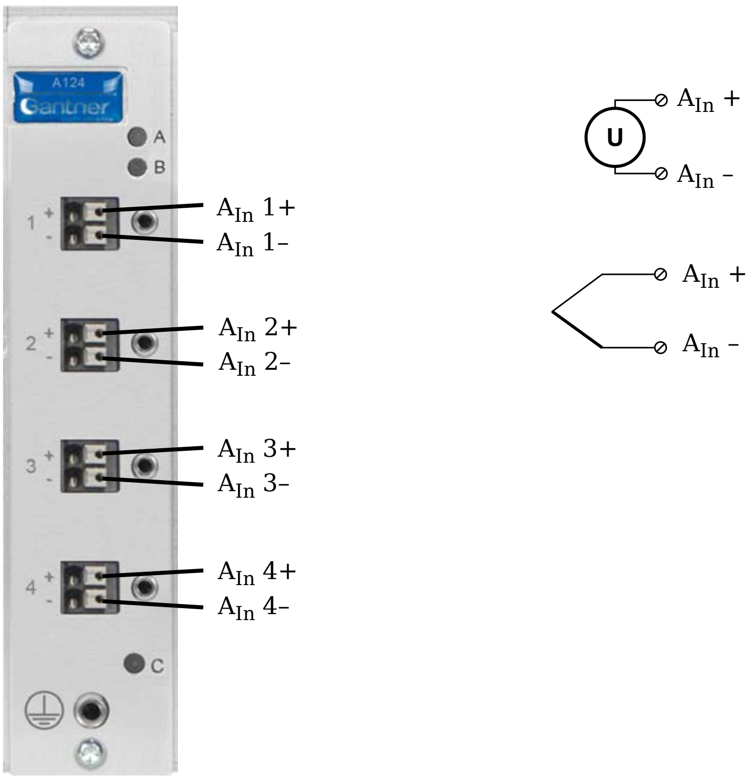


Fig. 4-72 Pin assignment for Q.brixx Module A104.

Tip
Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.18.1 Voltage

You can measure voltage differences of up to ±80 mV. The voltage level (the potential) may be up to 1200 V_{DC}.

IMPORTANT
Voltage differences which exceed the admissible limits produce incorrect measurement data, because the inputs are protected against overvoltages and limit the input voltage.

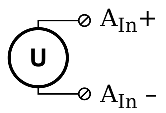


Fig. 4-73 A124, voltage measurement.

4.18.2 Thermocouple

Thermocouples can be connected directly; the comparative measuring point (cold junction compensation) is integrated in the module plug. You can connect the following types of thermocouple: B, E, J, K, L, N, R, S, T and U.

Alternatively, you can also use two thermocouples or a reference temperature source.

Tip
You will find information on the comparative measuring point and on the measurement with a reference temperature source in Section 6.5, *Measuring with thermocouples*, page 125.

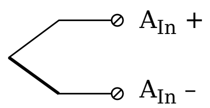


Fig. 4-74 A124, measurement with a thermocouple.

4.19 Q.brixx A127: Connecting sensors

DANGER

The cables to be connected or disconnected may carry voltages of up to 1200V!

Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

The Q.brixx module A127 can be used in the categories CAT II up to 1000V and CAT III up to 600V and has four electrically isolated analog inputs.

With this module the connection is provided through four BNC sockets. The outer side of the BNC sockets is isolated and the electrical connection is made through the inner side of the socket.

Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

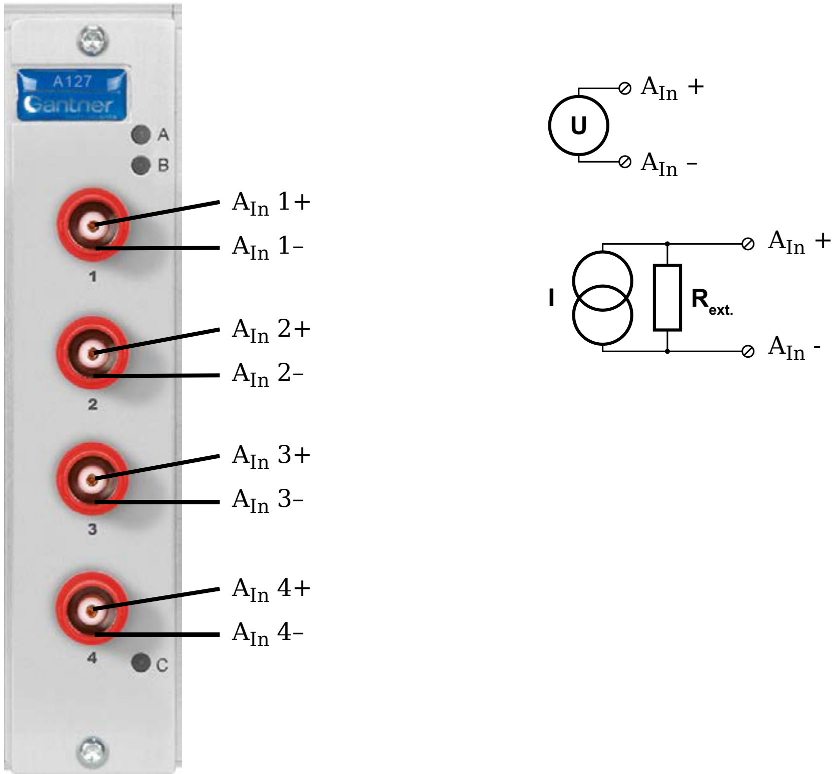


Fig. 4-75 Pin assignment for Q.brixx Module A127.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.19.1 Voltage

You can measure voltage differences of up to ±1200V. Here, various input voltage ranges from $\pm 40V_{DC}$ to $\pm 1200V_{DC}$ are possible. The voltage level (the potential) may be up to $1200V_{DC}$.

NOTICE

Voltages above 1200V can damage the module.

Each module is tested with a test voltage of $5kV_{DC}$ for one minute. A longer duration or a higher voltage can damage the module. In addition, each period of overvoltage reduces the service life of the module.

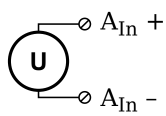


Fig. 4-76 A127, measurement of voltage.

IMPORTANT

Voltages which exceed the admissible limits give incorrect measurement data, because the input voltage is internally limited.

4.19.2 Current

NOTICE

Confusing the current and voltage inputs can damage the module and/or the external load resistance.

Make sure that no high voltages are applied to the current inputs. The voltage drop must not be beyond ±2.4V.

You need an (external) shunt resistance for the current measurement.

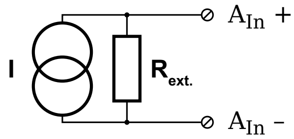


Fig. 4-77 A127, current measurement using an external shunt resistance.

4.20 Q.brixx A128: Connecting sensors

DANGER

The cables to be connected or disconnected may carry voltages of up to 1200V!

Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

The Q.brixx module A128 can be used in the categories CAT II up to 1000V and CAT III up to 600V and has four electrically isolated analog inputs.

With this module the connection is provided through four BNC sockets. The outer side of the BNC sockets is isolated and the electrical connection is made through the inner side of the socket.

Measurement ground (–) and the (module) supply voltage are electrically isolated in the module.

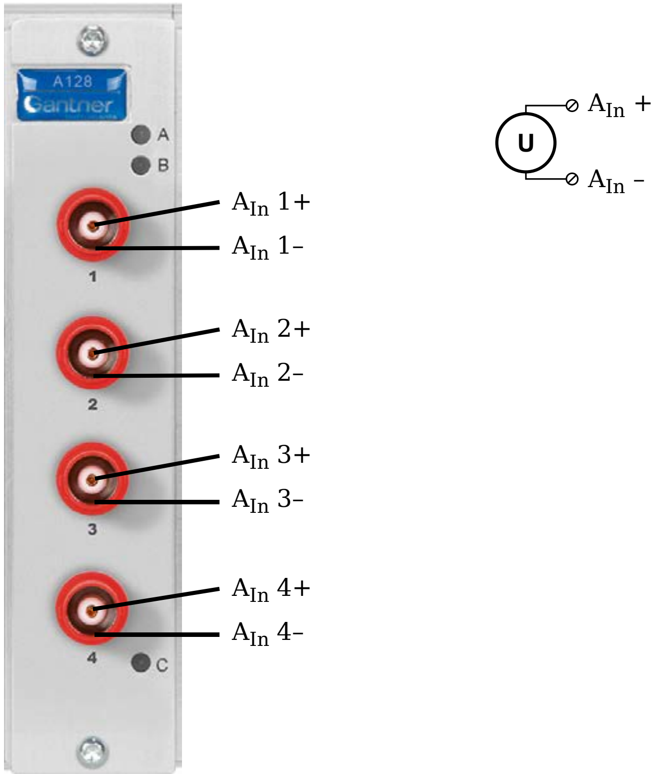


Fig. 4-78 Pin assignment for Q.brixx Module A128.

Tip

Further information on transducers and sensors can also be found in Chapter 6 ff. page 115.

4.20.1 Voltage

You can measure voltages of up to ±1200V_{DC}. Here, various input voltage ranges from ±40V_{DC} to ±1200V_{DC} are possible.

NOTICE

Voltages above 1200V can damage the module.

Each module is tested with a test voltage of 5kV_{DC} for one minute. A longer duration or a higher voltage can damage the module. In addition, each period of overvoltage reduces the service life of the module.

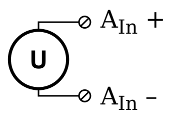


Fig. 4-79 A128, voltage measurement.

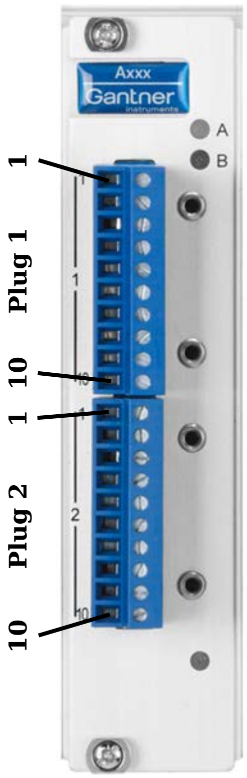
IMPORTANT

Voltages which exceed the admissible limits give incorrect measurement data, because the input voltage is internally limited.

4.21 Q.brixx D101: Connecting I/O

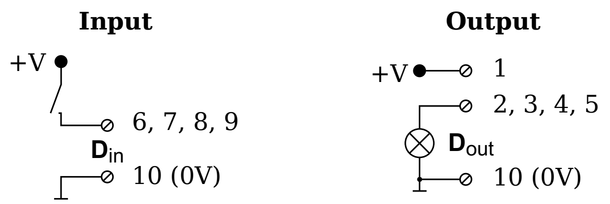
The Q.brixx Module D101 has eight digital inputs and eight digital outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections.

The designations 0 V and +V refer to the (external) supply voltage connections.



1	+V
2	D_{Out} 1
3	D_{Out} 2
4	D_{Out} 3
5	D_{Out} 4
6	D_{In} 1
7	D_{In} 2
8	D_{In} 3
9	D_{In} 4
10	0V

1	+V
2	D_{Out} 1
3	D_{Out} 2
4	D_{Out} 3
5	D_{Out} 4
6	D_{In} 1
7	D_{In} 2
8	D_{In} 3
9	D_{In} 4
10	0V



+V must be between 12 V and 30 V

Fig. 4-80 Pin assignment for Q.brixx Module D101.

4.21.1 Digital input and output

On each connecting plug contacts for four inputs and four outputs are available. Since the inputs and outputs of this module are electrically isolated from the supply voltage, you must also connect 0V for the inputs and 0V and a supply voltage (+V) for the outputs.

Fig. 4-81 D101, digital input and output.

The digital input is active (high level) when the applied signal voltage lies above the (programmable) threshold.

The following table shows possible combinations of contact assignments for the inputs:

Plug.Contact							
1.6	**1.7**	**1.8**	**1.9**	**2.6**	**2.7**	**2.8**	**2.9**
Status	Status	Status	Status	Status	Status	Status	Status
Status	Status	Status	Status	Status	Status	2-channel signal[1]	
Status	Status	Status	Status	2-channel signal[1]		2-channel signal[1]	
Status	Status	Status	Status	4-channel signal[2]			
Status	Status	2-channel signal[1]		2-channel signal[1]		2-channel signal[1]	
Status	Status	2-channel signal[1]		4-channel signal[2]			
2-channel signal[1]		2-channel signal[1]		4-channel signal[2]			
2-channel signal[1]		2-channel signal[1]		2-channel signal[1]		2-channel signal[1]	
4-channel signal[2]				4-channel signal[2]			
8-channel signal[3]							

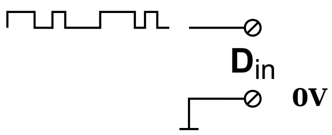
1) e.g. counter with additional input for counting direction or 2-phase counter signals or frequency measurement with direction detection (torque transducers)

2) e.g. counter with additional inputs for counting direction, zero reference and reset/enable for zero reference

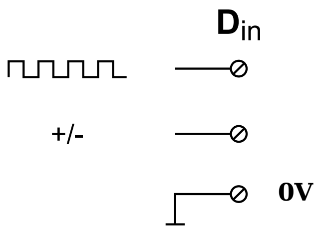
3) e.g. sensors with binary coding

The following block diagrams give you an overview of the possible circuits.

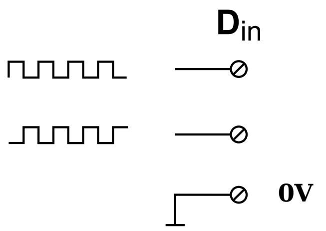
Measurement of status, time, frequency or PWM (Pulse-Width Modulation), 1 signal



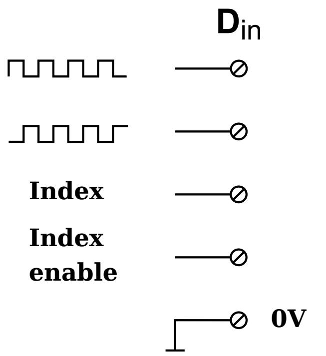
Up/down counter or measurement of frequency and direction with static direction signal, 2 signals



Measurement of frequency and direction or up/down counter with 2-channel frequency signal (90° phase delay)



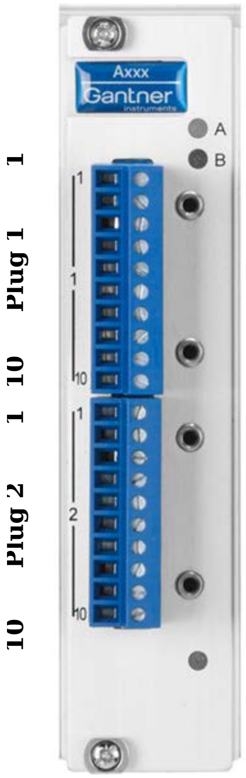
Measurement of frequency and direction or up/down counter with 4-channel frequency signal



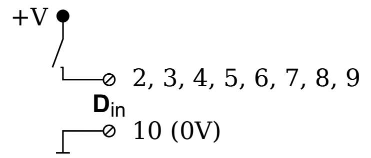
4.22 Q.brixx D104: connecting digital inputs

The Q.brixx Module D104 has sixteen digital inputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The designations 0 V and +V refer to the (external) supply voltage connections, NC indicates “not assigned”.



1	NC
2	D_{In} 1
3	D_{In} 2
4	D_{In} 3
5	D_{In} 4
6	D_{In} 5
7	D_{In} 6
8	D_{In} 7
9	D_{In} 8
10	0V
1	NC
2	D_{In} 1
3	D_{In} 2
4	D_{In} 3
5	D_{In} 4
6	D_{In} 5
7	D_{In} 6
8	D_{In} 7
9	D_{In} 8
10	0V



+V must be between 12 V and 30 V

Fig. 4-82 Pin assignment for Q.brixx Module D104.

4.22.1 Digital input

On each connecting plug contacts for eight inputs are available. Since the inputs of this module are electrically isolated from the power supply, you must also connect 0V and a supply voltage (+V).

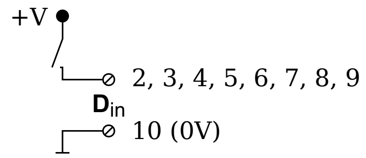


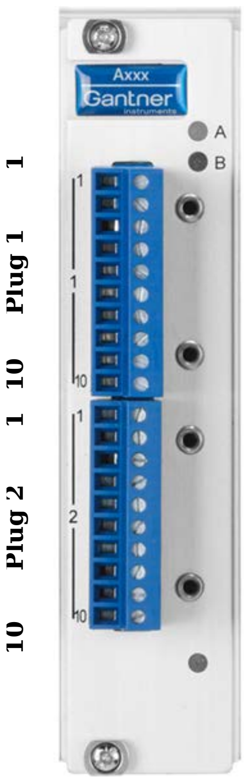
Fig. 4-83 D104, digital input.

The digital input is active (high level) when the applied signal voltage lies above the (programmable) threshold.

4.23 Q.brixx D105: connecting digital outputs

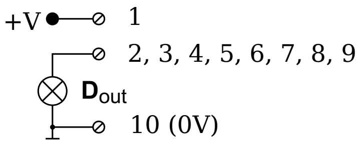
The Q.brixx Module D105 has sixteen digital outputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The designations 0 V and +V refer to the (external) supply voltage connections.



1 +V
2 D_{Out} 1
3 D_{Out} 2
4 D_{Out} 3
5 D_{Out} 4
6 D_{Out} 5
7 D_{Out} 6
8 D_{Out} 7
9 D_{Out} 8
10 0V

1 +V
2 D_{Out} 1
3 D_{Out} 2
4 D_{Out} 3
5 D_{Out} 4
6 D_{Out} 5
7 D_{Out} 6
8 D_{Out} 7
9 D_{Out} 8
10 0V



+V must be between 12 V and 30 V

Fig. 4-84 Pin assignment for Q.brixx Module D105.

4.23.1 Digital output

On each connecting plug contacts for eight outputs are available. Since the outputs of this module are electrically isolated from the power supply, you must also connect 0V and a supply voltage (+V) for the outputs.

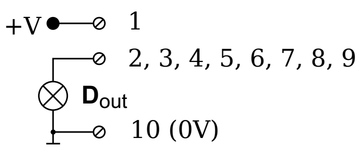


Fig. 4-85 D105, digital output.

4.24 Q.brixx D107: Connecting digital inputs

The Q.brixx Module D107 has sixteen digital inputs. The pin assignment of the two connector strips is identical and the connection terminals have numbers for identifying the connections. You will find the associated figures in each case at the same place in the circuit diagrams, for example each of the figures quoted in the second place belong to one possible connection method.

The designations 0 V (GND) and +V refer to the supply voltage connections for supplying the sensors. NC signifies “No Connection”. Both terminals are electrically isolated from one another and from the module supply voltage.

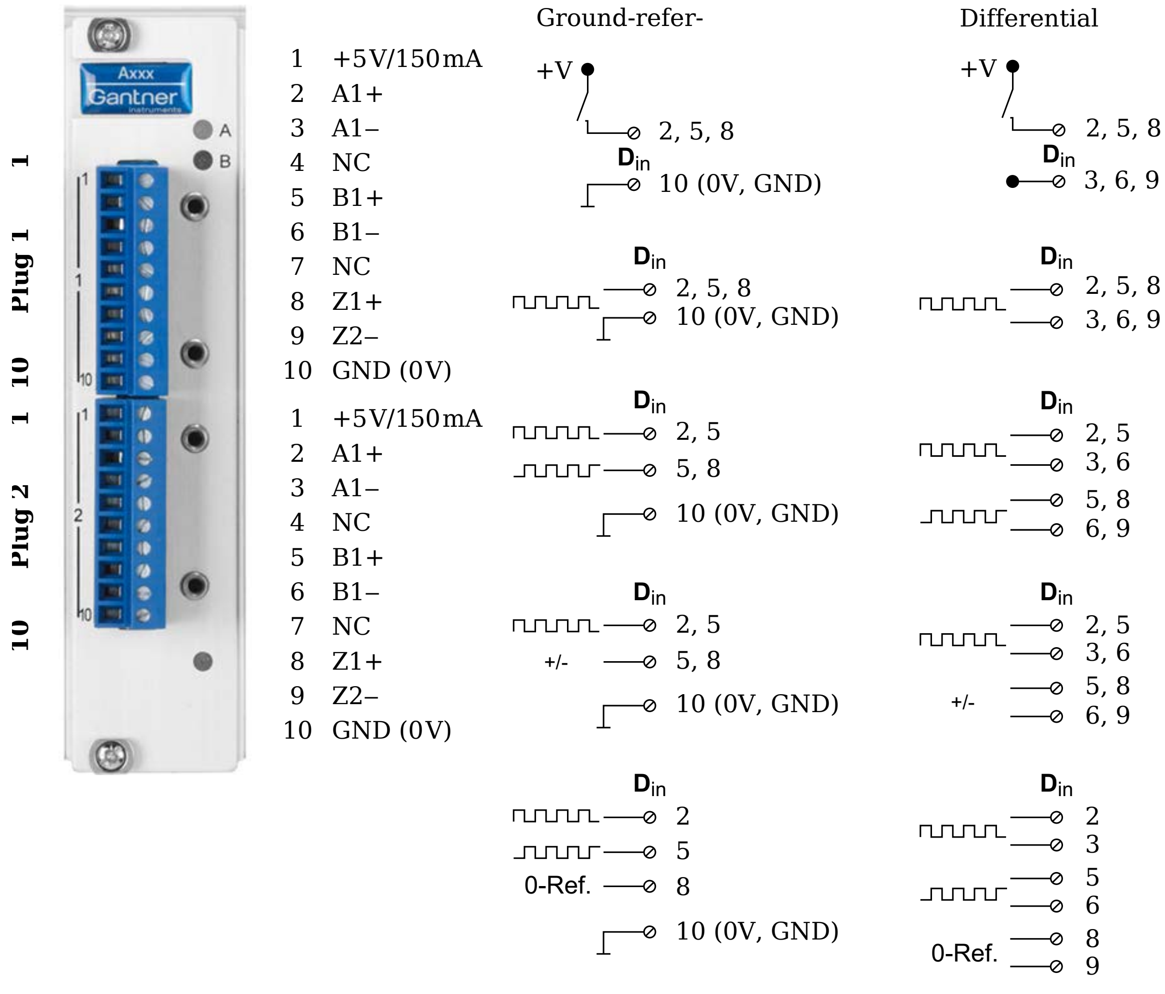


Fig. 4-86 Pin assignment and circuit variants for the Q.brixx Module D107.

4.24.1 Digital input

On each connecting plug contacts for three inputs are available. You can use the inputs as a differential input or as a ground-referenced (single-ended) input. Since in each case the inputs terminals are electrically isolated from one another and from the supply voltage, you also have to connect GND (0V) even with differential inputs.

A supply voltage (+V) of 5V and max. 150mA per terminal is available for supplying the connected sensors.

The digital input is active (high level) when the applied signal voltage lies above the threshold. In the differential measurement mode the threshold can be set in 256 steps between -20V and +20V, otherwise between 0V and +26V.

The following table shows possible combinations of contact assignments for the inputs on Plug 1 (Dx = Sensor x):

Operating mode	**Plug.Contact (assignment)**						
	1.2 (A1+)	**1.3 (A1–)**	**1.5 (B1+)**	**1.6 (B1–)**	**1.8 (Z1+)**	**1.9 (Z1–)**	**1.10 (0V)**
3 x standard[1], differential	$D1_1+$	$D1_1-$	$D2_1+$	$D2_1-$	$D3_1+$	$D2_1-$	GND
3 x standard, single-ended	$D1_1+$	—	$D2_1+$	—	$D3_1+$	—	GND
1 x 2 sensor signals[2] + 1 x standard, differential	$D1_1+$	$D1_1-$	$D1_2+$	$D1_2-$	$D2_1+$	$D2_1-$	GND
1 x 2 sensor signals + 1 x standard, single-ended	$D1_1+$	—	$D1_2+$	—	$D2_1+$	—	GND
1 x 3 sensor signals[3], differential	$D1_1+$	$D1_1-$	$D1_2+$	$D1_2-$	$D1_3+$	$D1_3-$	GND
1 x 3 sensor signals, single-ended	$D1_1+$	—	$D1_2+$	—	$D1_3+$	—	GND

1) e.g. status input, frequency measurement or counter
2) e.g. counter with additional input for counting direction (forwards/reverse counter) or 2-phase counter signals (quadrature counter) or frequency measurement with direction detection (torque transducers)
3) e.g. 2-phase counter signal or angle sensor with additional input for zero reference

The following illustrations show examples for the connection of various sensors. Here, in each case only one sensor and one variant is shown. For example, for the sensor in Fig. 4-88 or Fig. 4-89 you can also use connections 5/6 and 8/9 and the connections 2/3 for a standard sensor or digital input. The connection of a single digital input is not considered in illustrations. If your are connecting more than one sensor per terminal, you can mix ground-referenced and differential configurations.

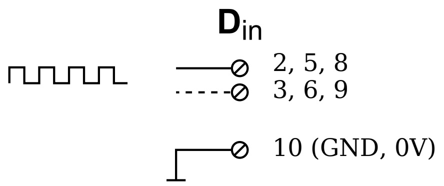


Fig. 4-87 *D107, sensor with one signal, single-ended or differential (input broken line).*

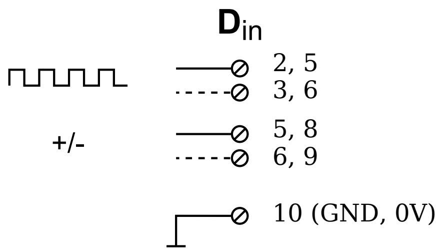


Fig. 4-88 *D107, sensor with two signals (counting direction), single-ended or differential (input broken line).*

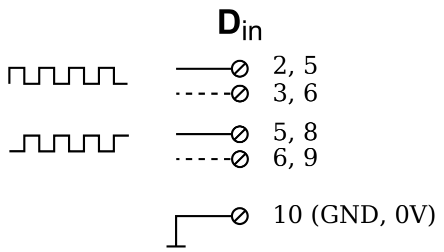


Fig. 4-89 *D107, sensor with two signals (90° offset), single-ended or differential (input broken line).*

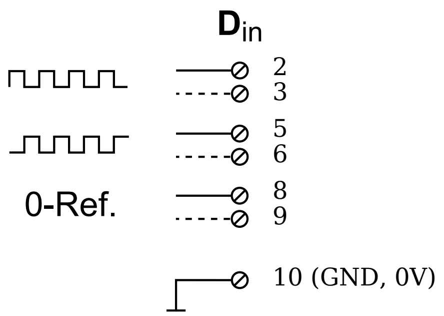
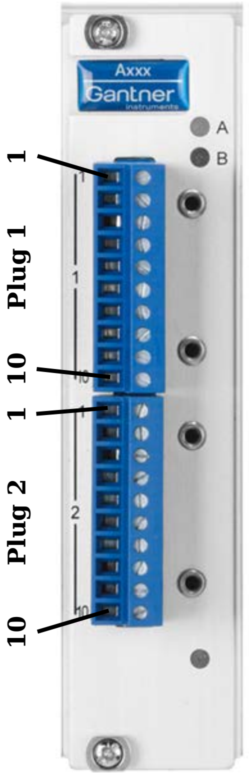


Fig. 4-90 *D107, sensor with three signals (2 x 90° offset and zero reference), single-ended or differential (input broken line).*

4.25 Q.brixx S104: Supply Module

The Q.brixx Module S104 is used for supplying active sensors or other peripherals and provides four electrically isolated supply voltages on two connector strips: $5V_{DC}$, $12V_{DC}$, $15V_{DC}$ and $24V_{DC}$. The output power is 5W per voltage. The assignment of the two connector strips is identical and the contacts of the first connection terminal are connected to the same type of contacts on the second connection terminal. The connection terminals have numbers for identifying the connections.

GND identifies the ground connection (0V) of a supply voltage and the corresponding supply voltage is stated after it in brackets. NC signifies "No Connection".



1 NC
2 +5V
3 GND (5V)
4 +12V
5 GND (12V)
6 +15V
7 GND (15V)
8 +24V
9 GND (24V)
10 NC

1 NC
2 +5V
3 GND (5V)
4 +12V
5 GND (12V)
6 +15V
7 GND (15V)
8 +24V
9 GND (24V)
10 NC

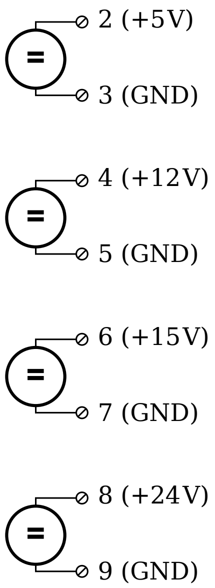


Fig. 4-91 Pin assignment for Q.brixx Module S104.

4.26 Replacing a module

Since the configuration of a module is also saved in the base of the module which is permanently connected to the rear panel of the Q.brixx system, you can easily replace one module by another one of the same type, e.g. if you want to use a module with different connections (D-sub or thermocouple sockets).

Since the module configuration is also stored in the module base, it is sufficient to just replace the module. The configuration present in the base is automatically transferred into the module when the power supply is switched on.

Procedure for replacement

1. Switch off the power supply to the Q.brixx system.
2. Release the screws of the module at the front of the Q.brixx system (refer to red marking in Fig. 4-92) with a cross-tip screwdriver.
3. Withdraw the module towards the front.
4. Push in the new module from the front (note the guiding grooves).
5. Retighten the module screws.
6. Switch on the power supply to the Q.brixx system.

   The module will now be configured from the base (flashing LEDs). When LEDs cease to flash, the configuration is concluded and the module is ready for operation.

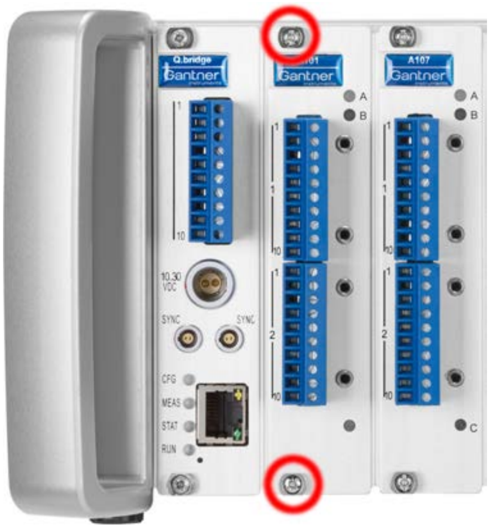


Fig. 4-92 To remove a module release the screws in the blue circles on the rear panel.

4.27 Replacing/changing the module type

If you are using a different type of module, the configuration is not loaded from the module base, because a different module type is involved.

The procedure is initially described in Section 4.27. Accordingly, you have to transfer the current or a new configuration into the base.

Transferring the configuration to the base

On saving a configuration, e.g. with the ICP 100 program or the test.commander program, the (new) configuration is automatically transferred into the base. In this way it is ensured that the same configuration is always present both in the base and in the module.

4.28 Adding modules to or removing them from the system

A change in the number of modules can only be made by Gantner; for this please contact the support, e.g. via www.gantner-instruments.com.

5 Configuration

IMPORTANT

In the description of this chapter screen shots are sometimes illustrated. The pictures were generated with modules from the Q.bloxx system, but they are almost identical to the pictures that you see with Q.brixx; only the name differs (Q.bloxx instead of Q.brixx).

You must first establish contact with the module before you can configure it. Use the test.commander program for this purpose.

For the program a license number is needed which you have to enter to be able to save configurations. During the installation of test.commander, the software ICP 100 is also installed and, with the licensing of test.commander, is also enabled. You will find the license numbers in the PDF file enclosed with the supplied items and on the separate printout with your license data.

The manuals and online help for the programs provide a comprehensive description of all program options. The following describes the most important settings to obtain a system suitable for acquiring measurements.

Tip

Use the test.commander Wizard for the initial setup.

If you already have a configuration file with the required settings available, you can load this file into the relevant module with the Program Controller Setup Wizard (included in test.commander) or ICP 100.

IMPORTANT

If you would like to combine modules or Test Controllers from older applications and recently purchased ones, all components should use the latest relevant internal software, the so-called firmware. To ensure this, carry out a firmware update; refer to Section 5.10, page 112.

Basic procedure

- Establish the connection (communication) between the PC and Test Controller.
- Start the configuration program.
- Enter the sensors used and their sensitivities to obtain an indication in the measured physical quantity.

- Define computations, digital inputs/outputs, alarm monitoring, etc.
- Activate all settings in the module and Test Controller.

Tip
At many points in the programs you can call the setting dialogs or settings via the context menu of an entry. You call the context menu with the right mouse key.

5.1 Installing the test.commander

➡ We recommend that you close all open programs before the installation.

Insert the Gantner CD into your CD drive. In the standard configuration Windows opens the CD automatically and a start window appears. If you have deactivated the Windows autostart function, find the file StartUp.exe in the main directory on the CD and give the corresponding symbol a double click to obtain the start window. Alternatively, you can also start the program Setup.exe in the folder test.commander to carry out the installation directly.

➡ The program ICP 100 is installed together with the program test.commander.

You will also find the relevant latest versions of the programs on our home page www.gantner-instruments.com.

Procedure

- Click on the symbol over ***Load software***.
- Click on the symbol  next to the program which you want to install.
  The program Setup.exe is started.
- Allow the file to open so that the installation can start.
  The starting dialog of the setup program appears.
- Follow the instructions of the setup program to define the installation directory and the program group for the software.
  Setup.exe creates the directory you have specified, if necessary and then copies all files to it.

When the program test.commander is started for the first time, you specify the language for the program user interface (you can change your selection at any time via **Extras > Settings > Language**).

Then enter your license data via **Help > Info** and ***Licensing***. If you have licensed the program test.commander, then the program ICP 100 is also enabled and a further license is not required.

5.2 Using test.commander

You can use the program test.commander, when a Q.gate Test Controller is present in your configuration. For the configuration no module or Test Controller needs to be connected; you can carry out the configuration also off-line. For initial operation we recommend though that all modules are connected.

5.2.1 Linking test.commander via Ethernet (TCP/IP)

Tip
Use the serial interface (refer to Section 5.2.2, page 84), if a permanent IP address (no DHCP) has already been set on the Q.gate Test Controller, but you no longer know what it is. Other than that, you cannot establish any link between the module and PC with "incorrect" address ranges.

Procedure

1. Connect the PC and Q.gate Test Controller via the Ethernet interface.
2. Start the program.
   Now you have two options: Either you can use the Initial Operation Wizard or you can close the starting dialog with ***Cancel*** and proceed as described in the following. If you want to use the wizard, then simply follow the instructions in the dialog.
3. Call the program for configuration via the menu **Utilities > Module Setup Wizard**.
4. In the program window and using the menu **Options > Communication settings**, specify the setting ***TCP/IP via controller*** as the ***Interface type*** and activate ***Use scan for IP addresses***.
   For the Ethernet address you can either execute a scan in the address range of the PC interface (a UDP Scan[1] is executed) or directly enter a single address for Q.gate. If required, ask the network administrator to enable these scan methods and access of the program through the firewall to the Test Controller.
   If you use, e.g. 15 seconds, for the ***Add. (itional) timeout***, an attempt to establish connection is interrupted after this

1) With the UPD Scan all devices in a network are addressed simultaneously. The scan is therefore executed very quickly.

period. The option only needs to be used for very slow networks or links via radio, etc.

5. Search for the modules: ***Find modules***.

   If you receive a firewall message during the search, you have to allow access to the Program Setup Wizard in order to be able to establish a connection (requires administrator rights), refer also to Section 6.1.3, *Allowing access to network devices (firewall)*, page 118.

   First the Test Controllers found are displayed after the search. Mark the Test Controller to which the modules to be set are connected and click on ***OK***. The Test Controller is addressed and the modules which have been found connected to it are displayed in a list.

If files with the module settings exist, you can transfer them to the marked modules using ***Configure selected modules***. Otherwise, create a project for the configuration (Section 5.2.3).

IMPORTANT

If, when reading out the module settings via the Test Controller (step 5.), the message appears that the firmware version of the Test Controller or of a module is older than expected, then you should carry out a firmware update; refer to Section 5.10, *Firmware update*, page 112.

5.2.2 test.commander and the serial (service) interface

test.commander uses the serial interface exclusively as a service interface for the Q.gate Test Controller to set the IP address for Ethernet. Setting connected modules is not possible via this interface.

Procedure

1. Connecting the PC and module via the interface.

   Use the supplied cable with the jack plug for the connection to the PC interface; refer also to Section 4.2.2, page 17.

2. Start the program[1].

3. Using the menu **Utilities**, call the menu item **Controller Serial Terminal**.

4. In the program window using the menu **Options > Communication Settings**, specify the setting ***RS232 direct connection*** as the ***interface type*** as well as the PC ***COM port*** used.

1) If you are not initially creating a project, close the starting dialog with ***Cancel***.

5. Call the program for the settings via the menu **Utilities > Controller serial terminal**.

   The program searches the above specified interface for the Test Controller and presents you with a dialog in which you can read out the existing settings (***Read***) or set a new Ethernet address (and subnet mask) or DHCP (***Write***).

5.2.3 Creating a project for configuration

A project contains the hardware setup, the sensor and I/O settings present in the modules as well as the sensor signals used and computations, the so-called variables, which are to be output.

Procedure

1. After the start of the test.commander you are offered several options. Select ***Open new project and read in online system***.

   The network to be searched is defined when the link is established; refer to Section 5.2.1 to Section 5.2.2, ff. page 83.

   Alternatively, you can also create a project in the test.commander with **File > New project** and specify the Test Controller used via the context menu **Add online controller**.
2. In the dialog mark the Test Controller which is mounted on the modules to be set and click on ***OK***.

   The existing module settings are read out and the Test Controller information updated via the connected modules. Confirm any changes to be made in order to retain the current state.
3. A dialog finally shows you that all settings have been successfully read from the Test Controller. Acknowledge this with a click on ***OK***.

In your project the selected Test Controller is now displayed as the main entry. A tree structure similar to that in Windows Explorer shows the connected (found) Q.brixx modules and the variables used. Open up the entries as required by a click on ⊞···. Mark a module and select **Configuration** from the context menu or double click on a module or signal (variable) to start the configuration program ICP 100. Then carry out all the module settings in the window of this program.

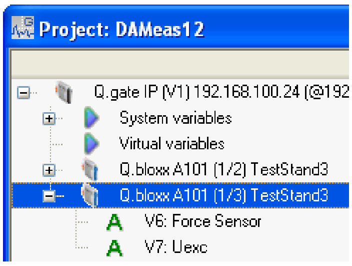
IMPORTANT

After changes to the configuration of modules or a Test Controller ✱ is displayed in the project tree. Select  or **File > Write project (update)** in the test.commander to update the settings in the project (and in the Test Controller). The project file is in this case automatically saved.

Tip

You process a complete variable in the configuration dialog in that you click on the variable in the left column (contains the variable number Vx) to mark it. Using the context menu, you can then cut, paste and copy the variable, overwrite it with a copied variable or delete it.

5.3 Setting sensor parameters



In order to set parameters you should be connected to the module and have called the configuration program (ICP 100 which is started automatically by test.commander): Mark a module and select **Configuration** from the context menu or double click on a module or module signal (variable) to start the configuration program. Then carry out all the module settings in the window of this program.

You can however also configure a project without a direct connection and then, once you have established the connection, load the corresponding files into the modules and load Test Controller.

All module signals are defined as variables. Therefore, for the entry activate the tab **Variable definition** in the configuration program.

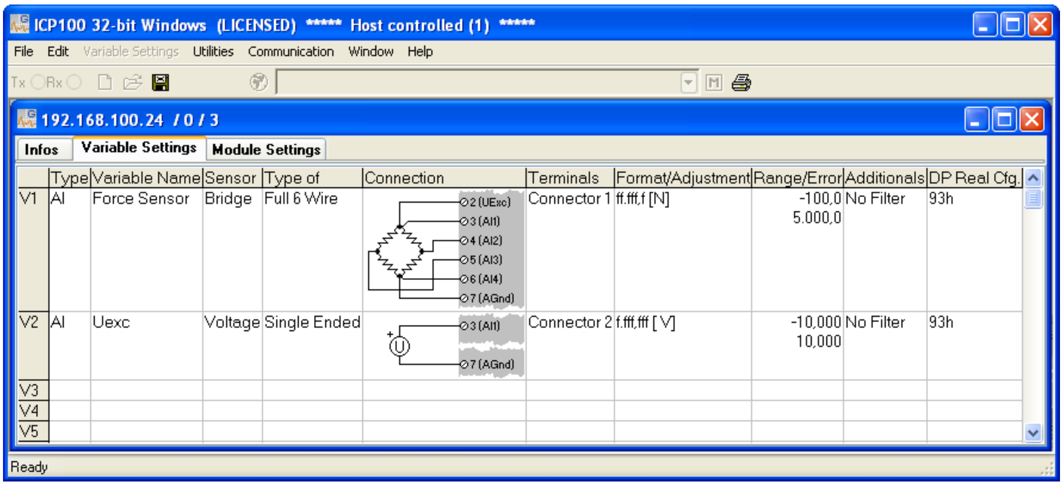


Fig. 5-1 Dialog with the configuration for force transducers (6-wire) and voltage input.

Procedure

1. Click in the column **Type** of the first row (V1 = Variable 1) or mark the row (click on V1) and use **Variable definition > Type**.
2. Select ***Analog. Input***.
3. Click in the column **Variable name** and allocate a name identifying the signal from the connected sensor.
4. Click in the column **Sensor** and specify the type of sensor.

   Depending on the type of module, you have various options available, e.g. ***Bridge*** for strain-gauge full and half-bridges, ***Pt100***, ***Resistance*** for resistors or ***Voltage*** for voltage measurements and IEPE sensors.
5. Click in the column **Type of** and specify the type of circuit or further information about the sensor type.

Depending on the selected sensor type, you have various options available, e.g. ***2-wire*** or ***4-wire*** (circuit) for resistive transducers or ***Full 4-wire*** or ***Full 6-wire*** (circuit) for strain-gauge full bridges.

The column **Wiring diagram** shows you the pin assignment to be used. With more than one input the first inputs are also always occupied first (and first Plug 1, then Plug 2, etc.). Check that your sensor is connected correctly.

6. Click in the column **Format/balance** to enter the scaling for the sensor.

   Depending on the type of sensor selected, you have various options available (refer also to Section 6.3, *Sensor scaling*, page 121):

   – For voltage signals specify the conversion of the measured voltage to the physical quantity measured by the sensor or output the measured voltage quantity without conversion (scaling).

   – For thermocouples or Pt100 sensors no further scaling is required as the conversion into °C is made automatically. The scaling is only needed when you want to convert to °F or K. In this case enter the ***Unit*** (type into the field) and then click on ***Scaling***. Using the method ***Factor and offset***. For a display in °F enter the factor ***1.8*** and ***32*** as the offset. For a display in °K enter the factor ***1*** and ***-273.15*** as the offset.

   – For full and half-bridge transducers you can obtain the data from the data sheet or (better) from the transducer calibration certificate. For a force transducer with, for example, 2.03mV/V at 5kN enter the ***Unit*** (type **kN** in the field) and then click on ***Scaling***. Using the method ***2-point calibration***. Enter in each case ***0*** for ***Point 1*** for ***Measurement*** and ***Displayed value*** and ***2.03*** as ***Measurement*** and ***5*** as ***Displayed measurement*** for ***Point 2***.

     Alternatively, you can also enter ***N*** as ***Unit*** and then ***5000*** as ***Displayed value*** for ***Point 2***.

   – For strain gauges you have the ***Strain gauge calculator*** available. Here, the unit is automatically changed to µm/m. In the dialog enter the gauge factor of your strain gauge (left field) and the bridge factor (right field) for your circuit.

   Floating point numbers are always transferred as 4-byte values and further setting is not necessary here.

   For the formats ***Integer*** (2 bytes) and ***Long integer*** (4 bytes) specify the number of ***Decimal*** places and the total number of places to be output (***Field length***). The field length is calculated including the points, but without any commas displayed for the thousands positions and it is only used for representation in one of the Gantner programs. Specifying three decimal places displays, for example, the value 1234 as 1,234.

After closure of the dialog the number of transferred places and the unit are displayed in the column **Format/balance**, e.g. ***ff,fff.f [kN]*** for an output in the unit kN with a total of seven characters with one decimal place and the decimal point.
If negative numbers occur, the display in this example is limited to -9,999.9 (seven characters without the comma).

7. Click in the column **Range/error** to limit the admissible value range and to define the reaction in the case of an error (optional).
8. Also optionally, you can specify filtering of the sensor signal in the column **Other**.
9. Save the changes in a file and close the module once you have made all the changes: or **File > Save to file and finish**.
   The file is created within the project folder and the file name is generated automatically. The project folder bears the same name as the project. The generated file name contains the address of the Test Controller through which the module is connected and an identifier for the relevant module.

IMPORTANT
If the modules are connected through a Test Controller, new module settings must also be updated there. Select or **File > Write project (update)** in the test.commander. The project file is in this case automatically updated.

5.3.1 Carrier frequency synchronization (Q.brixx A106)

The A106 module supports the supply of sensors with direct voltage (DC) or carrier frequency (CF).

➡ If you are using several modules of this type and set carrier frequency supply, you should synchronize the carrier frequencies of the modules, because otherwise crosstalk can occur between the supply lines and the signal inputs of different modules. This then leads to beats in the measurement signal.

After selecting a carrier frequency, you have three methods of supply:

1. No sync. (hronization)

   This setting is practicable when you are only using one module with carrier frequency supply. Within a module all carrier frequency generators are automatically synchronized.

2. Internal sync. (hronization)

   Set this type of synchronization for *one* module. The module then becomes the master to which all other modules synchronize.

3. External sync. (hronization)

   Specify this type of synchronization for all other modules so that they synchronize to the master.

Tip

We recommend that only one variant of the carrier frequency is used, i.e. do not mix 600 Hz and 4800 Hz.

4. Save the changes in a file and close the module once you have made all the changes: or **File > Save to file and finish**.

5.3.2 Zero balancing/taring the sensor

You have two ways of setting a measurement offset to zero, e.g. due to preloads:

1. Zero balance

   With this method measurement takes place over a certain time period and the mean is computed. This mean value is then subtracted from all the following measurements.

2. Taring

   With this method the (single) measurement present at a certain point in time is subtracted from all the following measurements.

Procedure

1. Click in the column **Type** of the first free row (V3 = Variable 3 in Fig. 5-2) or mark the row (click on V3) and use **Variable definition > Type**.
2. Select ***Default***.
3. Click in the column **Variable name** and allocate a name specifying the purpose of the signal, e.g. Zero_tare (Fig. 5-2).

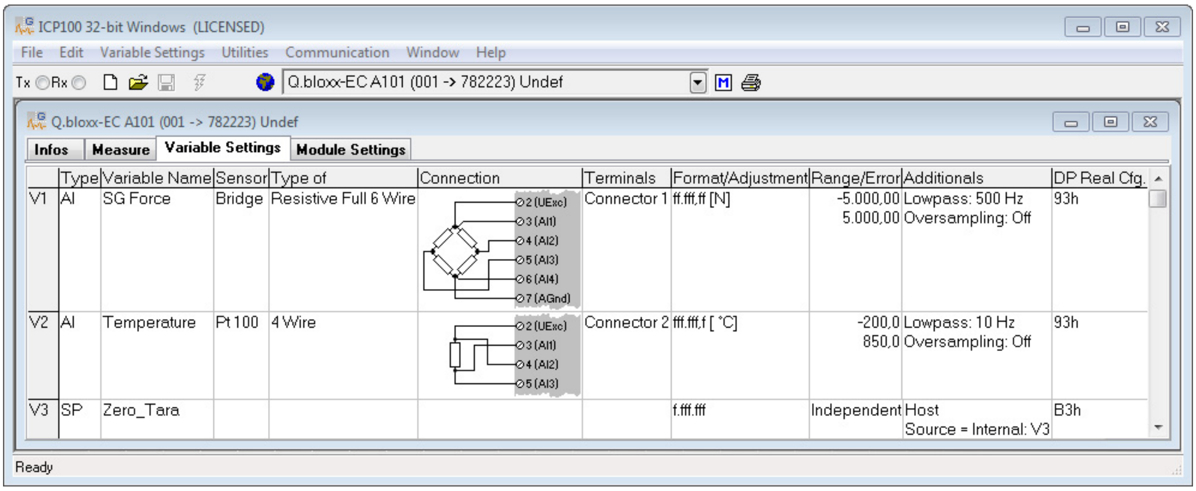


Fig. 5-2 Defining the variable for zero balancing and/or taring.

4. Click in the column **Format/balance** of the channel for which zero balancing and/or taring is to be executed, e.g. for the strain-gauge force sensor in Fig. 5-2.

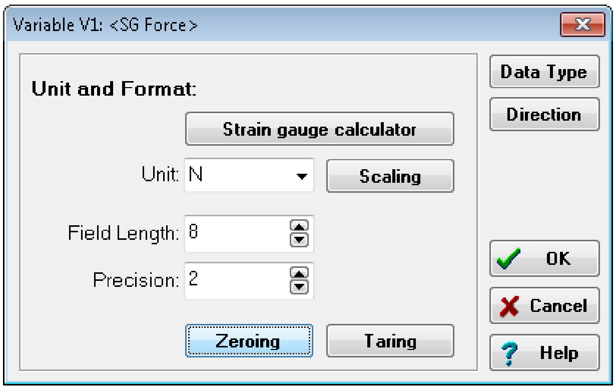


Fig. 5-3 Dialog for sensor scaling.

5. Click on ***Zero balance*** or ***Tare*** to configure the relevant process.
6. Select the variable created above as the control variable (Fig. 5-4).

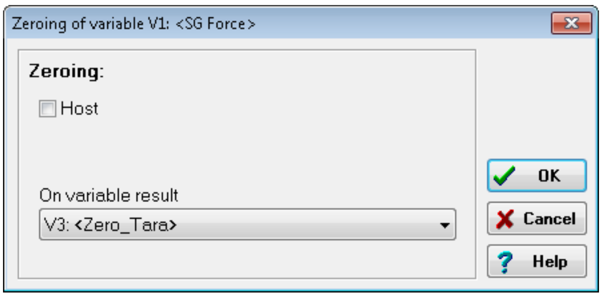


Fig. 5-4 Setting up zero balance or tare.

When the variable (Zero_tare in this example) has certain values, taring or zero balancing is carried out or an existing zero or tare value is deleted (undo zero balancing/taring):

Value	Function
1	Perform taring when setting the value
2	Reset tare (delete tare value)
4	Start zero balance The mean is formed until the value 0 is written to the variable again.
8	Reset zero balance (delete zero value)

7. Save the changes in a file and close the module once you have made all the changes: 💾 or **File > Save to file and finish**.

5.3.3 Sensor scaling over several points (table)

In the standard setting (linear) sensors are scaled via a characteristic curve with two points. You can however also perform scaling over several points (table). During the measurement the values are then linearly interpolated between the specified points.

Procedure

1. Create the sensor as usual (two-point scaling).
2. In the **Sensor** column click on the sensor.
3. Copy the sensor (click on ***Copy***) and specify a name, e.g. ***ForceTable*** (Fig. 5-5). If the scaling to be entered later only applies to this sensor, you should use the sensor type and the serial number as the name, e.g. ***C2 #1234 (5V)***.

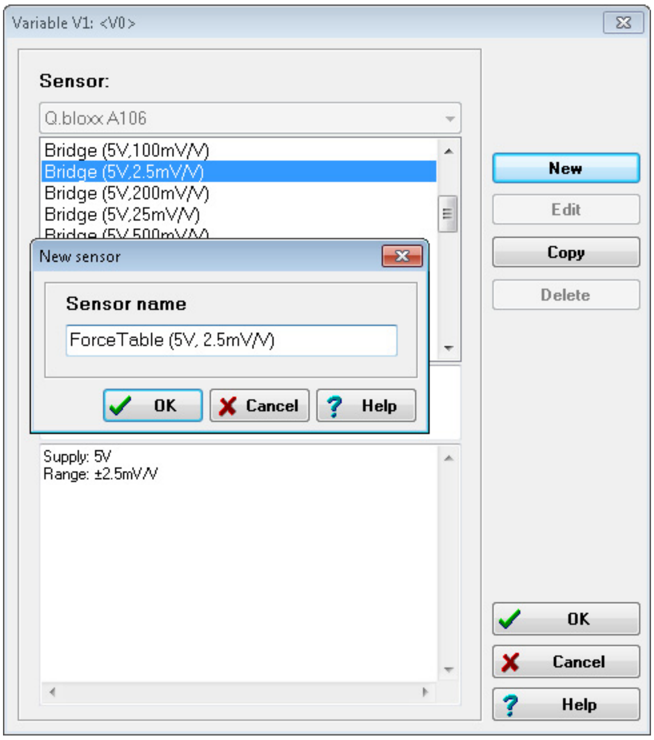


Fig. 5-5 Creating a new sensor for scaling.

4. Click on ***Edit*** and the **Unit** tab to be able to define the unit measured by your sensor (Fig. 5-6).

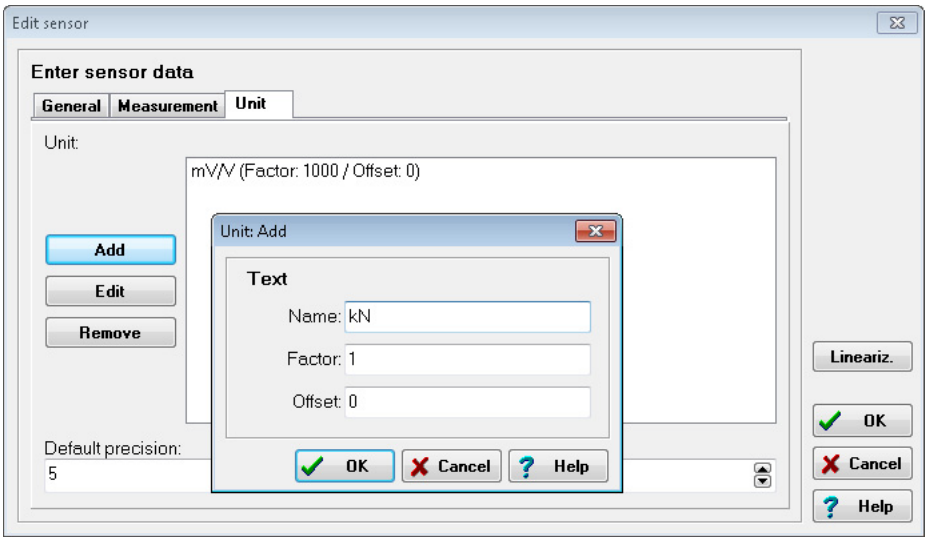


Fig. 5-6 Defining the unit for sensor scaling.

5. Specify the required unit, e.g. ***kN*** (Fig. 5-6).
6. Click on ***Linearize*** and select your unit.

7. Edit the existing values or generate further rows with ***New*** and specify the values for your sensor (Fig. 5-7). The rows sorted based on the entered values.

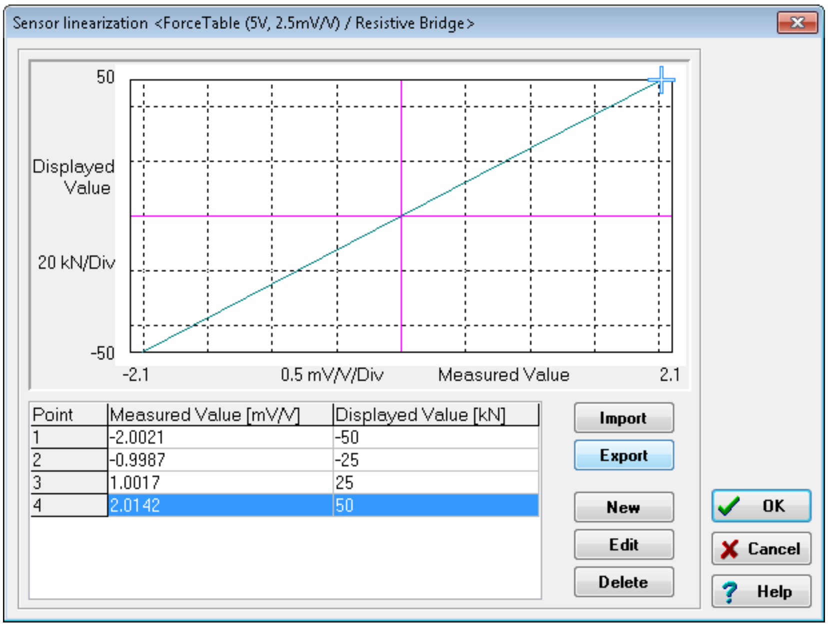


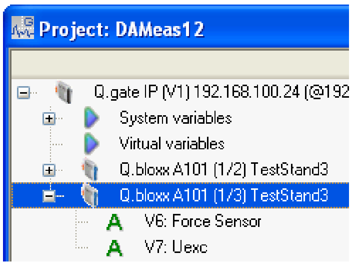
Fig. 5-7 Entering the scaling table.

If the data are present in an Excel file, you can also import a file in the format *Excel 97-2003-Workbook (*.xls)*.

Alternatively to entering a unit in step 5, you can leave the electrical unit of the sensor as it is and enter the table in this unit, e.g. *mV/V measured value* and *mV/V displayed value*. You can then define the unit displayed for the measurement in the column **Format/balance** column.

8. Save the changes in a file and close the module once you have made all the changes:  or **File > Save to file and finish**.

5.4 Specifying digital inputs/outputs



In order to set parameters you should be connected to the module and have called the configuration program (ICP 100 which is started automatically by test.commander): Mark a module and select **Configuration** from the context menu or double click on a module or module signal (variable) to start the configuration program. Then carry out all the module settings in the window of this program.

You can however also configure a project without a direct connection and then, once you have established the connection, load the corresponding files into the modules and load Test Controller.

All module signals are defined as variables. Therefore, for the entry activate the tab **Variable definition** in the configuration program.

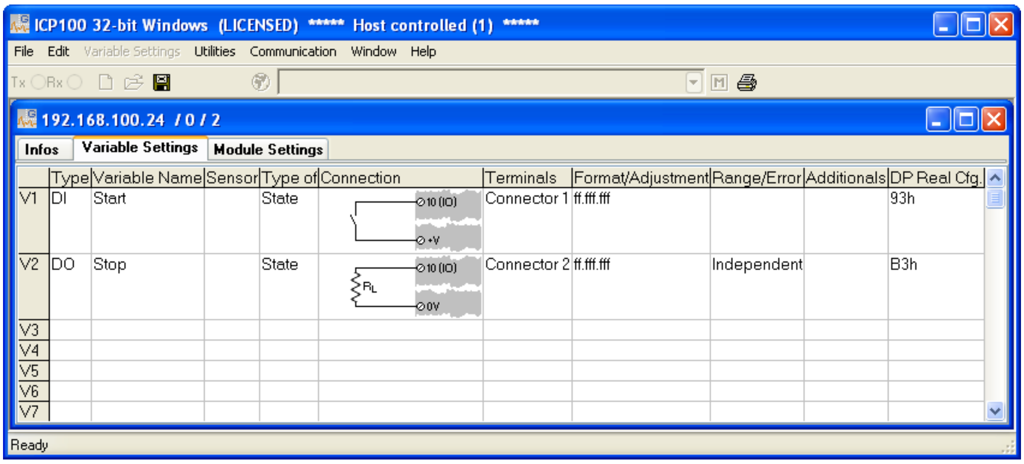


Fig. 5-8 Dialog with configuration for digital input and output.

Procedure

1. Click in the column **Type** of the first row (V1 = Variable 1) or mark the row (click on V1) and use **Variable definition > Type**.
2. Select ***Digit. input*** or ***Digit. output***.

   The column **Wiring diagram** shows you the pin assignment. With more than one input the first inputs are also always occupied first (first Plug 1, then Plug 2, etc.). Check for correct connection.
3. Click in the column **Variable name** and allocate a name identifying the signal.
4. At a digital *output* click in the column **Type of** and specify whether you want to use the output as ***Status*** indicator, ***Status field*** or ***Process output***.

   Process output: The output monitors a module signal and changes the output level under certain conditions. Click in the column **Other** and specify the type of alarm monitoring.

You can specify up to four alarm conditions. When one of the conditions is satisfied, the alarm signal is triggered.

To the left above the graphical displays select the levels at which switching is to occur and how they are to switch. Enter the values for the switching thresholds in the (scaled) unit of the selected signal. Use either fixed values (constants) or arrange for the values to be determined by other variables.

Status indicator: The output can be set via a command from the Test Controller, e.g. via a PROFIBUS-DP command. Click in the column **Other** and specify the type of alarm monitoring.

5. Click in the column **Format/balance** to specify the transfer format.

   Since digital signals do not require any ***Decimal*** places, you can enter 0 here. ***1*** is sufficient for the ***Field length***. With a digital input you can also specify a unit (optional).

   For several inputs/outputs and the type ***Status field*** (***Type of*** column), as well as the transfer as a number (e.g. as integer), there is also the type ***Status field 32*** with which all existing inputs or outputs are transferred as binary numbers. Define a suitable field length here depending on the number of inputs and outputs.

   When the dialog is closed, the number of transferred places and the unit in the column **Format/balance** are displayed.

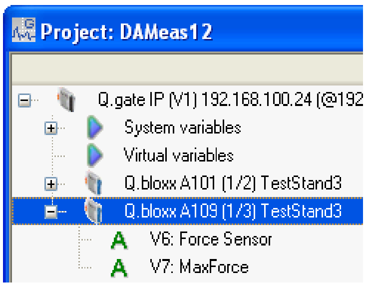
6. Click in the column **Range/error** to define the reaction in the case of an error for the digital outputs (optional).

7. Save the changes in a file and close the module once you have made all the changes: or **File > Save to file and finish**.

   The file is created within the project folder and the file name is generated automatically. The project folder bears the same name as the project. The generated file name contains the address of the Test Controller through which the module is connected and an identifier for the relevant module.

IMPORTANT

If the modules are connected through a Test Controller, new module settings must also be updated there. Select or **File > Write project (update)** in the test.commander. The project file is in this case automatically updated.



Defining analog outputs

In order to set parameters you should be connected to the module and have called the configuration program (ICP 100 which is started automatically by test.commander): Mark a module and select **Configuration** from the context menu or double click on a module or module signal (variable) to start the configuration program. Then carry out all the module settings in the window of this program.

You can however also configure a project without a direct connection and then, once you have established the connection, load the corresponding files into the modules and load Test Controller.

All module signals are defined as variables. Therefore, for the entry activate the tab **Variable definition** in the configuration program.

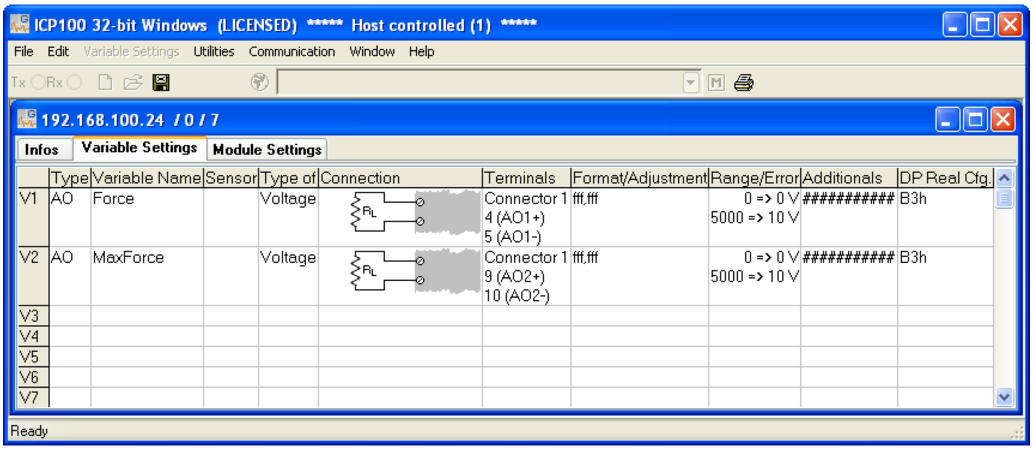


Fig. 5-9 Dialog with configuration for analog outputs.

Procedure

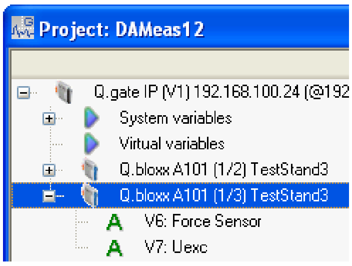
1. Click in the column **Type** of the first row (V1 = Variable 1) or mark the row (click on V1) and use **Variable definition > Type**.
2. Select ***Analog. Output***.
   The column **Wiring diagram** shows you the pin assignment. With more than one output the first outputs are also always occupied first (first Plug 1, then Plug 2, etc.). Check for correct connection.
3. Click in the column **Variable name** and allocate a name identifying the signal.
4. Click in the column **Type of** and specify whether you want to use the output as a ***Voltage*** or a ***Current*** output.
5. In the **Format/balance** column the output format is shown which has no further significance here.
6. Click in the column **Range/error** to define the output scaling and the reaction in the case of an error (optional).
7. Click in the column **Other** to specify the signal source (variable) used for the output.
8. Save the changes in a file and close the module once you have made all the changes:  or **File > Save to file and finish**.

The file is created within the project folder and the file name is generated automatically. The project folder bears the same name as the project. The generated file name contains the address of the Test Controller through which the module is connected and an identifier for the relevant module.

IMPORTANT

If the modules are connected through a Test Controller, new module settings must also be updated there. Select  or **File > Write project (update)** in the test.commander. The project file is in this case automatically updated.

5.6 Defining computations



In order to set parameters you should be connected to the module and have called the configuration program (ICP 100 which is started automatically by test.commander): Mark a module and select **Configuration** from the context menu or double click on a module or module signal (variable) to start the configuration program. Then carry out all the module settings in the window of this program.

You can however also configure a project without a direct connection and then, once you have established the connection, load the corresponding files into the modules and load Test Controller.

All module signals are defined as variables. Therefore, for the entry activate the tab **Variable definition** in the configuration program.

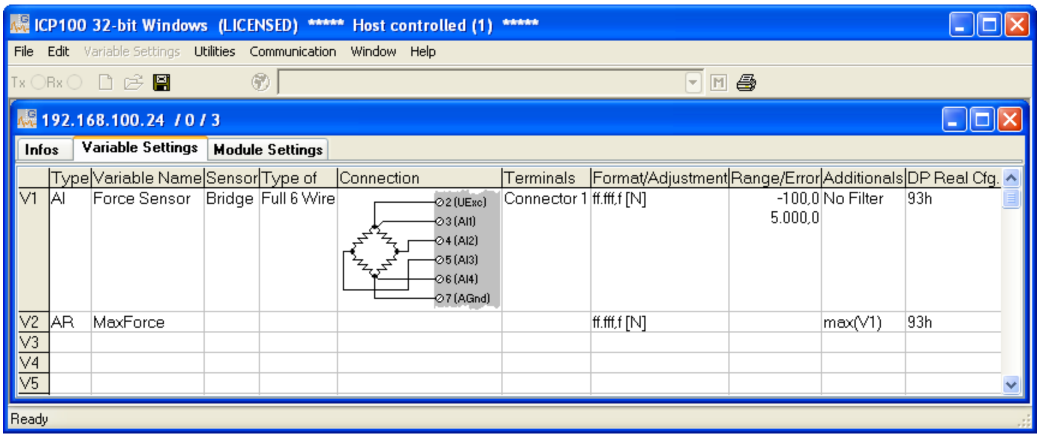


Fig. 5-10 Dialog with configuration for a computation.

Procedure

1. Click in the column **Type** of the first row (V1 = Variable 1) or mark the row (click on V1) and use **Variable definition > Type**.
2. Select ***Arithmetic***.
3. Click in the column **Variable name** and allocate a name identifying the signal.
4. Click in the column **Other** and specify the required computation.

   In the upper dialog field you can enter, as on a pocket calculator, a formula which uses the existing module variables. Create functions via the buttons in the lower section of the dialog. Click on ***OK*** once you have defined the required computation.
5. Click in the **Format/balance** column to specify the transfer format using the formats ***Integer*** (2 bytes) and ***Long integer*** (4 bytes).

Floating point numbers are always transferred as 4-byte values and further setting is not necessary here.

For the formats ***Integer*** and ***Long integer*** specify the number of ***Decimal*** places and the total number of places to be output (***Field length***). The field length is calculated including the points, but without any commas displayed for the thousands positions and it is only used for representation in one of the Gantner programs. Specifying three decimal places displays, for example, the value 1234 as 1,234.

After closure of the dialog the number of transferred places and the unit are displayed in the column **Format/balance**, e.g. ***ff,fff.f [kN]*** for an output in the unit kN with a total of seven characters with one decimal place and the decimal point.
If negative numbers occur, the display in this example is limited to -9,999.9 (seven characters without the comma).

6. Save the changes in a file and close the module once you have made all the changes: or **File > Save to file and finish**. The file is created within the project folder and the file name is generated automatically. The project folder bears the same name as the project. The generated file name contains the address of the Test Controller through which the module is connected and an identifier for the relevant module.

IMPORTANT

If the modules are connected through a Test Controller, new module settings must also be updated there. Select or **File > Write project (update)** in the test.commander. The project file is in this case automatically updated.

5.7 Specifying the alarm monitoring

In order to set parameters you should be connected to the module and have called the configuration program (ICP 100 which is started automatically by test.commander): Mark a module and select **Configuration** from the context menu or double click on a module or module signal (variable) to start the configuration program. Then carry out all the module settings in the window of this program.

You can however also configure a project without a direct connection and then, once you have established the connection, load the corresponding files into the modules and load Test Controller.

All module signals are defined as variables. Therefore, for the entry activate the tab **Variable definition** in the configuration program.

➡ In order to monitor a limit and to output a level on a digital output when an alarm occurs, you can directly use the function of the digital output. You do not need to set up any alarm monitoring. The alarm monitoring is used to monitor signals in the module and to make the result available to the PC or PLC as a preconditioned signal. Checking the original signal in the PC or PLC can therefore be omitted.

Procedure

1. Click in the column **Type** of the first row (V1 = Variable 1) or mark the row (click on V1) and use **Variable definition > Type**.
2. Select ***Alarm***.
3. Click in the column **Variable name** and allocate a name identifying the alarm signal.
4. Click in the column **Other** and specify the type of alarm monitoring.

   You can specify up to four alarm conditions. When one of the conditions is satisfied, the alarm signal is triggered.

   To the left above the graphical displays select the levels at which switching is to occur and how they are to switch. Enter the values for the switching thresholds in the (scaled) unit of the selected signal. Use either fixed values (constants) or arrange for the values to be determined by other variables.
5. Click in the column **Format/balance** to specify the transfer format.

   Since the alarm signal, like digital signals, does not require any ***Decimal*** places, you can enter 0 here. ***1*** is sufficient for the ***Field length***.

   When the dialog is closed, the number of transferred places and the unit in the column **Format/balance**, e.g. ***f***, are displayed.
6. Save the changes in a file and close the module once you have made all the changes:  or **File > Save to file and finish**.

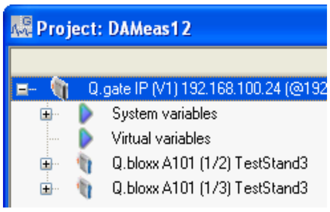
   The file is created within the project folder and the file name is generated automatically. The project folder bears the same name as the project. The generated file name contains the address of the Test Controller through which the module is connected and an identifier for the relevant module.

IMPORTANT

If the modules are connected through a Test Controller, new module settings must also be updated there. Select  or **File > Write project (update)** in the test.commander. The project file is in this case automatically updated.

5.8 Q.gate settings

In the Test Controller you specify, for example, the type and scope of the synchronization, set the (synchronous) output rate and baud rate of the modules to be used or define which bus diagnostic data or life signs are to be transmitted. In addition, you can check all the settings of host and module interfaces, allocate a location name, etc. The following sections only deal with the most important settings; for further information read the appropriate Test Controller manual.



Mark the Test Controller to be set and select **Settings** from the context menu or double click on the Test Controller to start the configuration program. Then you can carry out all the module settings in the window of this program. A tree structure similar to that in Windows Explorer shows the individual parameter groups.

Open up the entries as required by a click on ⊞···.

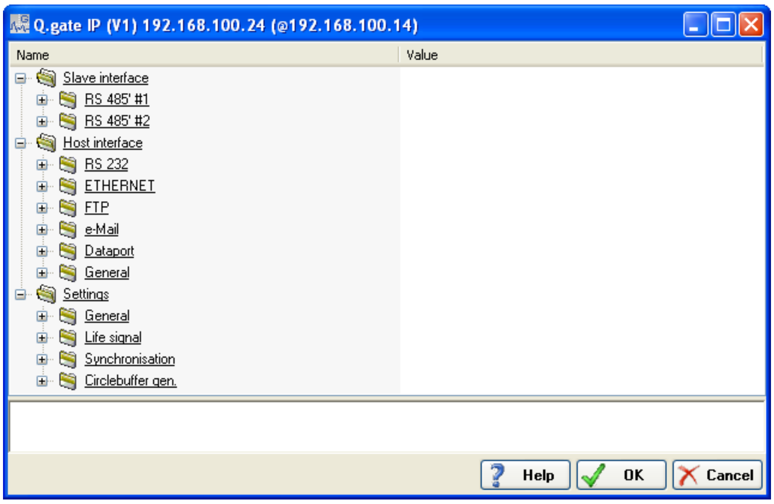


Fig. 5-11 Configuration dialog for a Q.gate. Test Controller

5.8.1 Module interface

Using this parameter group, the speed of data transmission on the individual interfaces (UARTs) can be defined. Since all modules are brought together in one housing with Q.brixx, here the maximum possible baud rate of 48 MBd can be used.

A change in the baud rate is carried out automatically on all connected modules.

Communication monitoring: With a value > 0 the module error LED is activated if there is a lack of communication after this period.

Response delay: This parameter is only needed when the modules are not directly connected to this interface, but instead connected to a modem, for example. Then enter the time here which is to be awaited additionally due to the slow connection.

5.8.2 Host interface

This parameter group defines the settings for communication with the host(s) (PC, PLC, etc.).

Since the Test Controller can also operate as an FTP server and FTP client, the settings for sending e-mails, for example, can also be defined here. Further information on these parameters can be found in the System Guide Manual.

5.8.3 Settings

Using this parameter group you define, for example, life signs or the location name.

5.8.3.1 General remarks

Location

Here, assign a name for the Test Controller.

Buffer pre-initialization

In the ***Fast filling*** default setting each measurement transferred with a bit error leads to an error: the measurement is set to -1 (default setting for ***Filling pattern***) and the error counter is set. This generally causes the test-rig to stop. In the setting ***Deactivated*** the previous measurement is also used for the present measurement. If the next measurement is alright again, measurement continues as normal. The error is however counted, but no alarm is triggered.

Filling pattern

Value which is used for a defective measurement (refer to Buffer pre-initialization).

5.8.3.2 Life sign

Here you specify the communication errors for which an error signal is to be set and whether it is to occur as a static signal or dynamically (switching between on and off with the ***I/O status cycle***).

5.8.3.3 Synchronization

Synchronous sampling frequency

If you are using several modules on various interfaces (UARTs), which operate at different sample rates, for example because not all modules support the same sample rate, then with this parameter you can ensure that those values transferred over an interface (UART) with a slow sample rate are also synchronized to the time points at which a measurement is also present that has been acquired with a fast sample rate (Fig. 5-12).

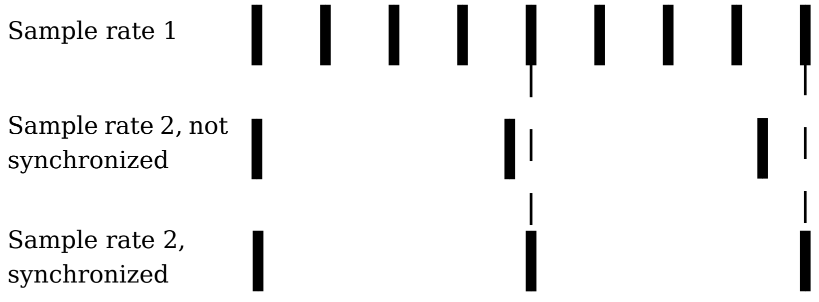


Fig. 5-12 Data transmission at a synchronous sampling frequency.

When using several Q.pac Test Controllers, additionally specify which is used as master (***Use as master: Yes***) and which are used as slaves. The master (only one master is permissible) defines the synchronization and then all slaves synchronize themselves to the master.

Time synchronization

If you want to use either several systems or to synchronize your system through an external time source, you must specify how the synchronization is to occur (refer also to Section 4.3, page 19).

1. Synchronization of several Test Controllers through one sync line

   Connect the sync connections on the Test Controllers by synchronization lines. For this purpose use a screened cable with twisted cores if possible. One (any) controller becomes the master; on this controller set **Settings > Synchronization > Sync. protocol settings** to ***None***. For the other Test Controllers specify ***Q.sync over RS485*** as the setting in the same dialog.

   The maximum length of all synchronization lines together is 1000m.

2. Synchronization of a Test Controller through a radio receiver for time signals

   Connect the receiver by the sync line; refer to Section 4.3.1, page 21. Depending on the output signal, specify ***AFNOR via RS485*** or ***IRIG B003/B005 via RS485*** for **Settings > Synchronization > Sync. protocol settings**. With a Q.gate Test Controller no further Test Controllers can be connected in this case. This is only possible in conjunction with an (additional) Q.pac Test Controller.

3. Synchronization of a Test Controller through a GPS receiver

   Connect the GPS receiver with the RS-232 interface of the Test Controller and specify ***NMEA-0183*** for **Host interface > RS 232 > Protocol**.

4. Synchronization of a Test Controller through SNTP

Make sure that the Test Controller can access a time server in the Ethernet network. Specify ***On*** for **Host interface > SNTP > SNTP mode** as well as the **Server address** (IP address of the time server).

All other variants are combinations of theses methods:

1. Synchronization of several Test Controllers through one sync line; the master controller can be synchronized through a GPS receiver or SNTP.

   Set the master up as described above (**Settings > Synchronization > Sync. protocol settings** remains on ***None***). On the slave controllers specify ***Q.sync over RS485*** for **Settings > Synchronization > Sync. protocol settings**.
2. Synchronization of several Test Controllers through one radio receiver for time signals in conjunction with an additional Q.pac Test Controller

   Connect the time signal on the Q.pac Test Controller to the digital IOs (plug terminal 2, connections 9 and 10). Connect the Q.pac Test Controller to the Q.gate Test Controllers through the sync lines. Depending on the output signal, specify ***AFNOR via IOs*** or ***IRIG B003/B005 via IOs*** for **Settings > Synchronization > Sync. protocol settings** on the Q.pac Test Controller. On the slave controllers specify ***Q.sync over RS485*** for **Settings > Synchronization > Sync. protocol settings**.
3. Synchronization of several Test Controllers through SNTP (without sync line)

   On all Test Controllers specify ***On*** for **Host interface > SNTP > SNTP mode** as well as the **Server address** (IP address of the time server).

5.8.3.4 Ring buffers

In each case a ring buffer is available. When reading data from the buffer, all the (new) data are retrieved which are present in the buffer. With the maximum buffer size (16 Mbyte is available) the transfer may take some time. Reduce the buffer if data are retrieved from the buffer only sporadically or not much data is involved.

5.8.4 System variable

! IMPORTANT

The system variable created in the default setting for the time or the cycle counter (Cyclecounter) must not be changed.

Here, you specify in which format the time signature is to be recorded: Context menu for system variables **Add new variable > ABSDATETIME**. After a double click on the variable and a further click on ***Formula*** you can also select other formats (Fig. 5-13).

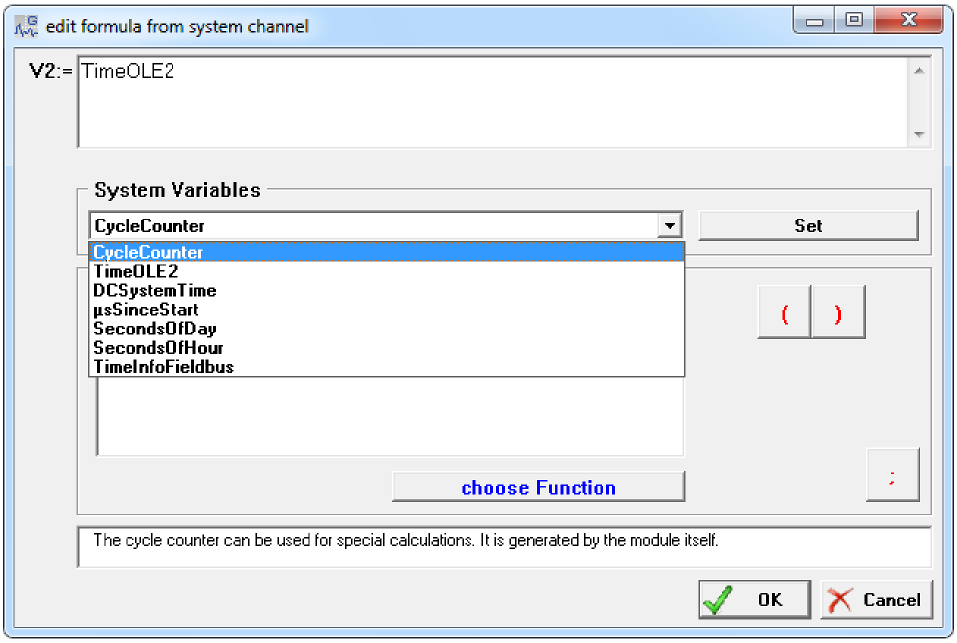


Fig. 5-13 Dialog for specifying the time format.

5.8.5 Virtual variable

With virtual variables you can carry out computations, evaluate trigger conditions or carry out assessments. The variables can be output like measurements or linked to other variables, measurements or digital I/Os.

In the context menu for virtual variables select **Add new variable > ARITHMETIC_EMPTY**. After a double click on the variable you can either specify a formula for the computation, define an event which is to be monitored (trigger) or specify the data format to be used (Fig. 5-14).

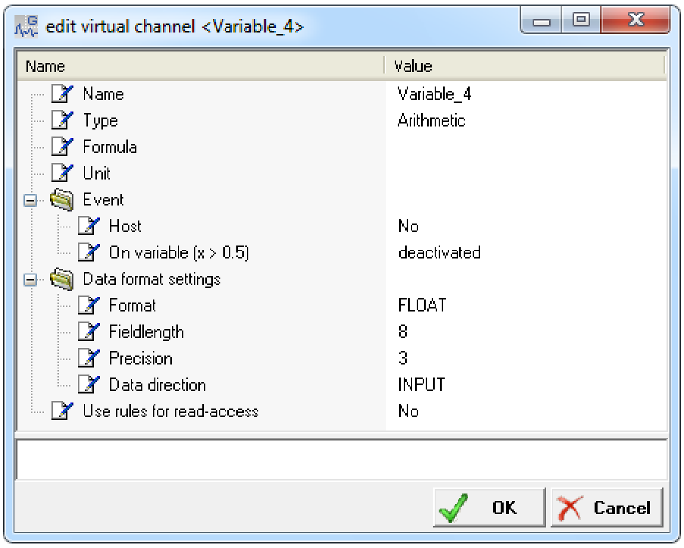


Fig. 5-14 Configuration dialog for a virtual variable.

Click on, for example, ***Formula*** to enter a computation (Fig. 5-15).

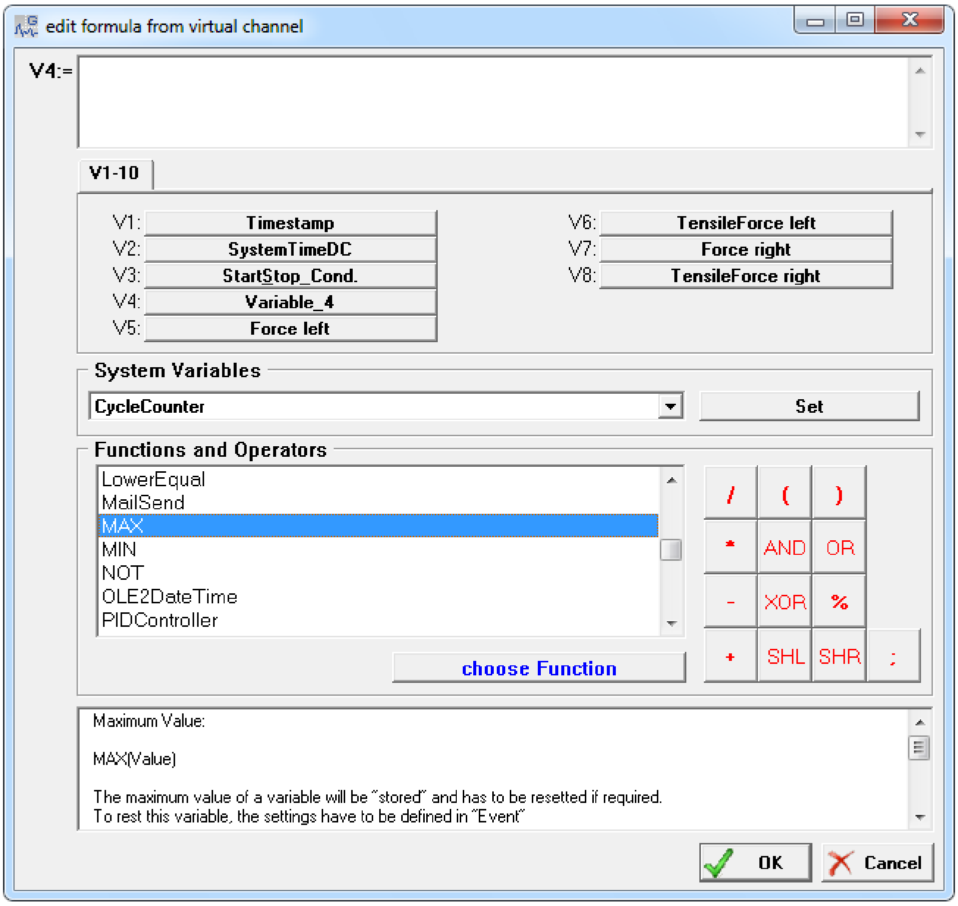


Fig. 5-15 Defining a computation (formula).

In the dialog you have available all variables already defined (tab **V1-10** and other tabs if more than ten variables have been defined). Click on one of the variables to insert it into the formula. Use the field **Functions and operators** to select a mathematical or logical function (select the function and click on ***Select function*** so that it is accepted into the formula field). Where required add brackets (simply enter them via the keyboard) in order to obtain the correct computational sequence. Close the dialog with OK.

IMPORTANT

Select  or **File > Write project (update)** in the test.commander to transfer the new definition into the Test Controller. The project file is in this case automatically updated.

5.9 Online tools

5.9.1 Read data buffer (with measurements)

Click on [icon] or use **File > Read online data buffer from controller** to be able to read out and view all values from the ring buffer.

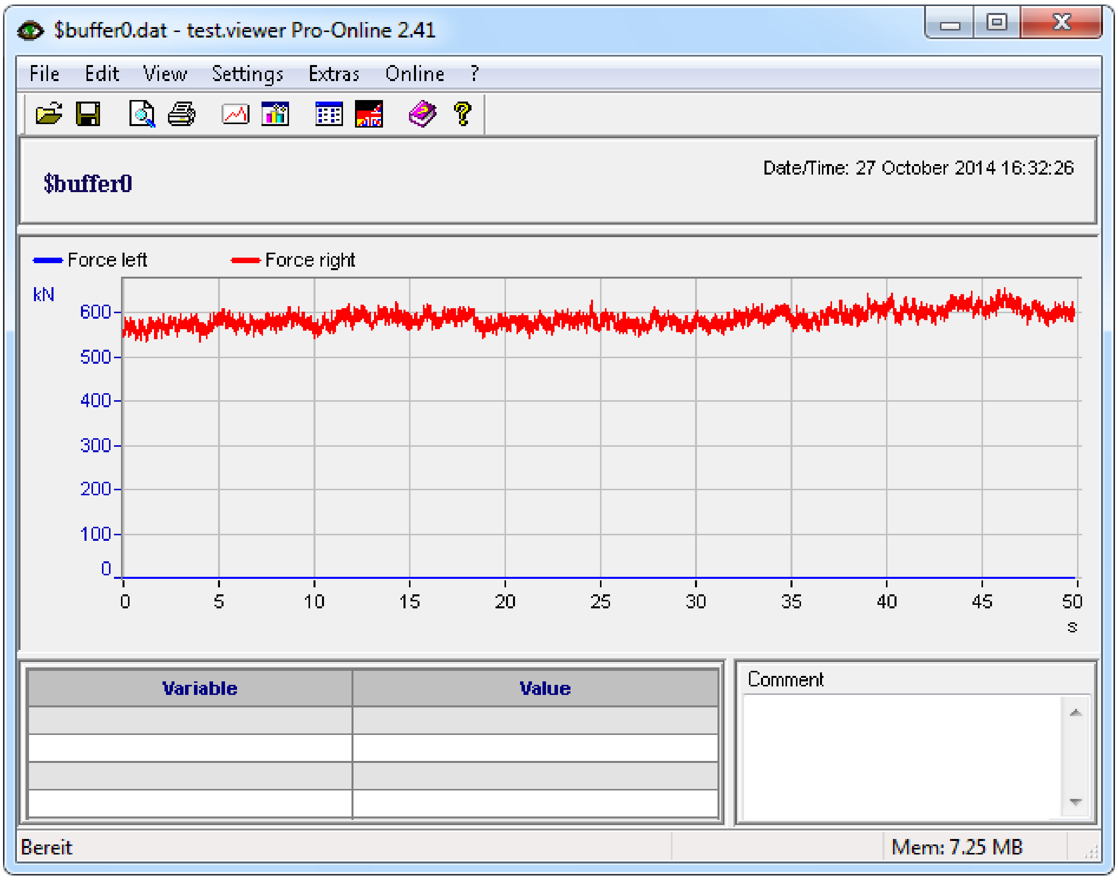


Fig. 5-16 Display of the buffer content with test.viewer.

You can carry out further settings using the menu and symbols, e.g. display the channel list, show the spectra or transfer a live stream of data.

5.9.2 Displaying measurements

Click on [icon] or use **File > Read online values from controller** to be able to view the values of your variables. If you have defined appropriate variables, you can also set initial values in this dialog.

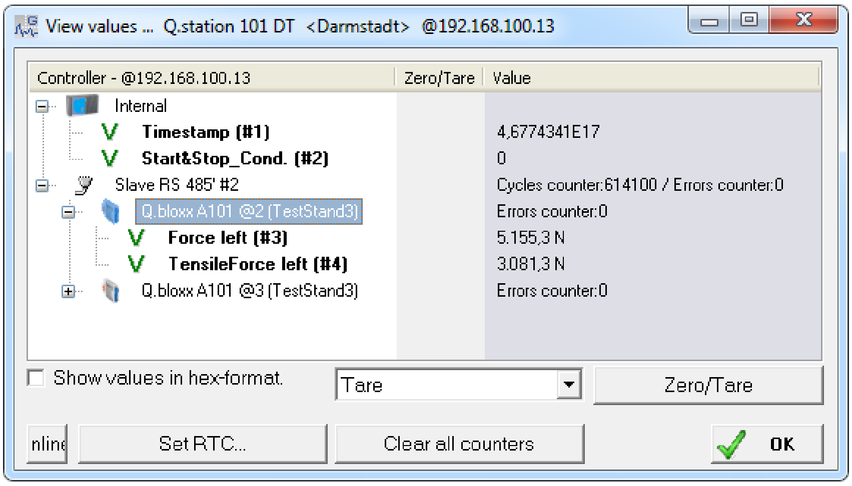
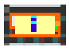


Fig. 5-17 Dialog for displaying the variable values.

In the dialog click on ***Show online graphics*** to display the values in a graph over time.

5.9.3 Reading module information

Click on  or use **File > Read online module info from controller** to be able to display information such as the address or serial number of your system.

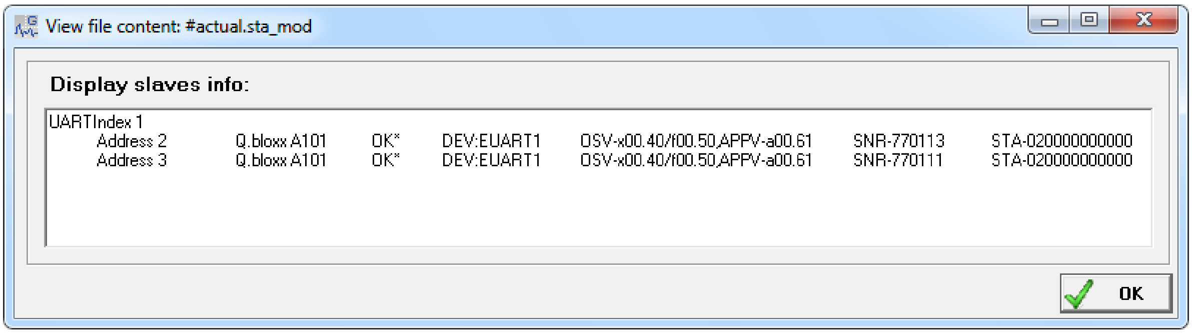


Fig. 5-18 Display of the module information.

5.9.4 Reading status information

Click on or use **File > Read online status info from controller** to display status information of your system.

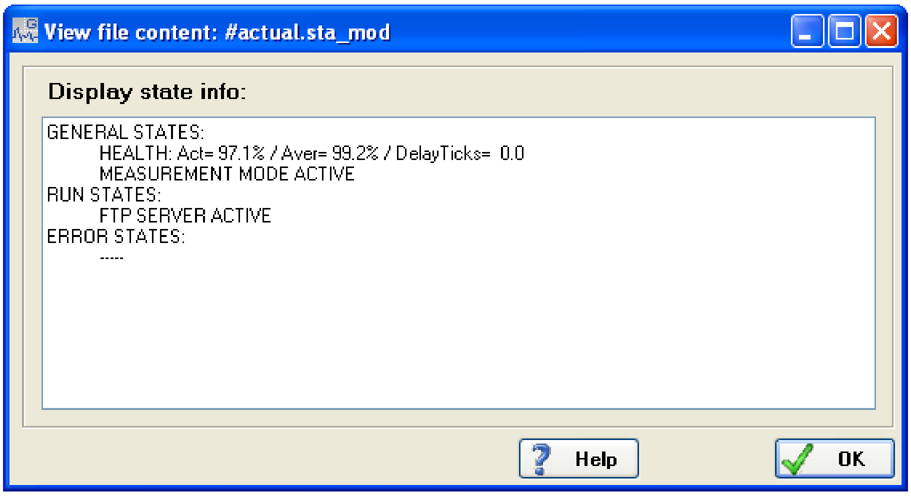


Fig. 5-19 Display of the status information.

5.10 Firmware update

Recently purchased modules or Test Controllers always contain the latest firmware, i.e. the software in the modules or Test Controllers is the current version. However, if you want to combine these modules with older modules and/or Test Controllers, you must update all older modules or Test Controllers and it is essential to update your software to the latest version, because otherwise disturbances in operation due to a communication failure may occur.

The current firmware is in each case included in the latest installations of the programs ICP 100 or test.commander. Here, the program licenses apply to all versions of a program. If required, download the latest versions from our web site: www.gantner-instruments.com. You will find the programs under **Downloads > Software**.

5.10.1 Firmware update for Test Controller

Install as required the latest version of the test.commander so that you can also install the latest version of the firmware on your PC. Before a new installation is carried out, we recommend that the existing version is uninstalled using the Windows Control Panel.

Procedure

1. In the program test.commander select **Utilities > Controller firmware update**.

   The network in the segment of the PC address is searched and the Test Controllers which are found are displayed in the window. If no Test Controller is found, you may have to enter the address manually or set the IP address of your PC to the segment used by the Test Controller; refer also to Section 4.2.1, *Connecting /Q.gate via Ethernet to a PC/PLC*, page 16.
2. Mark the Test Controller to be updated and click on ***OK***.

   The update tool is started and the Test Controllers present in the network are displayed again.
3. Mark the Test Controller to be updated and click on ***Update***.

   The Windows file dialog is opened and shows you the firmware versions available on your PC.
4. Mark the newest of the available firmware versions (if necessary, switch to the detailed view) and click on **Open**.

   The update process is started. Wait until the update has finished. The end of updating is indicated by the dialog “Update completed successfully”.
5. Click on ***OK*** and close the window of the update tool. The firmware update is now completed.

5.10.2 Firmware update for modules

Install as required the latest version of ICP 100 or test.commander so that you can also install the latest version of the firmware on your PC.

Procedure

1. In the program test.commander select **Utilities > Module firmware update**.
2. Make sure that the settings with regard to the interface used are correct: **Options > Communication settings**.
3. Search for the Test Controller or the modules: ***Find modules***.
4. If the modules are connected via a Test Controller, in the next window mark the Test Controller to which the modules to be updated are connected and click on ***OK***.

6 Functional Procedures

This chapter explains various important settings and processes more comprehensively than in the previous chapters, for example, to provide you with decision-making aids for the interface parameters or the settings of the modules.

6.1 Ethernet on the PC

The following sections describe various settings which you can carry out on the PC to enable a link to be formed. The images use menus and dialogs found in Windows XP; the names of the dialogs and fields in other versions of Windows are however similar and are usually also given.

6.1.1 Finding the IP address and subnet mask of the PC

In Windows 7 or 8 open the **Network and Sharing Center**, e.g. using  at the bottom on the right in the taskbar. Click on the **LAN connection** (the name may be different) through which the Test Controller is connected to the PC (Fig. 6-1 on page 116). In the following status dialog (similarly in Fig. 6-1) click on ***Details***.

The current address is displayed in the next dialog under ***IPv4 address***.

The subnet mask determines which addresses can be reached from the PC: Only addresses whose figures are identical in the places which contain a 255 in the subnet mask can be reached. The IP addresses of the PC and Test Controller should normally be located in the same Ethernet segment (only the last group of figures in the IP address is different), otherwise the subnet mask must be 255.255.0.0 so that the last *two* groups of figures may be different.

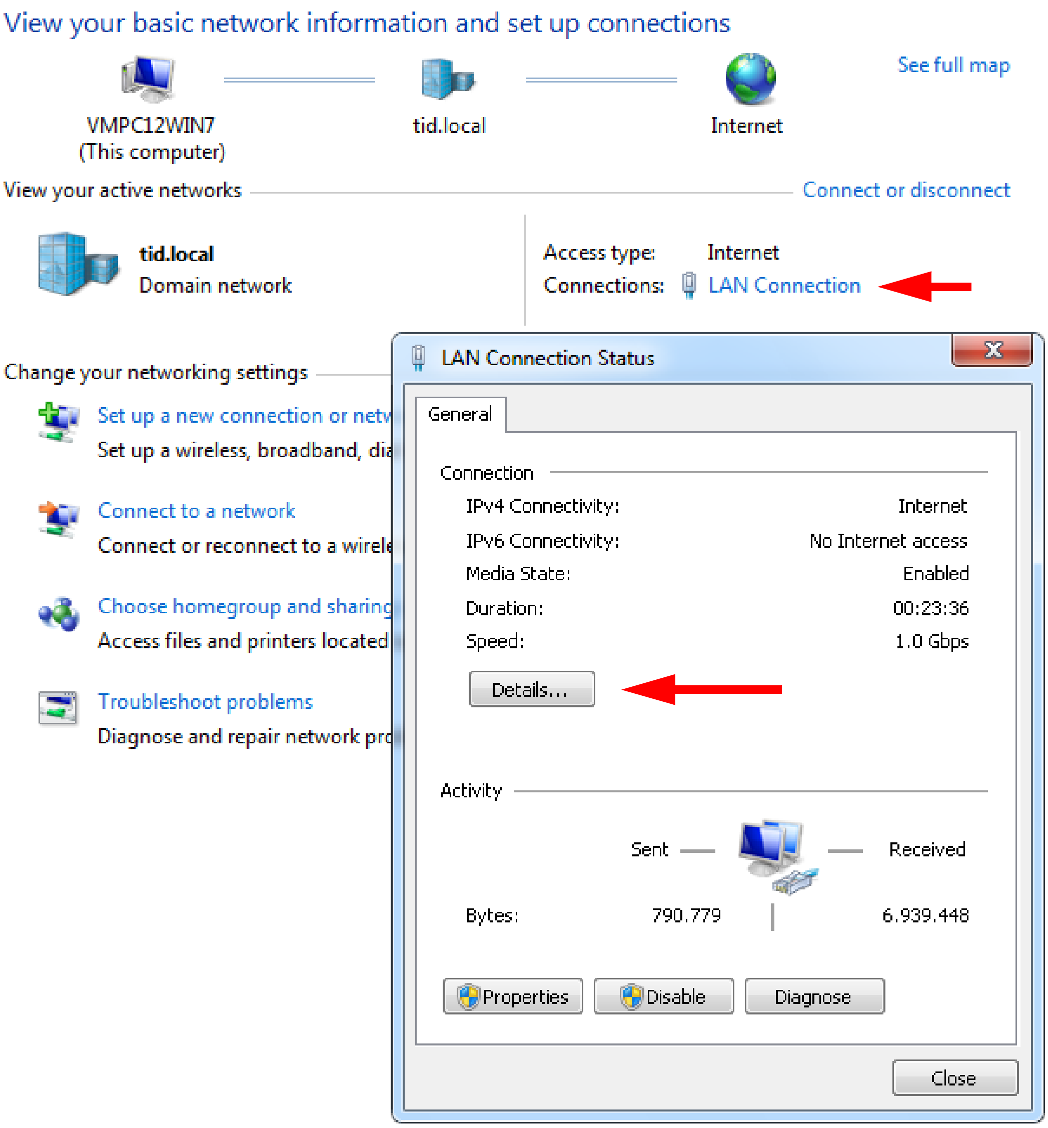


Fig. 6-1 Viewing/changing the IP address of the PC

Example 1

Subnet mask 255.255.255.0, IP address 192.168.100.26

Only addresses can be reached which start with 192.168.100, i.e. the first three groups of figures must be identical and only the fourth may be different.

Example 2

Subnet mask 255.255.0.0, IP address 192.168.100.26

All addresses can be reached which start with 192.168, i.e. the third group of figures may also be different between the PC and Test Controller.

6.1.2 Setting the IP address on the PC

If you want to connect to a Test Controller, you must assign a (temporary) IP address to the PC.

➡ We recommend that a temporary IP address is set up on the PC, because then the network settings on your PC for the normal connections are not changed. If you have already set up this type of “alternative configuration” for another network, you must note the existing settings so that you can restore them after concluding the configuration of modules or the Test Controller.

In Windows 7 or 8 open the **Network and Sharing Center**, e.g. using  at the bottom on the right in the taskbar. Click on the **LAN connection** (the name may be different) through which the Test Controller is connected to the PC (refer to Fig. 6-1 on page 116). In the following status dialog click on ***Properties*** (requires administrator rights). Then mark **Internet Protocol Version 4** and click on ***Properties*** (refer also to Fig. 6-2).

Then proceed to the register card **Alternative Configuration** and specify an address for the PC, e.g. ***192.168.100.5***, and a subnet mask, e.g. ***255.255.255.0*** (Fig. 6-3).

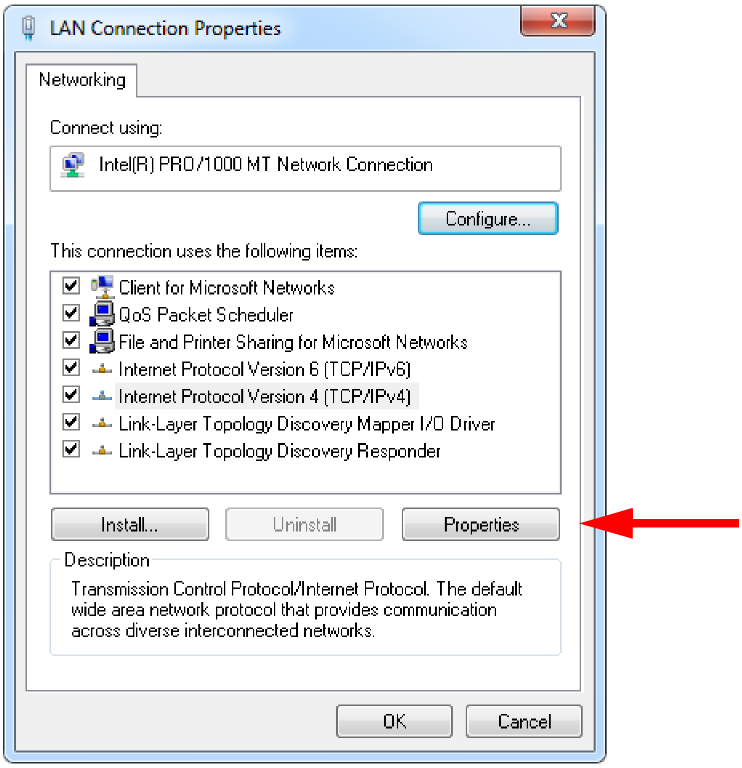


Fig. 6-2 LAN connection properties (Windows 7 and 8)

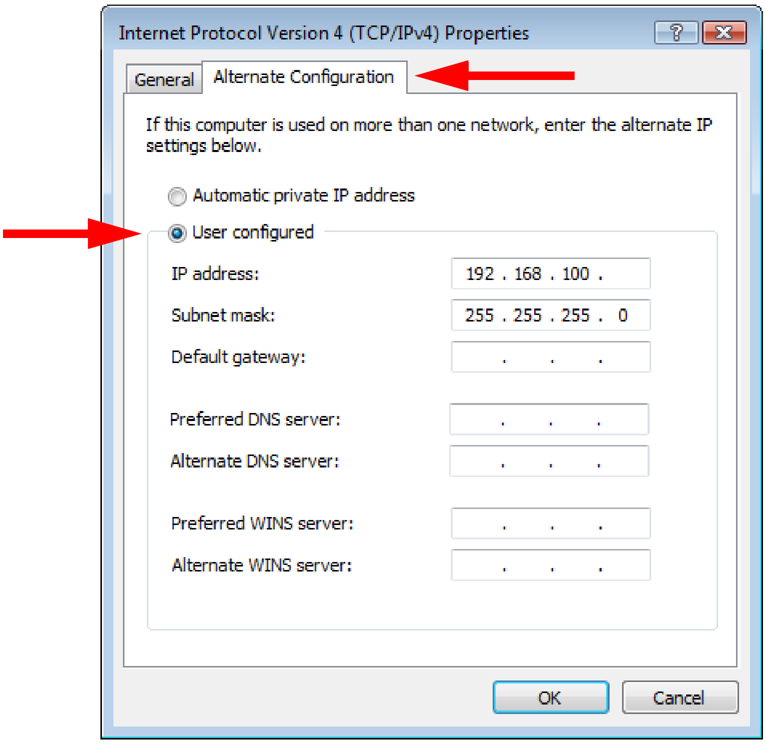


Fig. 6-3 Specifying the IP address and subnet mask for an alternative (temporary) configuration.

6.1.3 Allowing access to network devices (firewall)

Generally, a firewall monitoring access of the PC to the network and vice versa is installed on the PC. Therefore, you must allow access to the Test Controller or the module, otherwise no connection can be established via Ethernet. On the first attempt to establish a connection you receive a message similar to that shown in Fig. 6-4. Click on ***Unblock*** to allow the connection.

! IMPORTANT

You must possess administrator rights on the PC to be able to unblock the connection. If this is not the case, ask your administrator to do this for you. You must enable all programs for sharing which use an Ethernet connection to the modules or the Test Controllers.

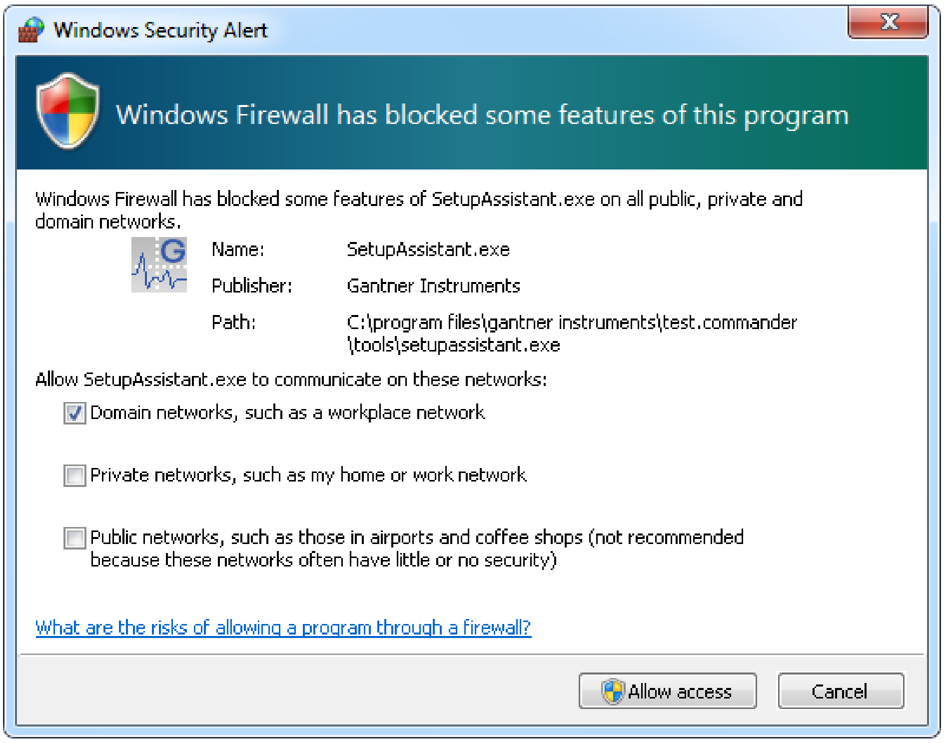


Fig. 6-4 Windows firewall message on attempting to establish an Ethernet connection.

6.2 Connecting sensors with sensing leads

Resistive sensors require an excitation voltage to be able to provide their output signal. For sensor excitation a current is passed through the connecting lead, which however causes a loss of voltage due to the resistance of the connecting lead. Consequently, the sensor is then not supplied with the voltage set on the amplifier module, but rather with a slightly lower voltage. This leads in turn to a lower output signal and, depending on the cable resistance, losses in the single-figure percentage range can occur even with just a few meters. Therefore, high quality amplifier modules for the excitation of resistive sensors use so-called sensing leads which can measure the loss of voltage, since only a very small current flows in them. This is because the inputs for the sensing leads have very high input resistances (usually over 10^6 Ω compared to a sensor resistance of a few 100 Ω. The amplifier module can therefore acquire the voltage arriving at the sensor error-free and increase its excitation voltage to compensate for the losses in the connecting cable. This is particularly the case when the temperature of the connecting cable changes. In this case the cable resistance changes and the sensor output signal would therefore also change if no sensing leads were used.

We therefore recommend the use of sensing leads. This is mainly necessary when several meters of cable are used, low measurement deviations are to be obtained or when the temperature of the cable may vary.

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6.3 Sensor scaling

Depending on the type of transducer (Sensor type), you have various possible scalings available. With voltage signals and strain gauge bridges (Bridge), you can define a conversion of the measured voltage (volts or mV/V) into a physical unit, e.g. in newtons. With strain gauges a special conversion tool is available to you.

Click in the column **Format/balance** of the variables to be set to call up the setup dialog (Fig. 6-5).

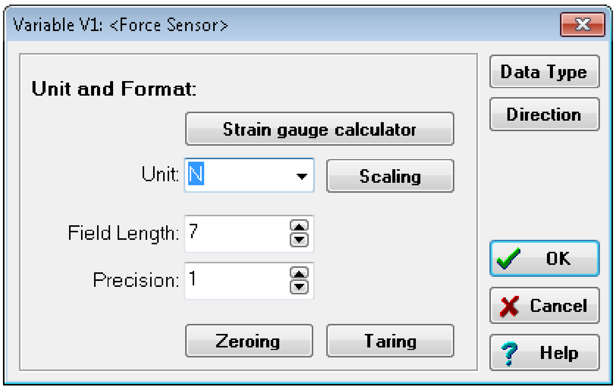

Fig. 6-5 Setup dialog for scaling.

6.3.1 Scaling of voltage signals and strain-gauge bridges

1. In the ***Unit*** field enter the required physical unit, e.g. ***N***.

   If the unit has already been entered, you can select it from the list box.

2. Click on ***Scaling***.

   The scaling dialog is displayed.

3. Enter the transducer (sensor) data from the calibration certificate or from the data sheet (example: refer to Fig. 6-6 on page 122).

   Instead of the full scale readings in the positive and negative directions, you can also enter just one direction. Then in each case use ***0*** for ***Measurement*** and ***Displayed value*** at ***Point 1***.

   An alternative is the entry of ***Factor*** and ***Offset*** if these data have been specified for your sensor.

   The numbers in the ***Display*** field depend on the settings in the **Range/error** column.

4. Close the scaling and setup dialog with ***OK***.

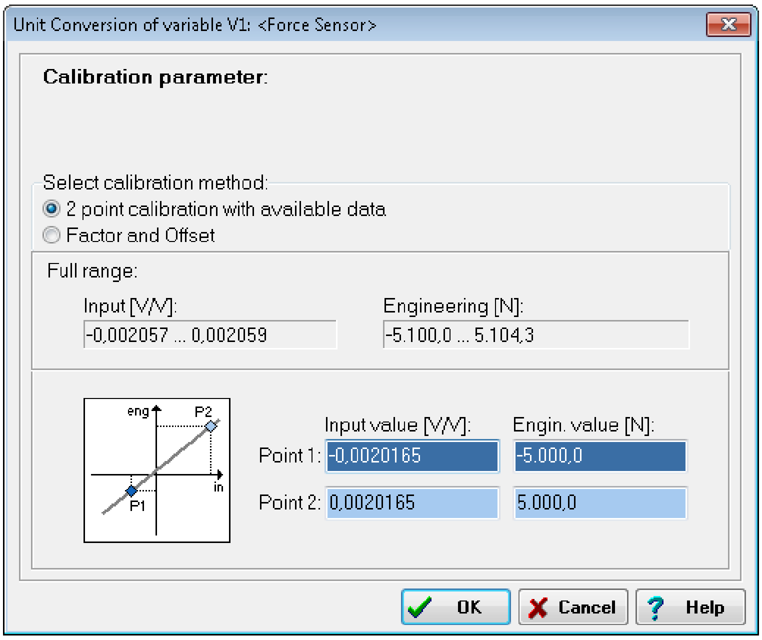

Fig. 6-6 Scaling dialog

6.3.2 Scaling strain gauges

1. Click on ***Strain-gauge calculator***, the unit is then automatically changed to ***µm/m***.
2. Enter the gauge factor of your strain gauge in the left field.

   The gage factor is a measure of the sensitivity of the strain gauge and is stated on each strain-gauge pack. It is usually between 1.8 and 2.2. Fig. 6-7 shows scaling with k = 2.03.
3. If you are using more than one active strain gauge in your bridge circuit, you must also state the resulting bridge factor (right field). The factor depends on the orientation of the strain gauge on the measurement object and, where applicable, also on the Poisson's ratio for the material. On a tension/ compression bar the bridge factor is, for example, approx. between 2.5 and 2.8 depending on the material.
4. Close the scaling and setup dialog with ***OK***.

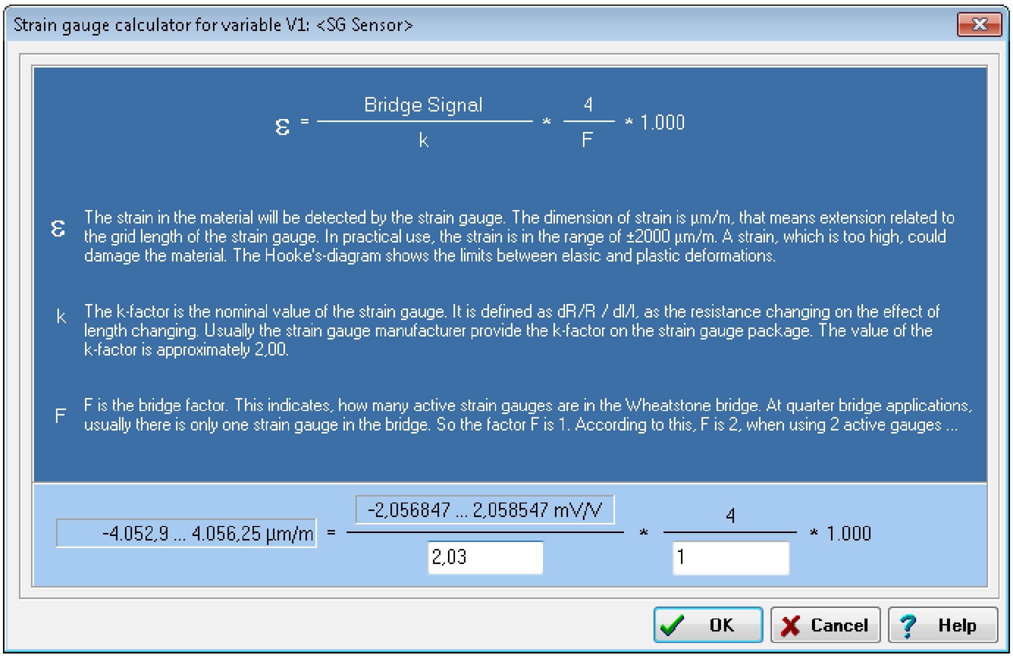

Fig. 6-7 Scaling dialog for strain gauges.

6.4 Current measurement with an external shunt

Current measurements are carried out by measuring the voltage drop across a resistance of known size (shunt resistance). In the Q.brixx modules, which are suitable for direct current measurement, this is a resistor of 50Ω, with which you can measure currents up to 25mA (the maximum shunt power dissipation is limited to 0.25W). Higher currents need an external shunt which is looped into the line to be measured. The power dissipation occurring at the current to be measured must be lower than the permissible power dissipation of the external shunt. In addition the voltages produced on the resistance must not exceed the permissible input voltage on the analog input of the Q.brixx module. Configure the analog input as a voltage input and divide the measured voltage by R_{ext}.

IMPORTANT
The error in the current measurement using an external shunt depends on the accuracy of the resistor used.

6.5 Measuring with thermocouples

Thermocouples consist of two “thermoelectric wires” which are formed from different materials, e.g. platinum and platinum/rhodium, and are joined together at one end, usually by welding. If this contact point and the other ends of the thermoelectric cables have different temperatures, a “thermoelectric voltage” is produced at the contact point. This voltage is essentially proportional to the temperature difference between the contact point and the ends of the cables.

Since thermocouples only measure a temperature difference (difference between the temperature at the contact point and the measured temperature at the terminal strip on the Q.brixx module), the terminal temperature must be known or the “transition” from the thermocouple cable or compensating cable to the copper cable must occur at a known temperature level. The first case is known as internal cold junction compensation (TC_{int}) and the second case as external cold junction compensation, TC_{ext}.

To acquire the temperature with internal cold junction compensation an additional temperature probe is used which measures the reference temperature. For the Q.brixx modules a cold junction compensation terminal with an integrated Pt1000 temperature probe is used. In this way, the temperature at the “transition point” is determined and the voltage produced by the thermocouple is corrected depending on the type of thermocouple.

To measure the temperature using external cold junction compensation, a second thermocouple of the same type is needed which is connected in series with the first one. The polarity is chosen such that the thermoelectric voltages subtract. The second thermocouple is located at a fixed reference temperature (usually 0°C). Then, the Q.brixx module calculates the temperature at the measuring point based on the linearization curve. However, the Q.brixx module requires the information of which reference temperature (cold point temperature) is being used.

7 International Sales and Service

The current addresses of our sales partners can be found in the Internet on our web site. You can take up direct contact with Gantner Instruments GmbH at any time.

You will find further information in the section Technical Information in our Wiki at https://dev.gantner-instruments.com/dokuwiki. The user name is ***support*** and the password is ***gins*** (not all sections are open to the public).

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