Gantner instruments

e.series

Manual

e.bloxx D1

Vers.-Nr. 18

Gantner
instruments

Important: Before commencing installation, commissioning, putting into service and before any maintenance work is carried out, it is essential that the relevant warning and safety instructions in this manual are read!

General warning and safety instructions:

Dear customer,

We congratulate you on having selected a product of Gantner Instruments Test & Measurement GmbH. So that our product functions in your installation with safety and to your complete satisfaction, we take this opportunity to familiarize you with the following ground rules:

1. Installation, commissioning, operation and maintenance of the product purchased must be carried out in accordance with instructions, i.e. in accordance with the technical conditions of operation, as described in the corresponding product documentation.

2. Before installation, commissioning, operation or maintenance it is therefore essential that you read the corresponding chapter of this manual and observe its instructions.

3. If there are still some points on which you are not entirely clear, please do not take a chance, but ask the customer adviser responsible for you, or ring the Gantner Instruments Test & Measurement GmbH hot line.

4. Where not otherwise specifically laid down, appropriate installation, commissioning, operation and maintenance of the appliance is the customer's responsibility.

5. Directly on receipt of the goods, inspect both the packaging and the appliance itself for any signs of damage. Also check that the delivery is complete (-> accessories, documentation, auxiliary devices, etc.).

6. If the packaging has been damaged in transport or should you suspect that it has been damaged or that it may have a fault, the appliance must not be put into service. In this case, contact your customer advisor. He will make every effort to resolve the problem as quickly as possible.

7. Installation, commissioning and servicing of our appliances must only be carried out by suitably trained personnel. In particular, correspondingly qualified specialists may only make electrical connections. Here, the appropriate installation provisions in accordance with the relative national Electrical Engineers construction regulations (e.g. ÖVE, [Austrian] VDE, [German]...) must be observed.

8. Where not otherwise stated, installation and maintenance work on our appliances is exclusively to be carried out when disconnected from the power supply. This applies in particular to appliances, which are normally supplied by low-tension current.

9. It is prohibited to make alterations to the appliances or to remove protective shields and covers.

10. Do not attempt yourself to repair an appliance after a defect, failure or damage, or to put it back into operation again. In such cases, it is essential you contact either your customer adviser or the Gantner Instruments Test & Measurement GmbH hot line. We will make every effort to resolve the problem as quickly as possible.

11. Gantner Instruments Test & Measurement GmbH accepts no responsibility for any injuries or damage caused as a result of improper use.

12. Although every care is taken and we are continuously aiming for improvement, we cannot exclude completely the possibility of errors appearing in our documentation. Gantner Instruments Test & Measurement GmbH therefore accepts no responsibility for the completeness or the accuracy of this manual. The right is reserved to make alterations, and we may carry out alterations at any time without giving prior notice.

13. Should you discover any fault with the product or in its accompanying documentation, or have any suggestions for improvement, you may confidently approach either your customer adviser or Gantner Instruments Test & Measurement GmbH directly.

14. However, even if you just want to tell us that everything has functioned perfectly, we still look forward to hearing from you.

We wish you a successful application of our appliances. We will be pleased to welcome you as a customer again soon.

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TABLE OF CONTENTS

1. ABOUT THIS MANUAL

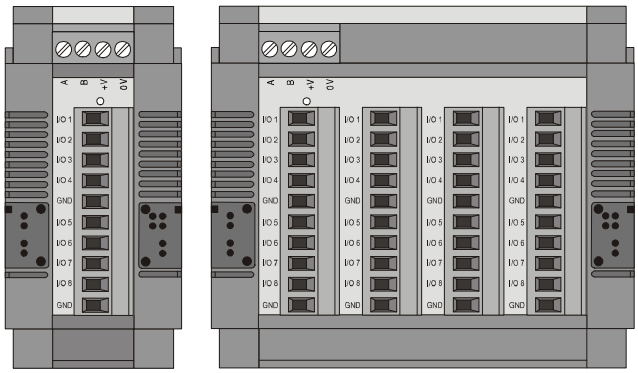
This manual describes the installation and setup of the e.bloxx D1-1 and D1-4 modules. Those modules only differ in their amount of digital inputs and outputs. So in this manual the e.bloxx D1-1 is described and shown in the pictures and at every point where there are differences between the e.bloxx D1-1 and the e.bloxx D1-4 there will be a special note.

The following information can be found in this manual:
- Description of the e.bloxx system with detailed information on the hardware and module features.
- Installation description of the modules and how they are connected to the power supply and bus lines.
- Description of the different types of measurement.
- A short introduction on how the e.bloxx modules are configured with the CONFIGURATION SOFTWARE ICP 100. This software has an integrated help including a detailed description of the configuration process.
- Possible errors and its solutions.
- Technical specifications of the modules.

2. MODULE DESCRIPTION

2.1. System Overview

The e.bloxx modules have been developed for the industrial and experimental testing technology, especially for the multi-channel measurement of electrical signals of thermal or mechanical data at test beds and test sites.



e.bloxx D1-1 **e.bloxx D1-4**

Picture 2.1 *- e.bloxx D1-1 and D1-4*

The e.bloxx D1-1 and D1-4, which are described in this manual, are 8-channel modules for recording digital signals. They are part of a whole product line of different e.bloxx, which differ by their number and type of inputs and outputs.

Due to the fast and precise signal conditioning the e.bloxx modules produce reliable and exact measurement data.

Standardized interfaces guarantee the integration of up to 127 modules into a single network.

With the e.gate module very high data rates via Profibus-DP and Ethernet can be realized. The customer-specific signal processing supplements the standard conditioning of the single e.bloxx modules.

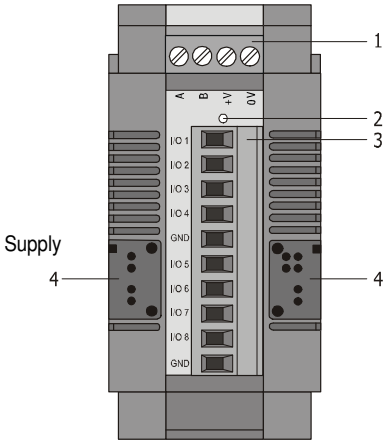
2.2. Types of Modules

There are several types of e.bloxx, which differ in their number and type of analog and digital inputs and outputs.

	A1-1	A1-4	A1-8	A3-1	A3-4	A4-1	A4-4	A5-1	A5-1 CR	A6-1	A6-3	A6-2	A9-1	D1-1	D1-4	D2-1
Voltage Supply	10 - 30 VDC															
Power Consumption [W]	1,5	6	12	1,5	6	1,5	6	1,5	1,5	2	6	5	2,3	1,5	6	2
Variable / Channels	8	32	64	8	32	8	32	8	8	8	24	16	8	8	32	8
Analog Inputs	1	4	8	4	16	4	16	2/3/6	2	1	3	1	-	-	-	-
Analog Outputs	-	-	-	-	-	-	-	-	-	1	3	2	4	-	-	-
Relay Outputs	1	4	8	-	-	-	-	-	-	-	-	-	-	-	-	4
Digital Inputs	1	4	8	1	4	-	-	1	1	1	3	6	1	8	32	-
Digital Outputs	-	-	-	1	4	-	-	1	1	1	3	4	1	8	32	-
Fieldbus Interface	RS 485															
Protocols	ASCII - Modbus-RTU - Profibus-DP - LocalBus															
Quantity to measure Sensor Principle																
Voltage	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-	-
Current	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-
Resistance	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt100 / Pt1000	x	x	x	-	-	-	-	x	-	-	-	-	-	-	-	-
Cryo Sensor	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
Thermocouple	x	x	x	-	-	x	x		-	-	-	-	-	-	-	-
Strain Gauge Full Bridge	x	x	x	-	-	-	-	-	-	x	x	x	-	-	-	-
Strain Gauge Half Bridge	-	-	-	-	-	-	-	-	-	x	x	x	-	-	-	-
Strain Gauge Quarter Br.	-	-	-	-	-	-	-	-	-	x	x	x	-	-	-	-
Inductive Full Brigde	-	-	-	-	-	-	-	-	-	x	x	x	-	-	-	-
Inductive Half Bridge	-	-	-	-	-	-	-	-	-	x	x	x	-	-	-	-
LVDT	-	-	-	-	-	-	-	-	-	x	x	x	-	-	-	-
Potentiom. Transducer	x	x	x	-	-	-	-	-	-	-	-	x	-	-	-	-
Piezoresist. Transducer	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
Status	x	x	x	x	x	-	-	x	x	x	x	x	x	x	x	-
Frequency	-	-	-	-	-	-	-	-	-	-	-	x	-	x	x	-
Counter	-	-	-	-	-	-	-	-	-	-	-	x	-	x	x	-

Table 2.1. *- Characteristics of the e.bloxx modules*

2.3. Module Parts



1 … Pluggable Screw-Type Terminal Strip for Connection of RS 485 Bus and Power

2 … Power/Error-LED (red/green)
3 … Pluggable Screw-Type Terminal Strip for Sensor Connection
4 … Rapid Bus Link Plugs

Picture 2.2. *- Parts of the e.bloxx D1-1*

Terminal Strip for RS 485 and Power Supply

Terminal	Description
A	RS 485 Bus Interface A
B	RS 485 Bus Interface B
+V	Power Supply +
0V	Power Supply -

Table 2.2. *- Description of Terminal Strip for RS-485 Bus and Power Supply*

Terminal Strip for Sensor Connection

Terminal	Description
I/O 1	Digital Input/Output 1
I/O 2	Digital Input/Output 2
I/O 3	Digital Input/Output 3
I/O 4	Digital Input/Output 4
GND	Digital Ground
I/O 5	Digital Input/Output 5
I/O 6	Digital Input/Output 6
I/O 7	Digital Input/Output 7
I/O 8	Digital Input/Output 8
GND	Digital Ground

Table 2.3. *- Description of Terminal Strip for Sensor Connection*

2.4. Functional Overview

This manual describes the e.bloxx modules D1-1 and D1-4. These modules are all 8-channel modules. They differ only in the number of digital inputs and outputs. The e.bloxx D1-1 has 8 digital inputs/outputs and the e.bloxx D1-4 has 32 digital inputs/outputs. The channels are defined in the configuration table of the Configuration Software ICP 100.

The values of each channel can be read out via the RS 485 bus.

2.5. Front-LED

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

LED green	Module works well, no signal overflow, no communication error…
LED red	general error like signal overflow, broken sense leads
LED red + short off period	general error like signal overflow, broken sense leads + communication timeout
LED green + short red flash	Signal ok + communication timeout
LED red fast flashing	global error, no suitable firmware

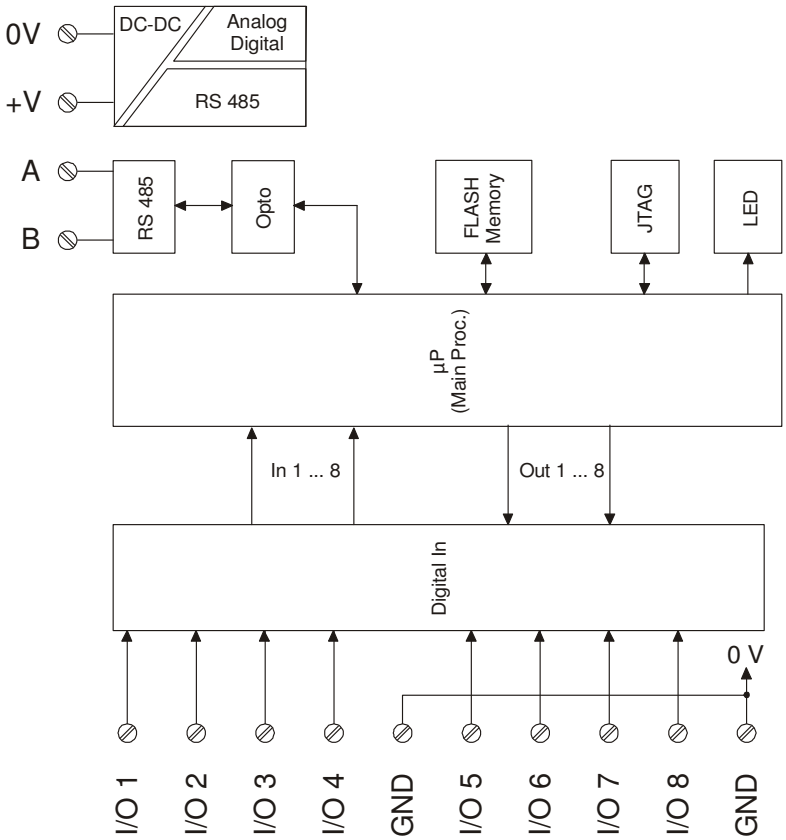
Notice: The LED will get red when the signal leaves the selected range and the error checking is activated (see ICP 100 column Range/Error).

2.6. DC-Isolation

The power supply and bus interface section are DC-isolated from each other.

2.7. Functional Diagram

The following picture can describe the e.bloxx D1-1.



Picture 2.3. *- Functional Diagram of the e.bloxx D1-1*

3. MOUNTING e.bloxx AND CONNECTING WIRES

3.1. Environmental Conditions

The e.bloxx modules are protected against water and dirt according IP 20. If required by the conditions of the operating site the modules have to be installed accordingly, e.g. in a water-resistant or waterproof case, compliant with the regulations of electrical engineering.
For the allowed ambient temperatures for the e.bloxx D1-1 and e.bloxx D1-4 see the Technical Specifications at the end of this manual.

3.2. Connection Technique

The wires are connected to the modules via screw-type terminals. The captive terminal screws are part of the terminal strips. All terminal strips are of plug-in type and can be detached from the modules.

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

Notice: Connecting wires respectively the plugging-in and –out of the terminal strip is only allowed with modules in power-off status.
In order to prevent interference with sensors, signals and modules, shielded cables have to be used for the power supply, bus connection and signal lines.
We strongly recommend using a single screened cable each input signal. To use more signals in one cable could generate interacting influences.

Notice: For optimal performance the e.bloxx modules must be grounded properly. This is achieved by utilizing the Ground/Earth screw on the back of each e.bloxx module. The screen of the sensor cable has to be grounded at the same potential.

3.3. Power Supply

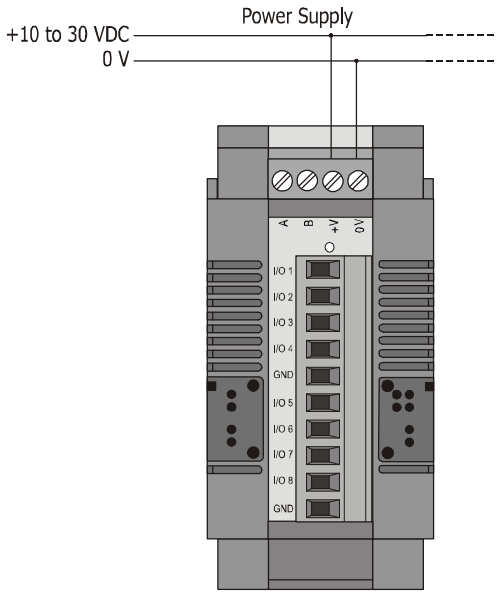
Non-regulated DC voltage between +10 and +30 VDC is sufficient for the power supply of the modules. The input is protected against excess voltage and polarity connecting error. The power consumption remains approximately constant over the total voltage range, due to the integrated switching regulator.

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

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

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

Notice: It depends on the power supply unit and its noise and internal grounding issues whether it is helpful to connect earth of the power supply unit with ground/earth of the e.bloxx module.



Picture 3.1. *- Power Supply of the e.bloxx Modules*

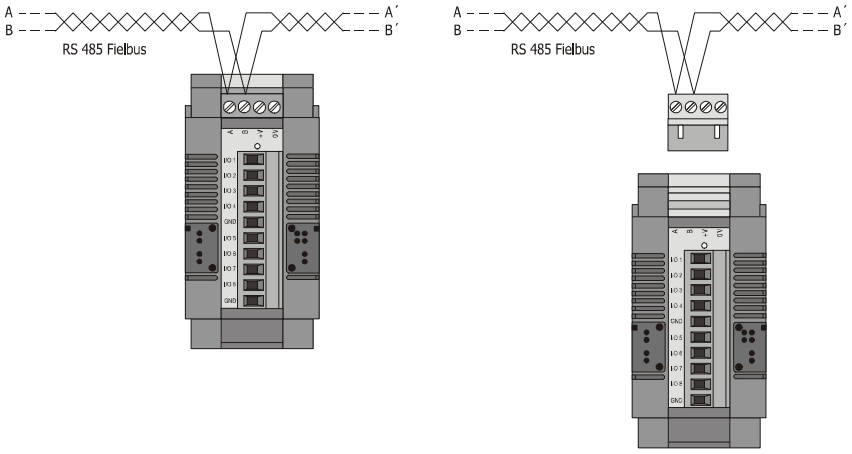
3.4. Bus Connection

Only the connection of the e.bloxx modules to the bus is described in here. A detailed description of the bus and the communication of the modules can be found in the Communication Guide of the e.bloxx modules.

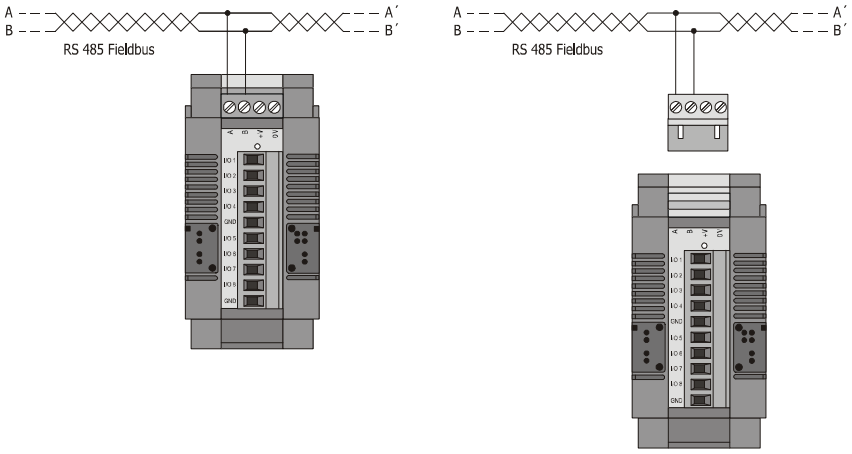
The e.bloxx modules have an RS-485 bus interface for connection to the serial fieldbus. The bus has to be terminated on both sides with a characteristic impedance. The maximum line length depends on the transmission speed (refer to the Communication Guide for details) and can never be higher than 1.2 km per bus segment or 4.8 km via a physical bus string by using 3 repeaters. A maximum of 32 devices are possible at each bus segment and up to 127 devices via a physical bus string.

Wiring

In general, the e.bloxx is connected to the bus by connecting both signal leads A and B of the incoming bus cable and A' and B' of the outgoing bus cable together to one terminal on the module (Picture 3.2). Alternatively, the bus can also be connected by a "stub cable" (Picture 3.3). This guarantees that the bus connection to other modules remains in place, even if one module has to be exchanged, due to the removable terminal strip.



Picture 3.2. *- Bus Connection of an e.bloxx D1-1 to the RS 485 Fieldbus with Derivation*



Picture 3.3. *- Bus Connection of an e.bloxx D1-1 to the RS 485 Fieldbus via Stub Cable*

The stub-cable should be as short as possible, not longer than 30 cm.

Notice: The terminal designations A and B of all modules of the e.bloxx series are exchanged compared with the PROFIBUS-definitions. Consequently, in multi-vendor systems the bus lines A and B have to be exchanged when connecting them to the e.bloxx.

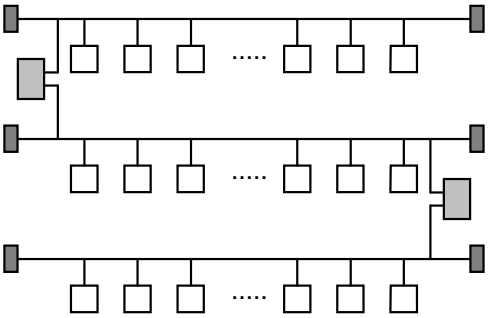
Bus Structure

The bus structure is a line structure where each bus segment will be terminated with characteristic impedance on both ends. Branches can be set up by means of a bi-directional signal amplifier, so-called repeaters. Other types of branches are not permitted (no tree topology). The max. stub-length to a user must not exceed 30 cm.

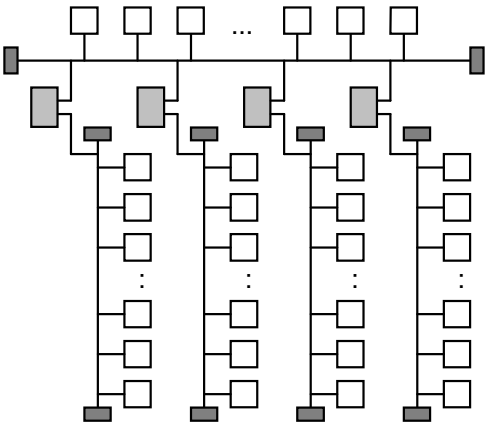
The following pictures show a few examples of possible bus topology structures. The meanings of the symbols are as follows:

... Bus User
... Repeater
... Bus Termination

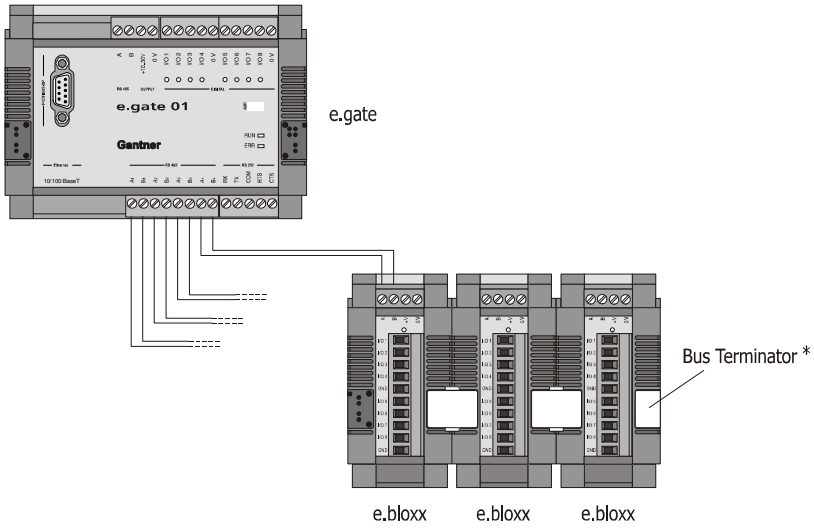
Picture 3.4. *- Simple Line Structure*



Picture 3.5. *– Extended Line Structure*



Picture 3.6. *- Line Structure with Branches*



Picture 3.7. *- e.bloxx D1-1 and D1-4 connected to e.gate*

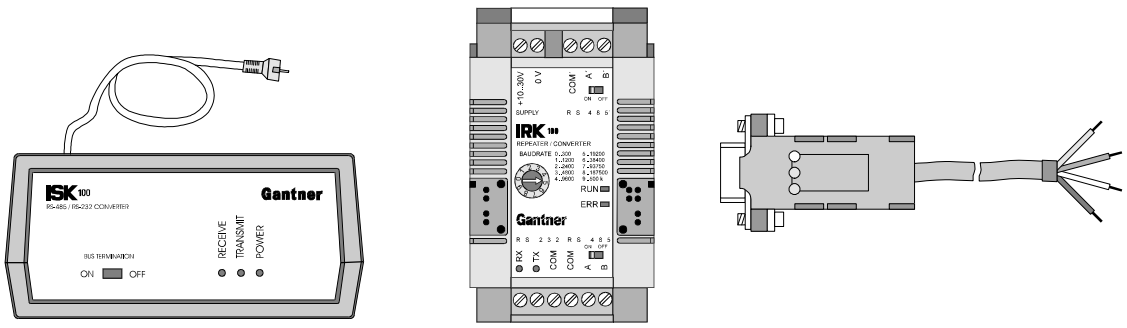
* ... If the e.bloxx modules are used together with an e.gate, which is used to collect the data of all connected e.bloxx modules and processes them for fast transmission via the further network, a bus termination must be connected to the last e.bloxx in each bus line.

Bus Connection to PC

The bus interface of the e.bloxx is based on the RS-485 standard. Since most hosts are "only" equipped with RS 232 interfaces, an interface converter or a plug-in board with RS-485 drivers is required for conversion purposes.

Gantner Instruments Test & Measurement GMBH offers a compact interface converter, called ISK 200, with an integrated power supply and automatic baud rate detection. The power supply, bus connection and a separate 24 VDC-output are DC-isolated. Therefore, the interface converter ISK 200 is also applicable as a power supply for remote applications. Additionally, the interface converter ISK 200 features the option of connecting the required bus termination via a switch. The converter is designed to be used as a desk device.

Another module IRK 100 from Gantner Instruments Test & Measurement GMBH is available which may be used as an RS 485 repeater or RS 485/RS 232 converter. The baud rate can be adjusted at the IRK 100. Also, for this module the required bus termination may be connected with a switch. The Repeater/ Converter IRK 100 has a snap-on mounting mechanism for the installation on standard profile rails (DIN rail) 35 mm according to DIN EN 50022.



Interface Converter ISK 200 **Repeater/Converter IRK 100** **Interface Converter ISK 101**

Picture 3.8. *- Interface Converters ISK 200, IRK 100 and ISK 101*

Bus Connection to Profibus-DP

For the installation of the bus cable and bus interface, 9-channel D-subminiature plugs and sockets are used. The pin assignment for the RS-485 connection according to PROFIBUS is given in Table 3.1.

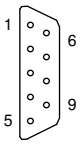
Plug	Pin	RS 485 Notation	Signal	Identification
 DB 9	1	-	Shield	Shield, Protective Ground
	2	-	RP	Reserved for Power
	3	B / B´	RxD/TxD-P	Receive/Transmit-Data-P
	4	-	CNTR-P	Control-P
	5	C / C´	DGND	Data Ground
	6	-	VP	Voltage Plus
	7	-	RP	Reserved for Power
	8	A / A´	RxD/TxD-N	Receive/Transmit-Data-N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

Table 3.1. *- Pin Assignment D-Subminiature Plug According to PROFIBUS*

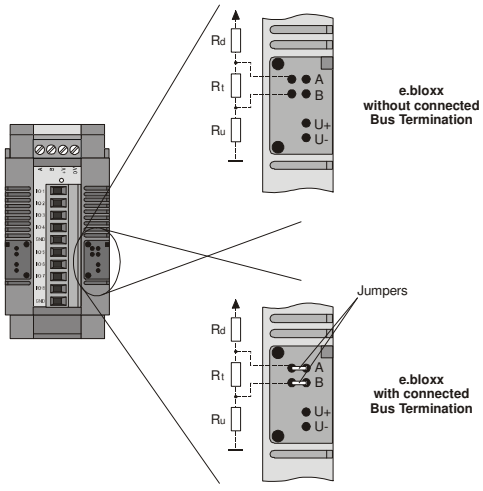
The signal leads A and B (and Shield) are mandatory for a (shielded) connection. Additional signal leads may be installed if required.

Notice: Due to the fact that the RS 485 interface is used for different protocols, in case of using Profibus-DP the leads A and B has to be crossed.

Bus Termination at the e.bloxx Modules

In order to avoid signal reflections on the bus, each bus segment has to be terminated at its physical beginning and at its end with the characteristic impedance. A terminating resistor is installed between the bus leads A and B for this purpose. In addition, the bus lead A is connected via a pull-up resistor to potential (VP) and the bus lead B is connected via a pull-down resistor to ground (DataGround). These resistors provide a defined quiescent potential in case there is no data transmission on the bus. This quiescent potential is level high.

The e.bloxx modules have these bus termination resistors built in. They can be connect to the bus by plugging the Bus *Termination Plug IBT 100*, which is available as accessory, into the rapid bus link plug on the front side of the module. Instead of the bus termination plug *IBT 100*, also separate jumpers may be used for the bus termination. In this case, it is mandatory that the jumper clips are installed as indicated below, and that the bus leads or the bus termination are not short-circuited by mistake.



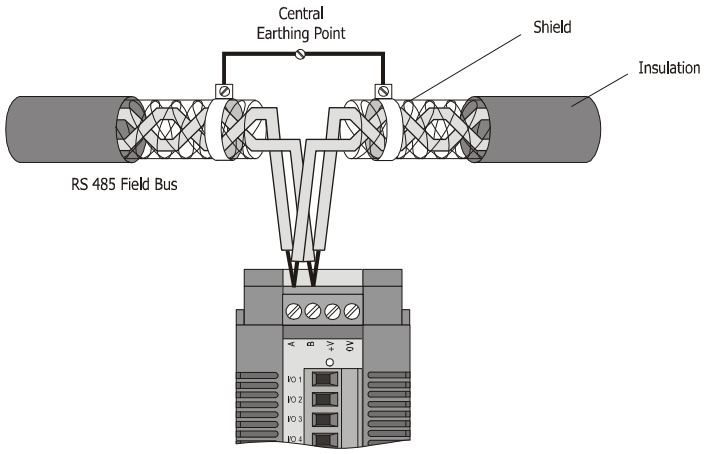
Picture 3.9. *- Bus Termination at the e.bloxx Modules*

3.5. Shielding

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

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

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



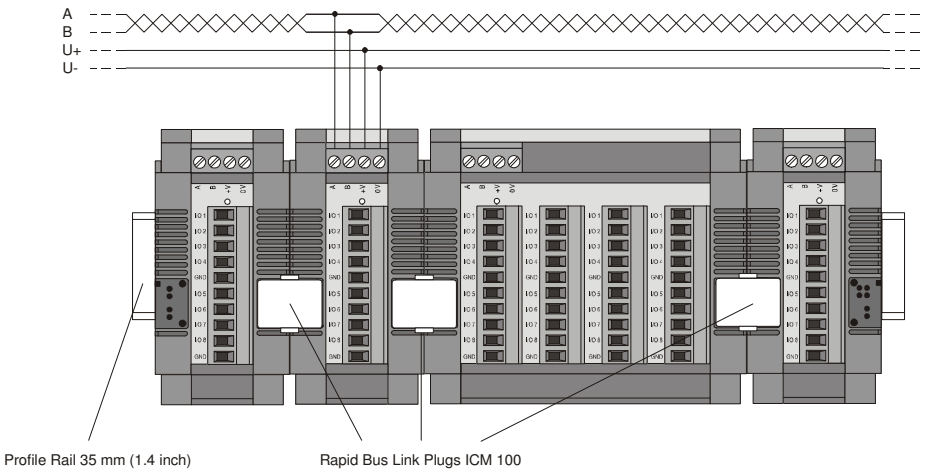
***Picture 3.10**. - Grounding of the Bus Line Shield at an e.bloxx*

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

3.6. Rapid Bus Link Plug

The e.bloxx have plugs on the left and right side, which allow to connect the bus and power supply from one module to the next with a Rapid Bus Link Plug (type designation: *ICM 100*). This novel kind of connecting bus and power supply is particularly advantageous if several modules are mounted on one common profile rail side by side. In this case, only the terminal of one module has to be connected. Furthermore, various modules of the e.bloxx series may be connected with the Rapid Bus Link Plug.

Notice: The current flowing through the Rapid Bus Link Plug Jack and the e.bloxx must not exceed 1 A. Thus, the power supply should preferably be connected to the middle of several modules and no more than 6 pieces of e.bloxx may be connected via the Rapid Bus Link Plug *ICM 100* in one line.



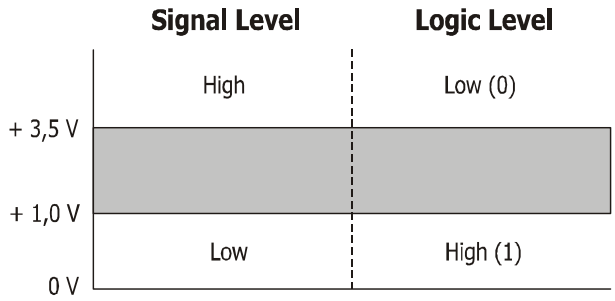
Picture 3.11. *- Connection of four e.bloxx Modules with Rapid Bus Link Plugs ICM 100*

4. MEASUREMENTS

4.1. General

The e.bloxx D1-1 and D1-4 have 8 resp. 32 digital inputs/outputs. The configuration of the inputs/outputs is done with the Configuration Software ICP 100 as required by the application. For the e.bloxx D1-4 the 32 physical inputs/outputs can be configured independently from each other.

Digital Inputs
The inputs of the e.bloxx can be used for collecting status information, for measuring frequencies or for counting. The inputs have an excess voltage protection (transil diodes), which comes into action at approx. 33 V. The maximum permissible input voltage amounts to 30 V. Input voltages between 3.5 VDC and 30 VDC are interpreted as logic LOW ("0"), input voltages lower than 1.0 V as logic HIGH ("1"). The maximum fan-in current amounts to 1.5 mA.



Picture 4.1. *- Definition of Signal Levels and Logic Levels*

Digital Outputs
The Digital Output Variable supports:
- digital status output, host-controlled
- digital status output, process-controlled
- pulse-width modulated signal output (PWM)
- frequency signal output

Via the digital inputs/outputs digital status information or measured quantities and sensor variables respectively can be output in digital form, according to the configuration. Digital status information can be withdrawn from the process (Process Out). A typical case of application would be e.g. the local output of an acoustic or optical signal in case a limiting value is exceeded or undershot by a measured value. Or the digital outputs may be set from the host computer by bus (Host Out). For analogue regulated quantities measured values or sensor variables in general can also be output as pulse-width modulated signal (PWM) by the digital output. The time base respectively the frequency with that the pulse width modulated signal output will be set, can be configured by the user by assistance of the *Configuration Software ICP 100*. Therefore the settings 10 ms, 1 s and 10 s are possible without depending on the functions of the remaining I/Os.

4.2. Variations - Specifications:

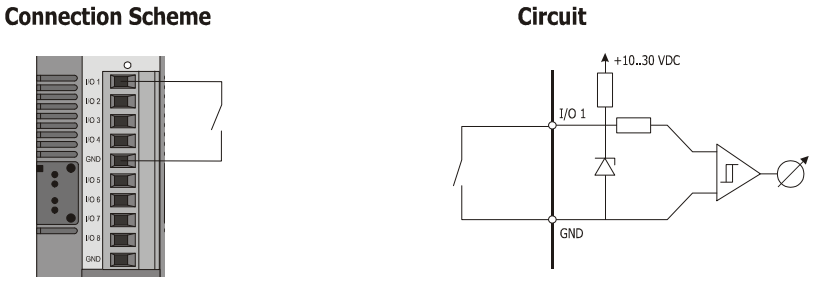
e.bloxx D1 Module's functionality can be selected by different firmware that can be downloaded by configuration software ICP 100. Beside the standard firmware three special firmware are available, one for Chronos method, one for Chronos/PWM and Frequency output and one for Fast Chronos. The respective functionality is described in the following table.

	Firmware	Standard (A X.X)		Chronos (B X.X)		Chronos-PWM (D X.X)		Fast Chronos (E X.X)	
		Limits	I/Os	Limits	I/Os	Limits	I/Os	Limits	I/Os
Status I/O (max. 8 in total)	Status input	No.: 8	1/	No.: 8	1/	No.: 8	1/	No.: 8	1/
	Host controlled output	No.: 8	1/	No.: 8	1/	No.: 8	1/	No.: 8	1/
	Process controlled output	No.: 8	1/	No.: 8	1/	No.: 8	1/	No.: 8	1/
	PWM output slow (1ms resolution)	No.: 8 1ms res.	1/	No.: 8 1ms res.	1/	No.: 6 1ms res.	1/	-	-
Counter , Frequency I/O (max. 4 in total)	Frequency measurement	No.: 4 400kHz	1/	-	-	-	-	-	-
	Frequency measurement (Chronos)	-	-	No.: 4 1s: 60kHz 100ms: 400kHz	2/	No.: 2 1s: 60kHz 100ms: 400kHz	2/	No.: 2 1 in: Ts = 1 ms 2 in: Ts = 2 ms	2/
	Counter (up), 32 bit	No.: 4 400kHz	1/	-	-	-	-	-	-
	Counter (up/down), 32bit	No.: 4 400kHz	2/	-	-	-	-	-	-
	Counter (quadrature),	No.: 4 400kHz	2/	-	-	-	-	-	-
	PWM output fast (10 kHz)	-	-	-	-	No.: 2 10kHz	No.: 2 10kHz	-	-
	Frequency output	-	-	-	-	No.: 2 10kHz	No.: 2 10kHz	-	-

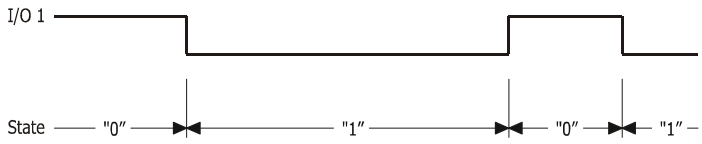
Every listed combination of I/Os is valid. The limitation of combination is the module's maximum of 8 I/O terminals.

Notice: At Chronos-PWM version automatically the first 2 PWM channels are fast PWM, remaining ones are slow. At Fast Chronos the frequency Input 1 has to be connected at I/O 1 and I/O 2, the frequency input 2 has to be connected at I/O 5 and I/O 6.

4.3. Digital Input - Status Recording



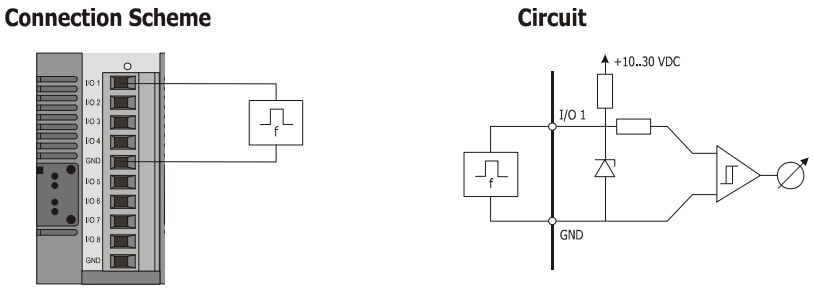
Picture 4.2 *- Digital Status Recording*



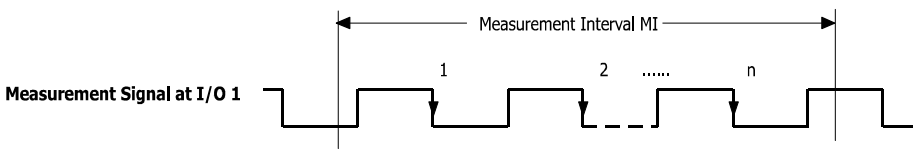
Picture 4.3 *- Signal Diagram of Status Recording*

For the acquisition of digital status information (on/off, closed/open, left/right, etc.) the signal applied to the digital input is collected and is held ready for further processing in the e.bloxx or for transmission via bus.
The digital input is set (switch closed) as long as the applied signal voltage remains under the threshold value of 1 V.
The digital information can be scanned as 1/0 information via bus.

4.4. Digital Input - Frequency Measurement



Picture 4.4 *– Frequency Measurement*



Picture 4.5 *- Signal Diagram of Frequency Measurement*

With the e.bloxx modules frequency measurement is a periodical counter measurement. The counter values for the actual measurement interval are calculated from the difference to the previous counter values.

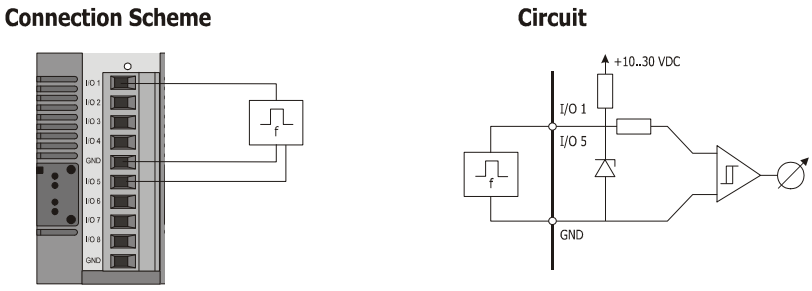
The frequency of the measurement signal is calculated as follows:

$$\text{Frequency } f = \frac{n}{MI}$$

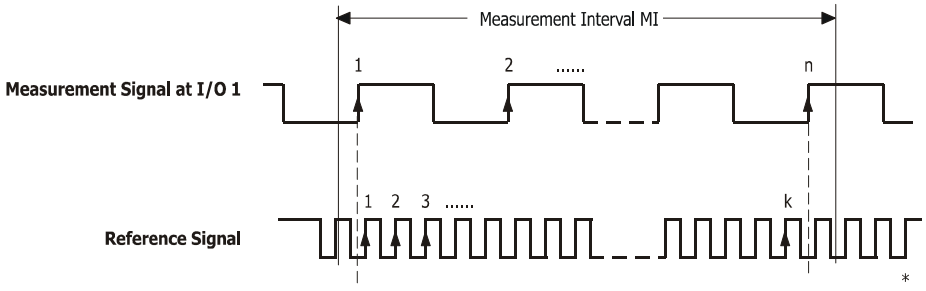
n … Number of periods of the measurement signal during the measurement interval MI (measurement counter)
MI … Measurement interval

If the period of the measurement signal will exceed the measurement interval it is not longer possible to calculate a valid frequency.

4.5. Digital Input - Frequency Measurement Chronos Method



Picture 4.6 *– Frequency Measurement Chronos Method*



Picture 4.7 *- Signal Diagram of Frequency Measurement Chronos Method*

With the e.bloxx modules frequency measurement is a periodical counter measurement. The counter values for the actual measurement interval are calculated from the difference to the previous counter values. A possible counter overflow must be considered. The counter width must be dimensioned to guarantee that no overflow is possible during a measurement interval, max. 100ms for 400kHz signal, max 1s for 60kHz signal.

The e.bloxx has internal counters who count the pulses of the measurement signal (measurement counter) and the reference signal (reference counter) occurring within the measurement interval MI (given by the interval counter).

The counter values of the reference counter are saved at all rising (or falling) signal edges of the measurement signal. The counter values of the measurement counter and the interval counter are saved at the end of the measurement interval.

The frequency of the measurement signal is calculated as follows:

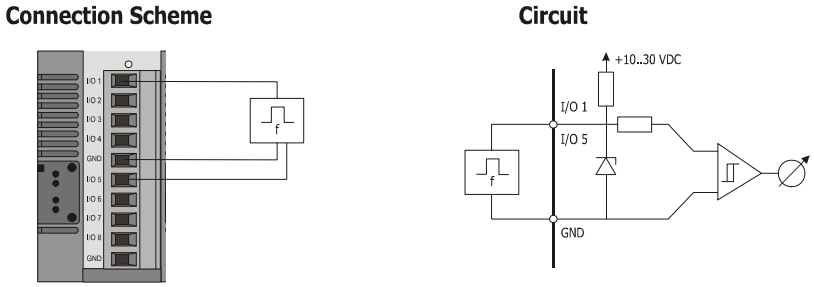
$$\text{Frequency } f = \frac{n}{k} \times f_{ref}$$

n … Number of periods of the measurement signal during the measurement interval (measurement counter)
k … Number of periods of the reference signal during the measurement interval (reference counter)
f_{ref} … Frequency of the reference signal

If the period of the measurement signal will exceed the measurement interval it is not longer possible to calculate a valid frequency.

Incase of using a double signal (0° and 90 °) the direction of a rotation can be detected.
Connection of frequency 1: I/O1, I/O5 (direction), GND
Connection of frequency 2: I/O2, I/O6 (direction), GND
Connection of frequency 3: I/O3, I/O7 (direction), GND
Connection of frequency 4: I/O4, I/O8 (direction), GND

4.6. Digital Input - Frequency Measurement Fast Chronos Method and Chronos PWM



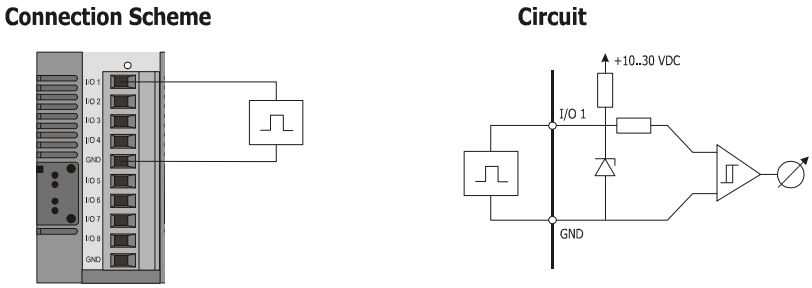
Picture 4.8 *– Fast Frequency Measurement*

The Fast Chronos Method based on the Chronos method but a fast refresh rate of 1 ms is possible (2 ms using 2 inputs). Two frequency channels are available. A frequency measuring range of 1 Hz to 2 MHz is possible. Due to the 48 MHz reference frequency a resolution of 20 ns resp. 0,002 % is possible.

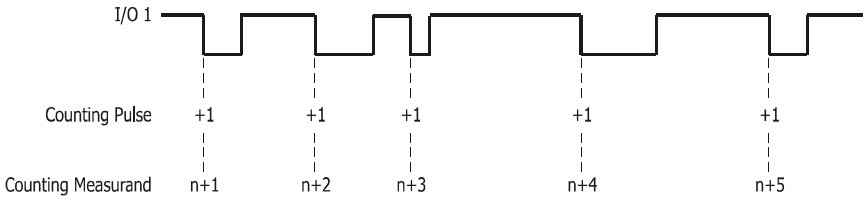
Incase of using a double signal (0° and 90 °) the direction of a rotation can be detected.

Connection of frequency 1: I/O1, I/O5 (direction), GND
Connection of frequency 2: I/O2, I/O6 (direction), GND

4.7. Digital Input - Progressive Counter (Up-Counter)



Picture 4.7 *– Progressive Counter (Example at I/O 1)*



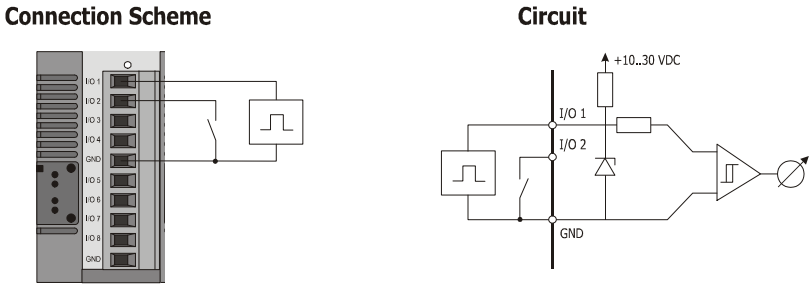
Picture 4.8 *- Signal Diagram of Progressive Counter (Example at I/O 1)*

When configuring a digital input as a progressive counter the e.bloxx constantly monitor the digital input for a signal variation. If a negative signal edge (1 -> 0) occurs at the input, the current result is increased by 1.
The range of values of the counter is from approx. -2,1 billion up to +2,1 billion (32 bit). The values can be reset to zero via the bus or via a digital input of the e.bloxx.

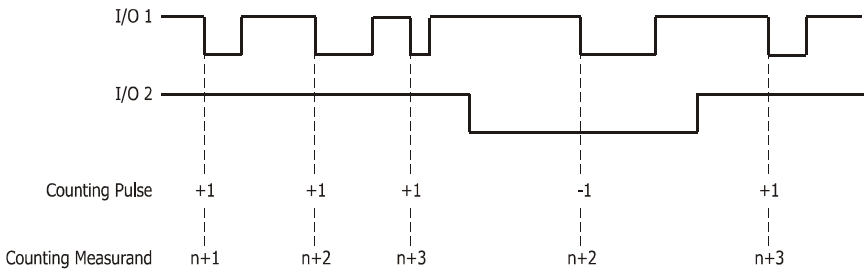
The progressive counter is possible with the inputs (I/O 1 ... I/O 4). The maximal counting frequency is 400 kHz.

Notice: After a voltage cut-off all counters are reset to zero.

4.8 Digital Input - Up/Down Counter



Picture 4.9 *- Up/Down Counter (Example at I/O 1 and I/O 2)*

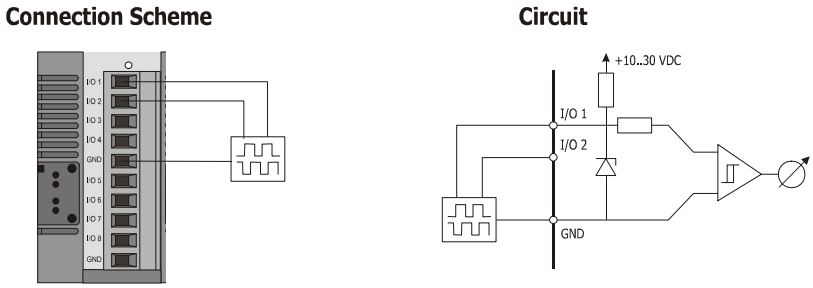


Picture 4.10 *- Signal Diagram of Up/Down Counter (Example at I/O 1 and I/O 2)*

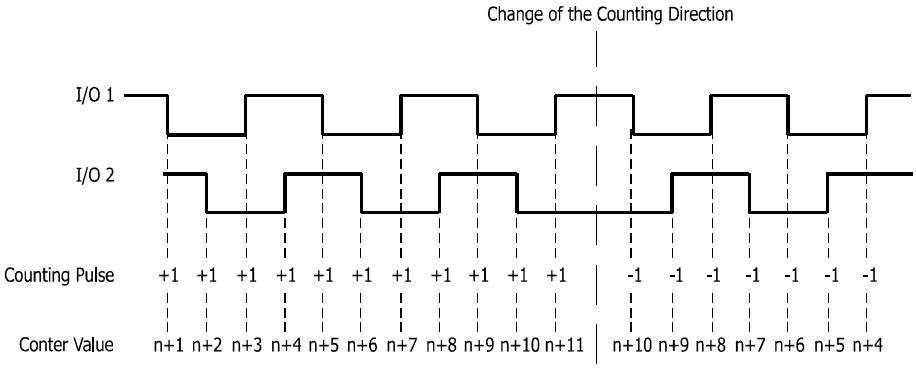
When configuring a digital input as a counter for counting up and counting down, the e.bloxx D1-1 or D1-4 constantly monitor the digital inputs (in this example I/O 1 and I/O 2) for a signal variation. If a negative signal edge (1 -> 0) occurs at the first input (here I/O 1), the current result is increased by 1 (if signal level at I/O 2 = 0) or decreased by 1 (if signal level at I/O 2 = 1), according to the status of the second digital input.

The range of values of the counter is from approx. -2,1 billion up to +2,1 billion (32 bit). The values can be reset to zero via the bus or via a digital input of the e.bloxx. Up to 4 up/down counters can be defined. The maximal counting frequency is 400 kHz.
Notice: After a voltage cut-off all counters are reset to zero.

4.9. Digital Input - Quadrature Counter



Picture 4.11 *– Quadrature Counter (Example at I/O 1 and I/O 2)*



Picture 4.12 *- Signal Diagram of Quadrature Counter (Example at I/O 1 and I/O 2)*

When configuring the digital inputs as a quadrature counter, the e.bloxx D1-1 or D1-4 constantly monitor the digital inputs that are used for the counter (in this example I/O 1 and I/O 2) for a signal variation (0 -> 1 and 1 -> 0). If both inputs have equal (different) signal levels and there appears a signal change at the first input the actual counting measuring will be increased (decreased) by 1.

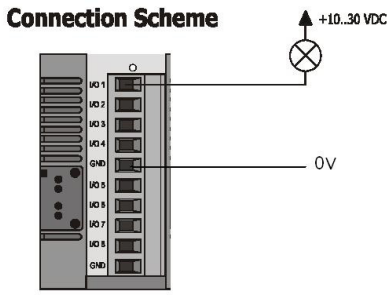
Vice versa to the progressive counter and the up/down counter both signal edges will be evaluated at the first digital input (here I/O 1) at the quadrature counter.

The range of values of the counter is from approx. -2,1 billion up to +2,1 billion (32 bit). The values can be reset to zero via the bus or via a digital input of the e.bloxx.

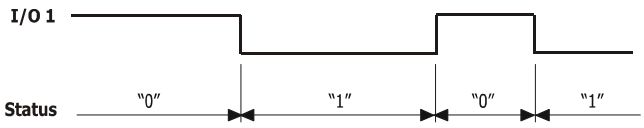
The progressive counter is possible with every input (I/O 1 ... I/O 8). The maximal counting frequency is 400 kHz.

Notice: After a voltage cut-off all counters are reset to zero.

4.10. Digital Status Output - Host-Controlled



Picture 4.13 *– Digital Output as Host-Controlled Output*



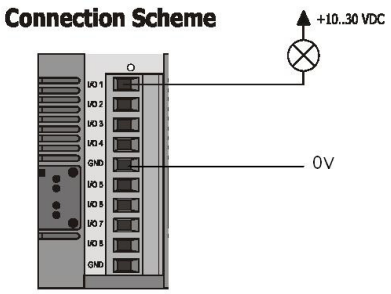
Picture 4.14 *- Signal Diagram of Host-Controlled Digital Output*

With the host-controlled digital status output, the digital output is set according to the status information received by the *e.bloxx D1* via bus.

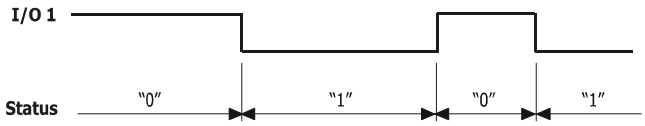
The distribution voltage can range from 10 to 30 VDC. It has to be either supplied externally or be picked up by the power supply of the sensor modules.

The status of the digital output can be scanned as 1/0 information via bus.

4.11. Digital Status Output - Process-Controlled



Picture 4.15 *– Digital Output as Process-Controlled Output*



Picture 4.16 *- Signal Diagram of Process-Controlled Digital Output*

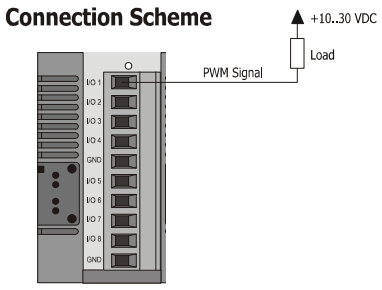
With the process-controlled output of status information the *e.bloxx D1* monitors measured values, resp. sensor variables as to constraints (threshold values). The digital output is set if one or several threshold conditions are fulfilled.

The user can freely define the constraints. The user can also preset the logical signal level (see also the *Configuration Software ICP 100*).

The distribution voltage can amount from 10 up to 30 VDC. It has to be supplied externally or picked up by the power supply of the sensor module.

The status of the digital output can be scanned as 1/0 information via bus.

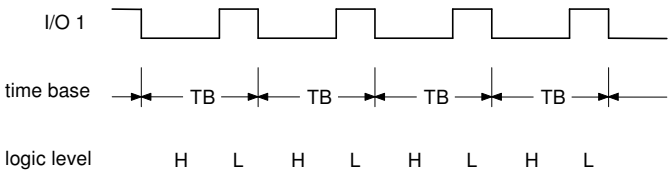
4.12. Digital Status Output - Pulse-Width Modulated Signal Output (PWM)



Picture 4.17 *– Digital Pulse-Width Modulated Signal Output*

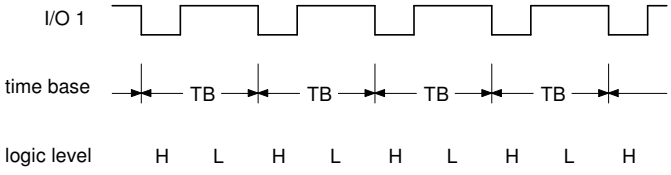
signal diagram:

- high measuring value:



PW = high/low = 66%

- low measuring value:



PW = high/low = 33%

Picture 4.18 *- Signal Diagram of Pulse-Width Modulated Signal Output*

Measured values, or sensor variables in general, can be output by the digital output as a pulse-width modulated signal (PWM). With this procedure the pulse width *PW* displays linear variation with the measured value between 0% (minimum capacity A) and 100% (maximum capacity B):

measured value = A + (B - A) · PW

Here the pulse width *PW* is the ratio - averaged out over a period - between *log. level High* and *log. level Low*. The user determines the frequency at which impulses are output at the digital signal output by defining the time base *TB*. The default setting variants are 10 msec, 1 sec and 10 sec for the PWM signal output via I/O1 or I/O 2 respectively. Other frequencies can be selected.

The distribution voltage can amount to between 10 and 30 VDC. It has to be supplied externally or be picked up by the power supply of the sensor module.

5. CONFIGURATION

5.1. General Information about Configuration Software ICP 100

The e.bloxx modules can be configured with the Configuration Software ICP 100. This software includes all functions to set the module parameters like baud rate, measurement rate, etc. and to define the input and output functions like the type of measurements and the processing of the measured values.
The Configuration Software ICP 100 also includes a function to display measured values in real-time. There are also several software packages from other companies that are adapted to the specific measurement tasks.
In the Configuration Software ICP 100 the two register cards "Variable Settings" and "Module Settings" will be displayed if you are configuring an e.bloxx that is not online and also the two additional register cards "Info" and "Measure" when configuring an online e.bloxx.

- On the register card "Info" several module information will be displayed.
- On the register card "Measure" the channel values of the online e.bloxx will be displayed in real time.
- On the register card "Variable Settings" the different channels of the e.bloxx can be configured. This will be done in the Variable Settings Table being displayed on this register card.
- On the register card "Module Settings" different general settings like the baud rate, address, etc. can be defined for each e.bloxx.

This manual only gives a brief description on how to set up and configure an e.bloxx module. A detailed description of all the functions of the Configuration Software ICP 100 is included in the help function of the software.

5.2. Setting Address and Baud Rate of an e.bloxx

Before a control (PLC) or a computer (PC) can interchange data with an e.bloxx via the bus, address and baud rate of the e.bloxx have to be defined. The following points have to be taken into consideration in this connection:
- All devices have to be adjusted to the same baud rate.
- The same address must not appear twice in the bus topology.

The setting variants for the bus parameters for e.bloxx are:

Bus Parameter	ASCII Protocol	MODBUS Protocol	Profibus-DP Protocol	LOCAL-BUS Protocol
Address	1 127	1 127	1…..126	1 127
Baud Rate	19,200 bps	19,200 bps	19,200 bps	19,200 bps
	38,400 bps	38,400 bps	-	38,400 bps
	57,600 bps	57,600 bps	-	57,500 bps
	93,750 bps	93,750 bps	93,750 bps	93,750 bps
	115,200 bps	115,200 bps	-	115,200 bps
	-	-	187,500 bps	187,500 bps
	-	-	500,000 bps	500 kbps
	-	-	1.500 kbps	1.500 kbps

Table 5.1 *- Setting variants for address and baud rate for the e.bloxx*

If no other specifications are made on delivery, the e.bloxx have address 1 and baud rate 1,5 Mbps as default. The adjustment can be changed via the bus by means of the *Configuration Software ICP 100*.

Adjustment via bus by means of the Configuration Software ICP 100:
The address and baud rate of an e.bloxx can be set in the Configuration Software ICP 100. On the dialog box "Module Information" the address and baud rate of the actual e.bloxx is displayed. After changing these settings, the new settings have to be loaded into the e.bloxx in order to take effect. To do this the menu item **Send to Module** or **Send to Module as...** in the menu **File** or the corresponding button () in the icon bar has to be selected.

Notice: The address 0 is provided for the PC in case of a transmission via PROFIBUS-DP. This address can therefore not be assigned to the e.bloxx. Also the address 127 is reserved for broadcast transmission in the PROFIBUS-DP protocol and may only be assigned for these cases.

5.3. e.bloxx Settings

On the register card "Module Settings" the following settings of an e.bloxx can be defined.

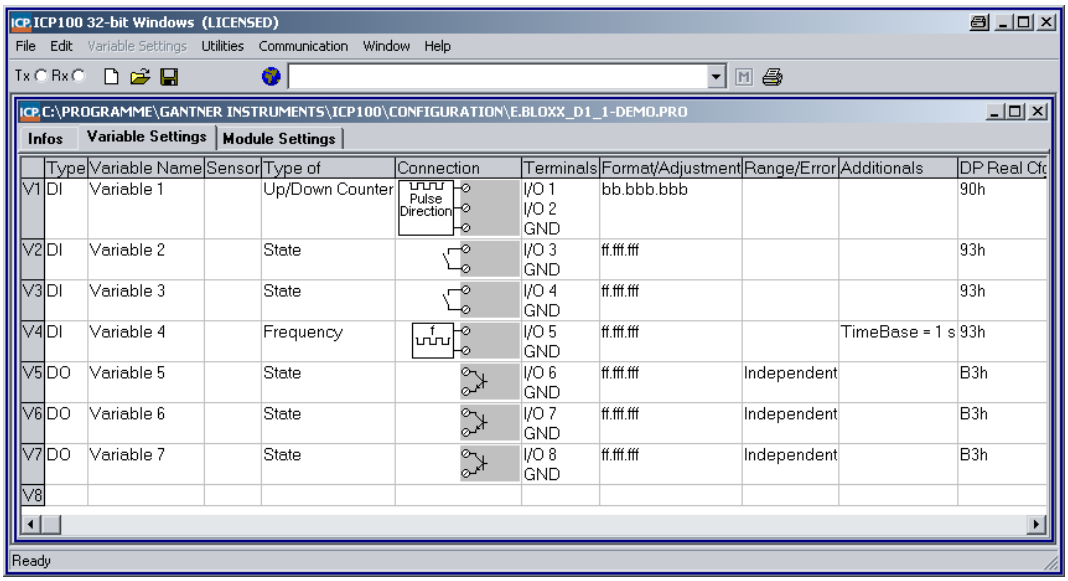
- Location: Description of each e.bloxx.
- User Name: Possibility to enter the name of the person that has configured the module.
- Config. Date: Displays the date of configuration.
- Address: Address of the online e.bloxx. Will only be displayed if e.bloxx is online.
- Protocol: Bus protocol that is used for communication between PC and e.bloxx. Will only be displayed if e.bloxx is online. In the configuration software ICP 100 only the LocalBus protocol is displayed. Nevertheless all the protocols mentioned in chapter 2.2 are available and the e.bloxx uses the required protocol automatically.
- Character Format: Determines the number of data, parity and stop bits for transmission between PC and e.bloxx. Will only be displayed if e.bloxx is online. With the e.bloxx the character format is fixed to 8E1.
- Answer Delay: Determines how long an e.bloxx will wait before it sends an answer to a host request.
- Timeout: A timeout means that there is no communication with the module during the time period that is set here. All host-controlled functions (output via the Digital and Analog Output Variables and the Setpoint Variable) can be defined to pass into a safe, definable status. As soon as the communication recommences, the values are assumed again, depending on the configuration.
- Special Data: If a special program (firmware) is loaded in the e.bloxx it may need some special data that can be input here.

After changing some of these settings, the new settings have to be loaded into the corresponding e.bloxx, so they can take effect. Therefore select the menu item **Send to Module** or **Send to Module as...** in the menu **File** or the corresponding button () in the icon bar.

5.4. Definition of Channels

Up to 8 channels (real + virtual) can be defined for an e.bloxx. They define how the signals at the in- and outputs of the e.bloxx will be processed. The value of every channel can be read out via the fieldbus. The channels are defined in the Variable Settings Table in the Configuration Software ICP 100.

The Variable Settings Table is displayed on the corresponding register card in the Configuration Software ICP 100.



	Type	Variable Name	Sensor	Type of	Connection	Terminals	Format/Adjustment	Range/Error	Additionals	DP Real Cfg
V1	DI	Variable 1		Up/Down Counter	Pulse Direction	I/O 1 I/O 2 GND	bb.bbb.bbb			90h
V2	DI	Variable 2		State		I/O 3 GND	ff.fff.fff			93h
V3	DI	Variable 3		State		I/O 4 GND	ff.fff.fff			93h
V4	DI	Variable 4		Frequency	f	I/O 5 GND	ff.fff.fff		TimeBase = 1 s	93h
V5	DO	Variable 5		State		I/O 6 GND	ff.fff.fff	Independent		B3h
V6	DO	Variable 6		State		I/O 7 GND	ff.fff.fff	Independent		B3h
V7	DO	Variable 7		State		I/O 8 GND	ff.fff.fff	Independent		B3h
V8										

***Picture 5.1**. - Example for Variable Settings Table*

Here all 8 possible channels will be listed. To define a new channel just click on a free line in the table or to change the type of channel click on the first column *Type* in the corresponding line. In both cases a dialog box will be opened where the type of the new channel has to be selected. There are 5 different types of channels:

- Digital Input Channel: Used to record digital status signals, measure frequency or count digital signals. In the column *Type of Measurement* it is possible to select the measurement function (state recording, counter or frequency measurement, refer to chapter 4).
- Digital Output Channel: Used for digital status signals, process out or PWM. In the column *Type of Measurement* it is possible to select the measurement function (state, process out, PWM).
- Arithmetic Channel: With this channel it is possible to perform calculations with the actual values of other channels and with constant values. The results of the calculations are assigned to the arithmetic channel and so arithmetic channels can also be used by other arithmetic channels for calculations.
- Alarm Channel: An Alarm Channel can be used to monitor another channel and to generate an alarm message if one of up to 4 definable thresholds are exceeded. The alarm messages can be read via bus.
- Setpoint Channel: The value of this channel can be set via bus. This way it is possible to set a value via bus which can be used by an arithmetic channel for further processing, e.g. to set a factor for measurement by the user.

The settings for all defined channels will be displayed in the corresponding column of the channels. To change these settings click on the corresponding field in the Variable Settings Table.

6. SPECIFICATIONS

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

6.1. Digital Inputs

Function per terminal strip	8 (e.bloxx D1-1) resp. 32 (e.bloxx D1-4) x status or 4 (e.bloxx D1-1) resp. 16 (e.bloxx D1-4) x frequency (400 kHz) or 4 (e.bloxx D1-1) resp. 16 (e.bloxx D1-4) x quadrature counter (400 kHz) or 4 (e.bloxx D1-1) resp. 16 (e.bloxx D1-4) x up/down counter (400 kHz) not connected inputs can be used as status
Status	
Response time	1 ms
Frequency measurement	
Time base	0.001 to 10 sec
Max. frequency	400 kHz
Counter	
Counter depth	32 bit
Counter frequency	400 kHz
Input voltage	max. 30 VDC
Input current	max. 1.5 mA
Switching threshold	>3.5 V (logical “low”)
Switching threshold	<1.0 V (logical “high”)
Accuracy at 25 °C	0.01 %
Temperature drift	0.01 % / 10 °K

6.2. Digital Outputs

Function	process-, host controlled
Type of output	Open Collector
Output voltage	max. 30 VDC
Output current	max. 100 mA

6.3. Communication Interface

Standard	RS 485, 2-wire
Data format	8E1
Protocols	ASCII, MODBUS, PROFIBUS-DP, LOCAL-BUS
Baud rates	
ASCII	19.2, 38.4, 57.6, 93.75, 115.2 kbit/s
MODBUS	19.2, 38.4, 57.6, 93.75, 115.2 kbit/s
PROFIBUS-DP	19.2, 93.75, 187.5, 500, 1500 kbit/s
LOCAL-BUS	19.2, 38.4, 57.6, 93.75, 115.2, 187.5, 500, 1500 kbit/s
Connectable Devices	up to 32 without repeater up to 127 with repeater
Galvanic Isolation	500 V

6.4. Firmware Types in Scope of Supply

Chronos

Function	Frequency measurement
Method	Chronos Optimized by the combination of time measurement and edge counting
Number of channels	4
Accuracy	0.01 %
Temperature drift	0.01 % / 10 °K

Chronos-PWM

Function	Frequency measurement (s. above)
Number of channels	2
Function	Frequency output Pulse width modulation (PWM)
Frequency range	0.1 Hz to 10 kHz
Accuracy	0.15 %
Number of output channels	2

Fast Chronos

Function	Frequency measurement (s. above)
Number of channels	2
Frequency range	1 Hz to 2 MHz
Time base	0.001 to 1 sec
Reference frequency	48 MHz
Resolution	0,.002 %
Accuracy	0.01 %
Refresh rate	1 ms at 1 input channel 2 ms at 2 input channels

Not used inputs and outputs can be used for status signals.
The definition of “not used” is that the Inputs 1, 2, 4 or 4 are not used. Is e.g. the Input 1 and 2 used for frequency input, the inputs 5 and 6 are not available because the inputs are used for the direction of input 1 and 2.

6.5. Power Supply

Power supply	10 VDC to 30 VDC Overvoltage and overload protection
Power consumption	Approx. 1.5 W (e.bloxx D1-1) Approx. 6 W (e.bloxx D1-4)
Influence of voltage	0.001 % / V

6.6. Mechanical

Case:	Aluminium and ABS
Dimensions (W x H x D):	e.bloxx D1-1: 45 x 90 x 83 mm (1.8 x 3.5 x 3.3 inch)
	e.bloxx D1-4: 104 x 90 x 83 mm (4.1 x 3.5 x 3.3 inch)
Protective system:	IP 20
Weight:	e.bloxx D1-1: 160 g
	e.bloxx D1-4: 500 g
Mounting:	DIN EN-Rail

6.7. Connection

Plug-in screw terminals:	Wire cross-section up to 1.5 mm²
Rapid bus connector:	4-pin plug in ABS-housing

6.8. Environmental Conditions

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

7. DECLERATION OF CONFIRMATION

Konformitätserklärung – Declaration of Conformity – Déclaration de Conformité

The undersigned, representing:

Gantner Instruments Test & Measurement GmbH
Montafonerstr. 8 – A-6780 Schruns /Austria
tel: +43/5556-73748-410 – www.gantner-instruments.com

herewith declares, that the product:

e.bloxx D1-1
Certificate Ref No: **040330WG-09**

is in conformity with the following EC directive(s), including all applicable amendments:

Directives		Short Title
X	89 / 336 / EEC	EMC Directive
	99 / 5 / EEC	R&TTE Directive
	73 / 23 / EEC	Low Voltage Directive
	98 / 37 / EEC	Machinery Directive
	99 / 519 / EEC	Limitation of human exposure to electromagnetic Fields

Only "x"-marked directives are relevant for the product and for this declaration of conformity !

and that the standards and/or technical specifications referenced below have been applied:

Standards			Short Title
EMC		EN 61000-6-1 : 2001	Generic immunity standard for residential, commercial and light-industrial environments
	X	EN 61000-6-2 : 1999	Generic immunity standard for industrial environments
		EN 61000-6-3 : 2001	Generic emission standard for residential, commercial and light-industrial environments
	X	EN 61000-6-4 : 2001	Generic emission standard for industrial environments
	X	EN 61326: 1997+A1+A2	Electrical equipment for measurement, control and laboratory use – EMC requirements
R&TTE		EN 300220-1/3 : 2000	Electromagnetic compatibility for Short Range Devices (SRDs) from 25 to 1000 MHz
		EN 300330-1/2 : 2001	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 25 MHz
		EN 301489-1/3 : 2001	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 40 GHz
Safety		EN 61010 : 2001	Safety requirements for electrical equipment for measurement, control and laboratory use
		EN 60950 : 2000	Safety requirements for information technology equipment
		EN 60335 : 2002	Safety of household and similar electrical appliances
		EN 60601 : 1988	Safety requirements for medical electrical equipment
Machinery		EN 292-1/2: 1991	Safety of machinery – Basic concepts, general principles for design
		EN 954-1: 1996	Safety of machinery – Safety-related parts of control system
		EN 60204-1:1997	Safety of machinery – Electrical equipment
Human Expos.		EN 50364 : 2001	Limitation of human exposure to electromagnetic fields
		EN 50371 : 2002	Limitation of human exposure to electromagnetic fields (10MHz-300GHz) – Generic Standard

Remarks: Only "x"-marked standards are relevant for the product and for this declaration of conformity! Concerning safety aspects, the general and the product specific warning and safety instruction in the product accompanying documents must also be regarded!

This declaration is based upon the respective technical documentation held by the manufacturer.

CE

Schruns, 30th March 2004

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Werner Ganahl, General Manager

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Konformitätserklärung – Declaration of Conformity – Déclaration de Conformité

The undersigned, representing:

Gantner Instruments Test & Measurement GmbH
Montafonerstr. 8 – A-6780 Schruns /Austria
tel: +43/5556-73748-410 – www.gantner-instruments.com

herewith declares, that the product:

e.bloxx D1-4
Certificate Ref No: **040330WG-10**

is in conformity with the following EC directive(s), including all applicable amendments:

Directives		Short Title
X	89 / 336 / EEC	EMC Directive
	99 / 5 / EEC	R&TTE Directive
	73 / 23 / EEC	Low Voltage Directive
	98 / 37 / EEC	Machinery Directive
	99 / 519 / EEC	Limitation of human exposure to electromagnetic Fields

Only "x"-marked directives are relevant for the product and for this declaration of conformity !

and that the standards and/or technical specifications referenced below have been applied:

Standards			Short Title
EMC		EN 61000-6-1 : 2001	Generic immunity standard for residential, commercial and light-industrial environments
	X	EN 61000-6-2 : 1999	Generic immunity standard for industrial environments
		EN 61000-6-3 : 2001	Generic emission standard for residential, commercial and light-industrial environments
	X	EN 61000-6-4 : 2001	Generic emission standard for industrial environments
	X	EN 61326: 1997+A1+A2	Electrical equipment for measurement, control and laboratory use – EMC requirements
R&TTE		EN 300220-1/3 : 2000	Electromagnetic compatibility for Short Range Devices (SRDs) from 25 to 1000 MHz
		EN 300330-1/2 : 2001	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 25 MHz
		EN 301489-1/3 : 2001	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 40 GHz
Safety		EN 61010 : 2001	Safety requirements for electrical equipment for measurement, control and laboratory use
		EN 60950 : 2000	Safety requirements for information technology equipment
		EN 60335 : 2002	Safety of household and similar electrical appliances
		EN 60601 : 1988	Safety requirements for medical electrical equipment
Machinery		EN 292-1/2: 1991	Safety of machinery – Basic concepts, general principles for design
		EN 954-1: 1996	Safety of machinery – Safety-related parts of control system
		EN 60204-1:1997	Safety of machinery – Electrical equipment
Human Expos.		EN 50364 : 2001	Limitation of human exposure to electromagnetic fields
		EN 50371 : 2002	Limitation of human exposure to electromagnetic fields (10MHz-300GHz) – Generic Standard

Remarks: Only "x"-marked standards are relevant for the product and for this declaration of conformity! Concerning safety aspects, the general and the product specific warning and safety instruction in the product accompanying documents must also be regarded!

This declaration is based upon the respective technical documentation held by the manufacturer.

CE

Schruns, 30th March 2004

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Werner Ganahl, General Manager

Notice:

Information in this manual are valid from March 2006 until revocation.
Further changes and completion of the manual are reserved and possible without notice.

www.gantner-instruments.com

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