

Interface technology



INSTRUCTION MANUAL

ISM-usb.1 / .2

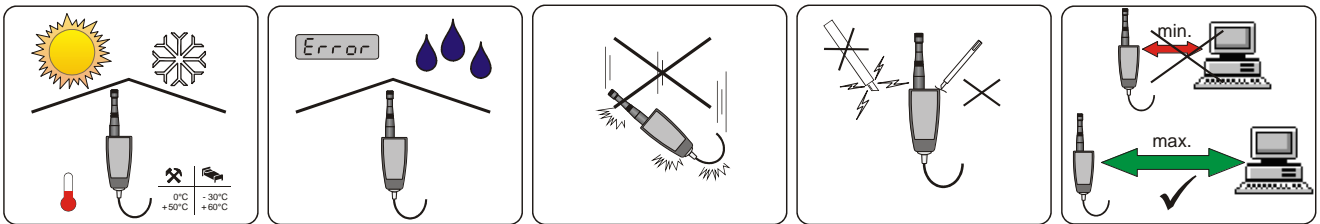
**PC - Radio station for wireless
data transmission**

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Messtechnik GmbH & Co. KG

Important information at the start



- ◆ Observe permissible temperature range
- ◆ Keep dry
- ◆ Do not drop
- ◆ Protect from mechanical shock, do not open case
- ◆ Locate with maximum possible distance from technical devices (such as PCs, monitors etc.), in order to avoid radio interferences

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1. Introduction

1.1 General information

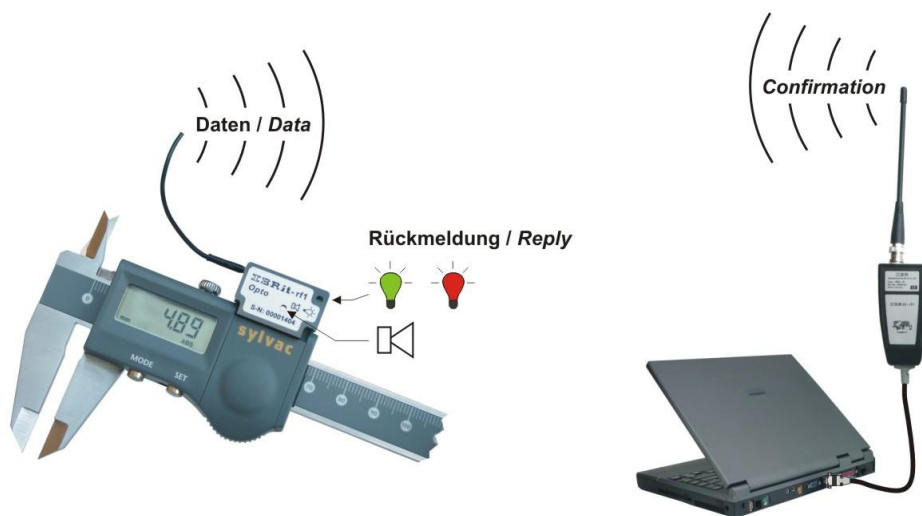
The IBRit-rf1 and ISM radio module series allow the wireless transmission of measurement data from gauges to a PC with USB - interface or to an IMB-rf1 / IMB-ISM module (as the case may be).

On the PC side the wireless communication with the gauges occurs via the **ISM-usb** PC - Radio station.

The **ISM-usb** PC - Radio station is connected to the PC via an USB - port and allows the communication in an address range from 1 ... 500.

The differentiation of the data from the individual radio modules is achieved by address numbers. The address number and other individual radio module settings concerning the particular application can be transmitted from the PC to the radio modules and are stored there.

The corresponding PC software **IBR_SimKey** is included in the delivery of the **ISM-usb** PC - Radio station.



The transmission of measurement data is triggered by pressing the data key on the gauge (if available), or on the radio module or automatically when the measuring value changes. The radio module completes the measured value by adding an address number (sender), a communication control word and a double checksum. The special data coding and the PC's reply directly to the radio module guarantee absolute data security.

A transmission error, e.g. caused by a radio interference, is detected by the communication dialogue between PC and radio module. The measurement data transmission is automatically repeated up to 3 times within 0,01 ... 0,08 seconds. A successful measurement data transmission is confirmed to the user by a green flashing light and short beep tone on the radio module. If the PC could not receive the measurement data from the radio module faultlessly, a red flashing LED and two long beep tones inform the user about the faulty measurement data transmission. The user can obtain further error information by reading the red LED's Morse - code (please refer to page 14 of this manual).

The maximum radio range depends strongly on the environment and can vary from several meters up to 300 meters.

The received measurement data can be made available for nearly any software, because the **IBR_SimKey** PC software utilizes the keyboard buffer to output the measurement data.



1.2 Features

- ◆ PC - Radio station **ISM-usb** with USB - interface for communication with up to 120 radio modules
- ◆ Radio modules (for connection to gauge)

ISM-232	/	IBRit-rf1-232	for gauges with RS232 interface
ISM-cab1	/	IBRit-rf1-cab1	for connection to gauges via cable, can be adapted to various interfaces
ISM-mahr	/	IBRit-rf1-mahr	for gauges with MarConnect interface
ISM-mit1	/	IBRit-rf1-mit1	for gauges with Mitutoyo Digimatic interface
ISM-opto	/	IBRit-rf1-opto	for gauges with Opto-RS232 interface
ISM-prox	/	IBRit-rf1-prox	for gauges with Proximity interface
ISM-S233	/	IBRit-rf1-S233	for gauges with Power-RS interface
ISM-3i			for gauges with TRIPLE-I interface
ISM-ISi			for IMS measuring probes
		IBRit-rf1-digi	for gauges with Mitutoyo Digimatic interface

In the following the IBRit-rf1 and ISM radio module are referred to as “gauge radio modules”.

- ◆ High data security by double and independent check sum control
- ◆ Optical and acoustical transmission confirmation by the radio modules
- ◆ Radio range of the ISM-usb.1 up to 300 m in case of visual contact (with external antenna)

1.3 Technical data

Mechanical characteristics ISM-usb.1

Case	Plastic
Wall holder	Wall holder for ISM-usb with two mounting holes
Dimensions with antenna W x H x D / Weight	47 x 275 x 30 mm / ca. 175 g

Mechanical characteristics ISM-usb.2

Case	Plastic
Dimensions with antenna W x H x D / Weight	20.3 x 52.5 x 45.5 mm / ca. 20 g

Electrical characteristics*

Power supply	By USB - interface
Current consumption	max. 40 mA
Transmission frequency	433.926 MHz
Frequency deviation	± 13 kHz / ± 115.2 kHz
Modulation type	FSK
RF Output power @ 50Ω	+6 dBm
Sensitivity @ 50Ω	-100 dBm
Transmission speed	9600 baud / 230400 baud

* : at an ambient temperature of 25°C. All values are typical values unless otherwise specified.

Environmental conditions

Operating temperature range	0 ... 50°C
Storage temperature range	-30 ... +60°C
Protection class	IP50 (CEI / IEC 529)

Specific standards

CE conformity	Harmonised standard EN 300 220
FCC	FCC ID : T6T-604001





2. Getting started

2.1 Delivered items

ISM-usb.1

PC - Radio station **ISM-usb** with integrated USB-connection cable, antenna, wall holder, manual and CD-ROM containing USB - driver.

Please check the shipment for completeness and keep the packaging.

ISM-usb.2

PC - Radio station **ISM-usb**, antenna, mounting bracket for CD43 / CD70, manual and CD-ROM containing USB - driver.

Please check the shipment for completeness and keep the packaging.

Note : For plugging on / removing the bracket for CD43 / CD70 the antenna can be unscrewed.

2.2 System requirements

PC with USB - interface and operating system Windows 2000 ... Windows 10.

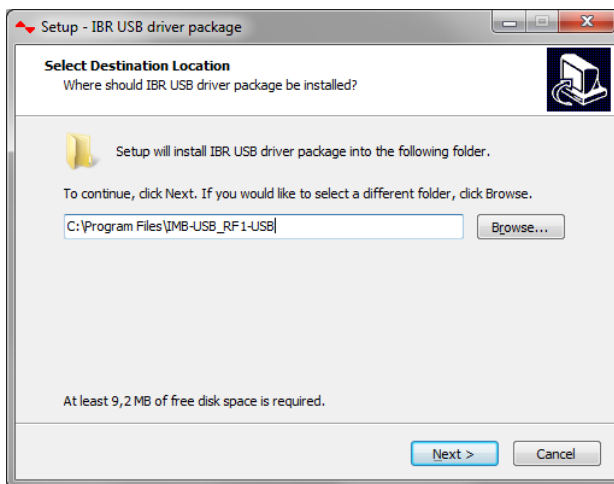
2.3 Installation of the USB - driver for the ISM-usb PC - Radio station

The driver installation package is located on the CD-ROMs ,*IBR Support Software*' and ,*Software for Metrology and SPC*' in the directory <CDROM>:\USB-Driver\IMB-USB_RF1-USB\IMB-USB_RF1-USB_inst.exe.

The most recent version can be downloaded at http://www.ibr.com/download/IMB-USB_RF1-USB_inst.zip .

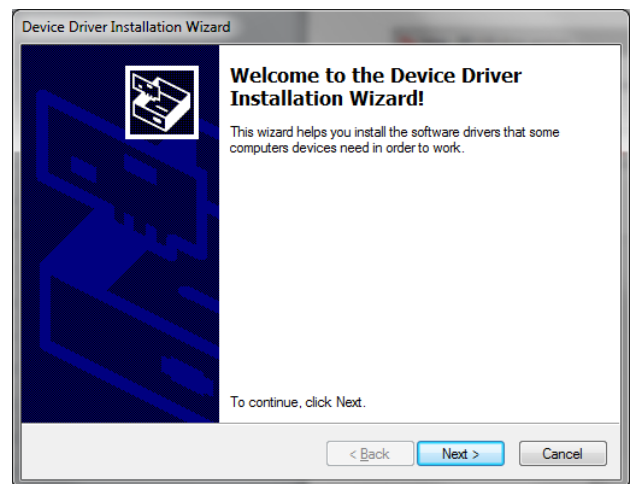
1.

When the driver installation package is started, the installer asks for a directory where the driver files shall be copied to :



2.

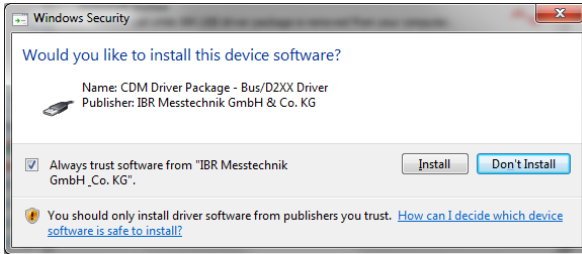
By clicking on Next, the installer copies the required files to the directory selected and automatically opens the Device Driver Installation Wizard :





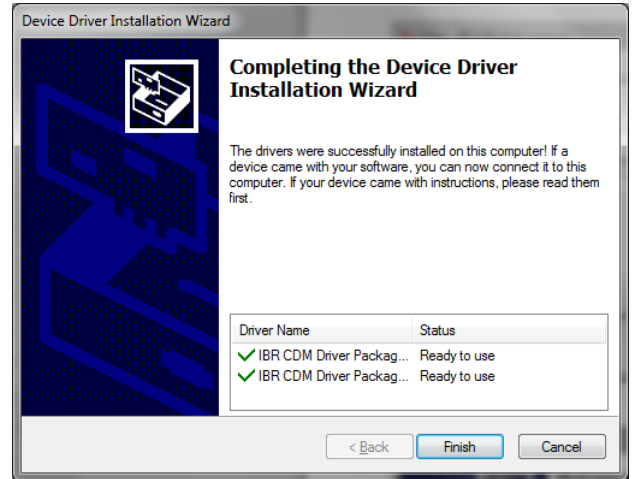
3.

The Device Driver Installation Wizard asks you to confirm the signature of the driver. You need to allow the installation of the driver :



4.

When the driver installation is completed, the Device Driver Installation Wizard shows you the result of the driver installation :



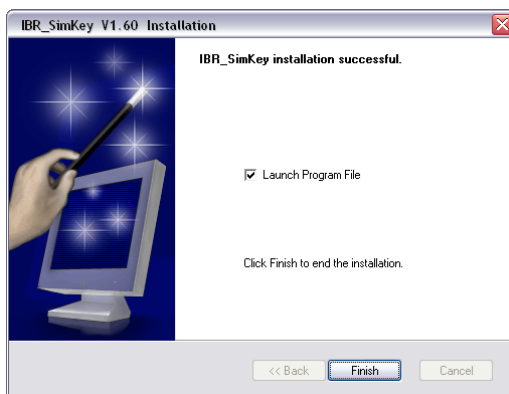
2.4 Installation and initial operation of the IBR_SimKey PC software

1. Installation of IBR_SimKey

- a) Please insert the CD (that is included in the delivery of the **ISM-usb** PC - Radio station) into your CD – drive and open the folder **IBR_Simkey** or download the software from http://www.ibr.com/download/IBR_SIMKEY.zip and extract the ZIP file.
- b) Start the file IBR_SimKey_Inst.exe.
- c) Follow the instructions displayed in the windows of the programme installer.

2. Starting IBR_SimKey

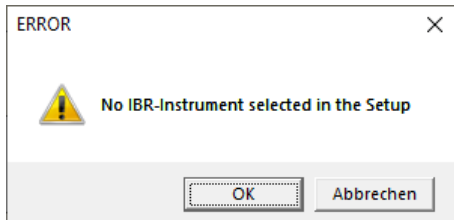
Initial operation of the software can take place directly after completion of the installation procedure. In order to do so, leave the box **Launch Program File** checked and click the **Finish** - button.





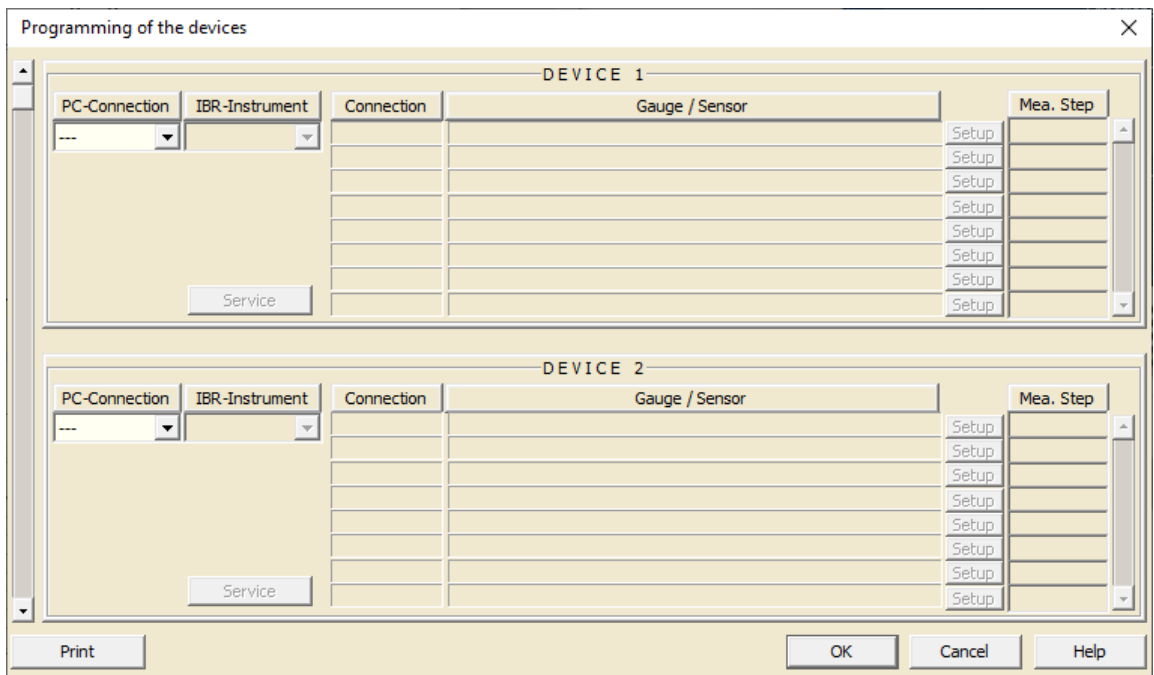
If the software has already been installed, you can start it by clicking on the icon **IBR_SimKey V...** in the menu **Start / Programms / IBR_SimKey**. You can also start the software by double clicking its desktop symbol (icon). It is named **IBR_SimKey V...** and is automatically created during installation of the software.

On initial operation of the software or in case there was no PC - connection selected in the software, you will receive the following message :



Please confirm the message box by clicking the **OK** - button.

Now, the window for interface settings and instrument selection shown below is automatically displayed.



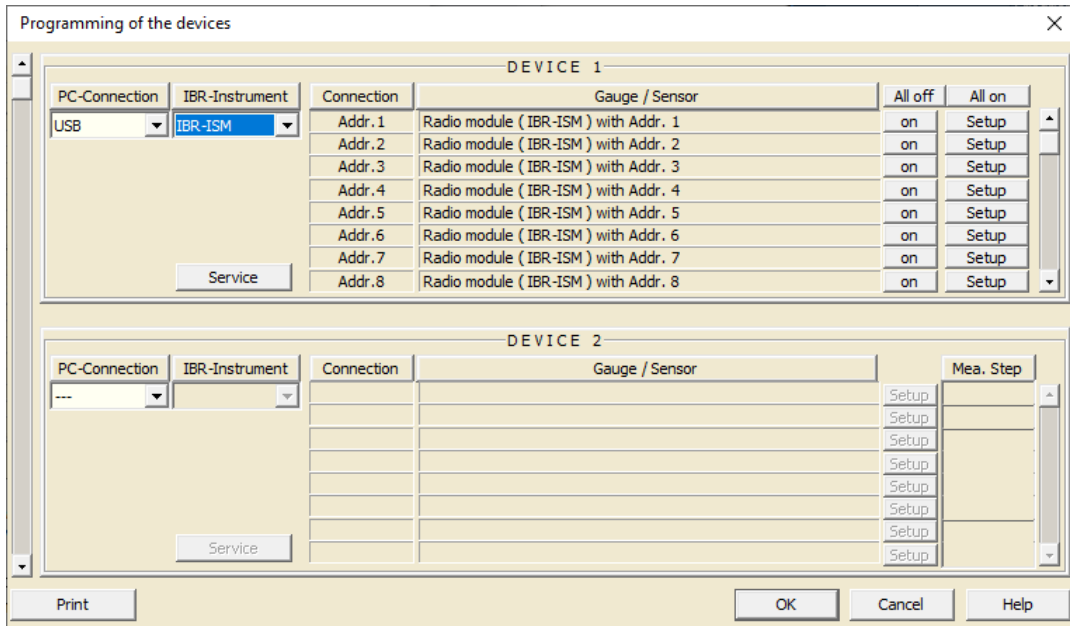
Note : On initial operation of the software both the message box and the window shown above are displayed in the language of the Windows operating system.

Now, please select the entry **USB** as setting for the **PC-Connection**. Afterwards please select the entry **IBR-ISM** as setting for the **IBR-Instrument**.





When the selections concerning the PC - connection and the IBR - instrument have been made, the columns **Connection** and **Gauge / Sensor** are filled and displayed as shown below.

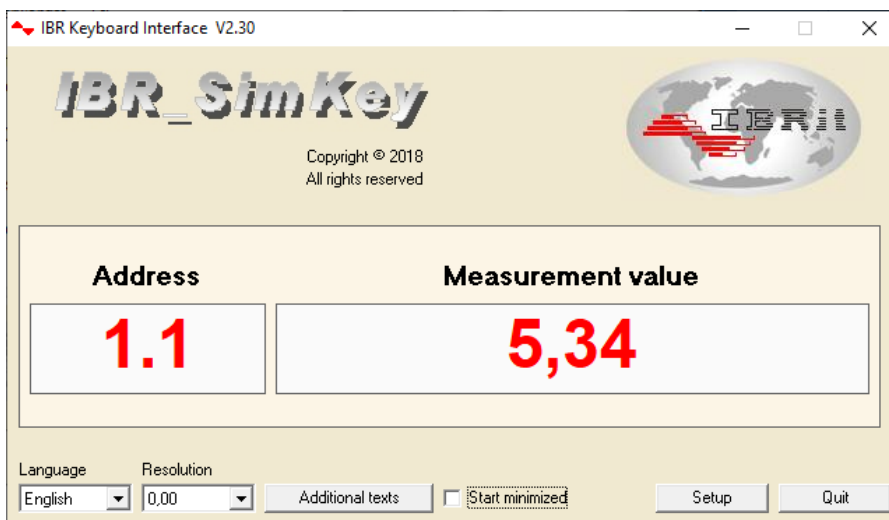


Note : If a (*) appears behind the entry IBR-ISM, then the ISM module was not found (e.g. no driver installed, the IBR-ISM is used by another software, ...).

The gauge radio modules can be individually either activated or deactivated for operation with a particular PC - Radio station. In order to do so, please click the **on (off)** - button of the radio module concerned. The button is located directly on the right - hand side of the **Gauge / Sensor** column. This programming possibility allows simultaneous operation of several PC - Radio stations with up to 120 radio modules. The addresses 121...499 can be assigned via the Setup buttons of the respective channels.

By clicking on the **OK** - Button the settings are confirmed and the window is closed.

As a result, the display window of **IBR_SimKey** is opened and you can begin with transmission of measurement data. The display window is shown below.



Now, measurement data can be transmitted to the PC by pressing the data key on the gauge (if available), or on the radio module.

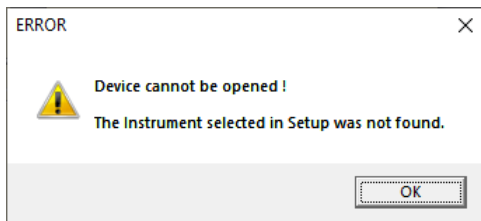




Description of the display window :

- Address** - Displays the sender - address of the last transmitted measurement dataset.
- Measurement value** - Displays the measurement value of the last transmitted measurement dataset.
- Language** - List of languages available for selection. Displays the current setting.
- Resolution** - List of resolutions available for measurement value display. Indicates the current setting.
- Additional texts** - Opens a window that allows adjusting various format settings concerning the measurement data that is to be transmitted. The settings have effect only on measurement data made available for other software (e.g. MS-Excel, MS-Word, ...), by using the keyboard buffer.
- Setup** - Opens the window for interface settings and instrument selection.
- Quit** - Closes the **IBR_SimKey** software.

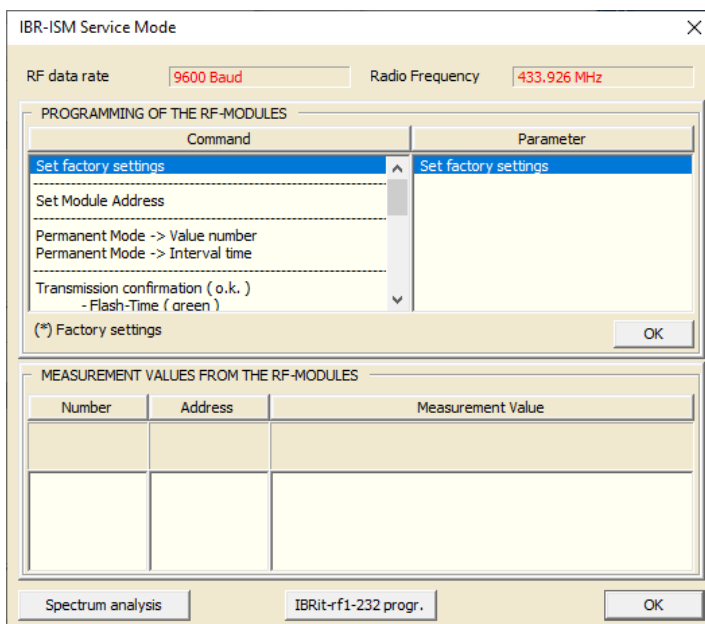
Please note that there must be a **ISM-usb** PC - Radio station connected to the PC in order to operate the **IBR_SimKey** software. Otherwise you will receive the following message :



3. Programming of gauge radio modules by using the IBR_SimKey PC software

The individual programming of the gauge radio modules can be done by using the PC - software **IBR_SimKey**. All chosen settings are stored in the gauge radio modules and are preserved even if the module's batteries are exchanged.

Click on the **Setup** - button in the main window of the **IBR_SimKey** PC - software (display window) in order to program the radio modules. As a result, the window for interface settings and instrument selection will be opened automatically. Please click the **Service** - button of this window in order to access the programming window. It is displayed below.





In the upper left - hand area of the programming window you can find the selection column containing the commands available for programming. The selection column containing the appropriate parameters is located directly to the right of it.

For programming please select the command to be executed and then the desired parameter. By clicking the **OK** - Button the chosen command is loaded into the transmission buffer. Now, please press the data key of the radio module which is to be programmed, in order to trigger measurement data transmission. On the end of the measurement data transmission the PC - Radio station sends the chosen command from the transmission buffer to the gauge radio module. The radio module confirms successful programming by a short tone sequence and a triple flash of the green LED.

Overview of commands for programming gauge radio modules :

Command	Description	Values (range)
Set factory settings	Resets all adjusted parameters back to factory settings. These are marked by a (*) in the parameter list.	-----
Set Module Address	Serves to select the sender address of the radio module that is to be programmed. Note : Please use only addresses 1...499 for measurement operation !	From 1 to 500.
Permanent Mode - Value number (IBRit-rf1 legacy mode)	Defines how many measurement data records are to be transmitted automatically in the Permanent Mode. The Permanent Mode is started by pressing the data key on the radio module. Note: Using the Permanent Mode can reduce the lifetime of the module's battery.	From 0 to 255 values.
Permanent Mode - Interval time (IBRit-rf1 legacy mode)	Defines with which time interval the data records are to be transmitted automatically in the Permanent Mode. Note: Using the Permanent Mode can reduce the lifetime of the module's battery.	From 1 to 256 seconds.
Transmission confirmation (o.k.) - Flash-Time (green)	Defines the period of time during which the green LED is lit (on transmission confirmation by the radio module).	From 0 to 2150 milliseconds.
Transmission confirmation (o.k.) - Beep-Time	Defines the period of time during which the buzzer beeps (on transmission confirmation by the radio module).	From 0 to 250 / frequency.
Transmission confirmation (o.k.) - Beep-Frequency	Defines the beep tone - frequency of the buzzer beep (on transmission confirmation by the radio module).	From 500 to 2000 Hz.
Transmission error - Flash-Time (red)	Defines the period of time during which the red LED is lit (on error signal by the radio module).	From 0 to 2150 milliseconds.
Transmission error - Double-Beep-Time	Defines the period of time during which the buzzer beeps once (on error signal by the radio module).	From 0 to 250 / frequency.
Transmission error - Double-Beep-Frequency	Defines the beep tone - frequency of the buzzer beep (on error signal by the radio module).	From 500 to 2000 Hz.

Continued on next page.





Overview of commands for programming gauge radio modules (continuation) :

Command	Description	Values (range)
Time delay for data request	Defines the time delay between the triggering of the measurement data request (e.g. by pressing the data key on the radio module) and the real take-over of the measurement value from the gauge. By using this option it is possible to avoid distortion of the measurement value by moving the gauge on pressing the data key.	From 0 to 2.4 seconds.
Time offset on synchr. Triggering	Defines the offset time between the measurement data transmission of several simultaneously triggered radio modules. By using this option it is possible to avoid overlapping of measurement data transmissions. 10 milliseconds offset time between the individual radio modules transmissions can be considered sufficient. The setting would in that case be "0 msec" for module 1, "10 msec" for module 2, "20 msec" for module 3 and so on.	From 0 to 250 milliseconds.
Request char. for Opto-RS232	This setting has effect only on the measurement data request of the gauge radio modules with Opto-RS232 interface. Any character or a "Simplex Impulse" can be set for measurement data request. Please refer to the manual of your gauge in order to find the correct setting in your case.	-----
External data request mode	Activates / deactivates the mode for external data request. This mode is only available for the radio modules ISM-Dial and IBRit-rf1-Dial. With other radio modules the use of this mode will result in an error.	on / off
Send battery voltage	After the next measuring value the voltage of the battery in V will be transmitted additionally (only supported by ISM modules).	-----
RF data rate	This option allows you to switch between 9600 Baud and 230400 Baud. (see page 12 / 13) (only supported by ISM modules; the ISM modules must be set to address 500 for the switching)	9600 Baud / 230400 Baud

Example : Programming of a new radio module address (sender)

1. Command : Click on **Set Module Address**
2. Parameter : Select an address between **1** and **500**
3. Set command into transmission buffer : Click on **OK** - Button
4. Press the data key of the radio module which is to be programmed, in order to trigger measurement data transmission
5. The radio module confirms successful programming by a short tone sequence and a triple flash of the green LED





ISM Permanent Mode :

Additionally you can change the data transmission rate of the ISM radio modules from 9600 baud 230400 baud (see table on page 11 → RF data rate). With this data transmission rate the ISM Permanent Mode can be used which allows you to transmit measuring values automatically every time the value changes.

Advantages of the 230400 Baud data rate :

- a) approximately 1 million instead of only 200.000 transmissions possible, before the batteries run out
- b) ISM Permanent Mode can be used

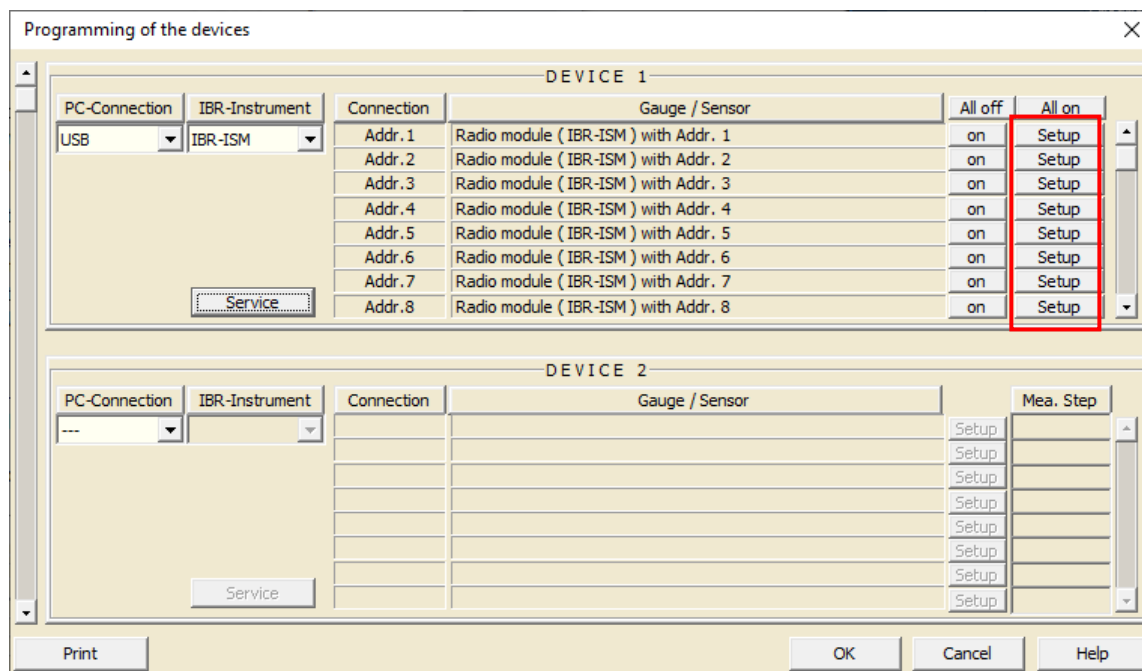
Disadvantages of the 230400 Baud data rate :

- a) not IBRit-rf1 compatible
- b) only approximately 60% range in comparison with 9600 Baud

Please note that the change of the data transmission rate is only possible if the address of the radio module has been set to **500** before (see page 11). After the change of data rate the address can be switched back to the old value again.

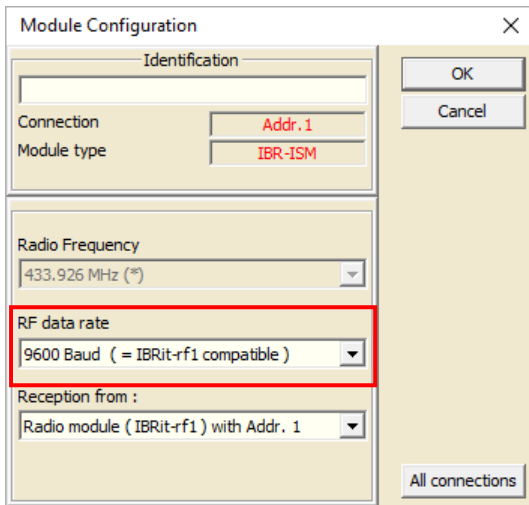
After changing the data transmission rate of the ISM radio modules, it has to be also changed for the ISM - usb, so that the ISM-usb will be able to receive the values from the radio modules and change their settings.

To do this, please click in the hardware setup on one of the **Setup** buttons on the right side :





The following window will open. There you can select the required data transmission rate :



Note : This is the setting for the radio receiver. Because of this the RF data rate has to be changed in the setup window of **one** address only.

After changing the data transmission rate of the ISM - usb to 230400 baud, the following additional commands become available in the **Service** window :

Note : The following commands are not relevant for the radio module ISM-3i, because it is controlled by the sensor display SD1.

Command	Description	Values (range)	ISM-cab1 prox mit1 opto mahr dk s233	ISM- ISi
ISM Permanent Mode				
- Maximum data rate	This determines the maximum data rate for the transmission of the measuring values. The maximum data rate should not exceed 2 Hz for the mentioned radio modules, because else the battery life will be shortened too much. The ISM-ISi always works with 10 Hz.	0.5 to 5 Hz	✓	✗
- Switch mode on/off by pressing button	This determines how the Permanent Mode can be activated / deactivated at the radio module.	off / short / long	✓	✓
- Timeout for mode auto disable	This determines the time for the automatic deactivation of the Permanent Mode. Relevant is the time without change of the measuring value.	0 to 255 min (0 = no automatic deactivation)	✓	✗
- Additional automatic data transmission	This determines the interval in which the radio module automatically sends a value, even if the measuring value has not changed. (The time for the automatic deactivation is not influenced by this.)	0 to 255 sec (0 = no data transmission without change of the measuring value)	✓	✓

Continued on next page.





Overview of commands (continuation) :

Command	Description	Values (range)	ISM-cab1 prox mit1 opto mahr dk s233	ISM-ISi
- Threshold for starting the data transmission	This determines how big the change of the measurement value must be to end the idle mode.	off / 0,8 to 204 µm	✗	✓
- Stabilisation time for ending the data transmission	This determines the time after that the radio module changes to the idle mode (*), if the value has not changed.	off / 0.1 sec to 25.5 sec	✗	✓
- Send mea. value after stabilisation	This determines the maximum number of retries to send a last value after the stabilisation of the measuring value until a confirmation is received. If the radio module has not received a confirmation after this number of retries, it gives an error message.	with 0 to 255 retries (0 = no verification and no error message)	✗	✓

(*)Note : *In the data transmission mode, 10 measuring values / sec are requested by the ISM-ISi.
In the idle mode no measuring values are transmitted and only 2 measuring values / sec are requested by the ISM-ISi.*

4. Confirmation signals of the gauge radio modules

The gauge radio modules always return a clear optical and acoustical confirmation to the operator on programming or measurement data transmission. Hence, the operator is immediately informed whether the transmission was successful or not.

If the transmission was not successful, then the Morse - flashing code of the LED informs the operator about the cause of error.

The following table explains the confirmation signals returned by the gauge radio modules:

LED	Buzzer	Meaning
1 x green	1 x short	Data transmission successful
1 x red	2 x long	Faulty radio transmission
2 x red	2 x long	Timeout Error on reading the measurement value from the gauge
3 x red	2 x long	Spike on the data line of the Opto-RS232 interface
4 x red	2 x long	No stop-bit from the Opto-RS232 interface
5 x red	2 x long	Parity - error from the Opto-RS232 interface
6 x red	2 x long	Input buffer overflow on the Opto-RS232 interface
7 x red	2 x long	Undefined data format on the Opto-RS232 interface
8 x red	2 x long	Write error on EEPROM access
9 x red	2 x long	Read error on EEPROM access

Note :

Further measurement data cannot be transmitted until the error message has ended !!!





ISM-3i

Since the ISM-3i has no LED and Buzzer, one of the following messages is displayed on the LCD of the measuring instrument if an error occurs :

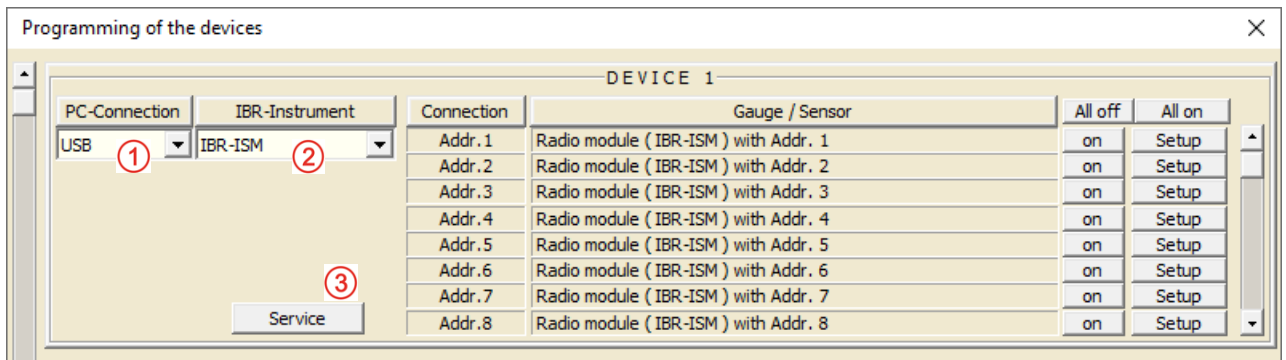
LCD	Meaning
rF-Err.1	Faulty radio transmission
rF-Err.2	Timeout Error on reading the measurement value from the gauge

5. Signal strength measurement

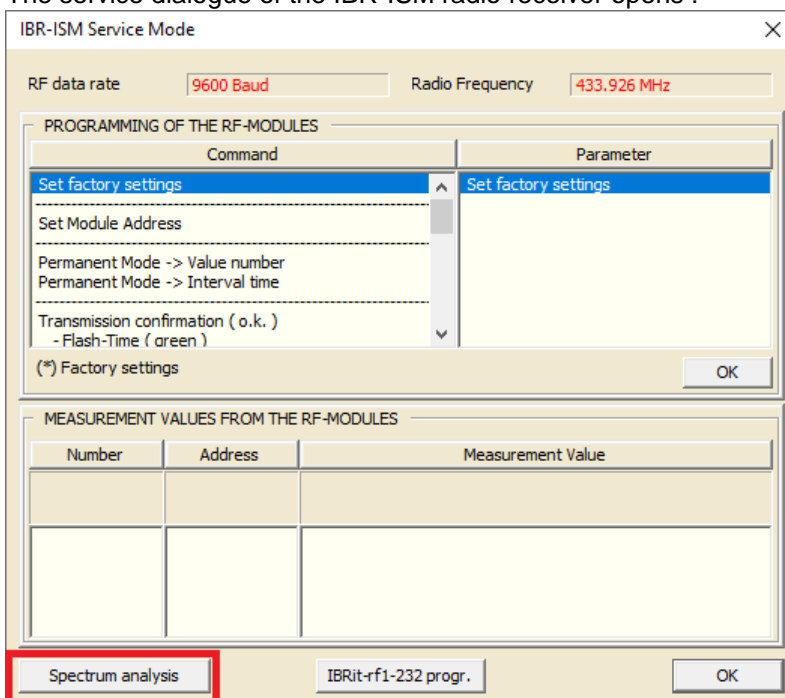
The ISM-usb radio receiver can do an RSSI measurement (Received Signal Strength Indicator). By this the signal strength of radio or interference signals can be measured which might exist in the frequency range of the ISM or IBRit-rf1 radio modules.

Please use the latest versions of our USB driver and the IBR_SimKey software for the test (see chapter 2.3 and 2.4).

Start the IBR_SimKey software and open the dialogue to configure the connected IBR hardware. Please select **USB** as PC-Connection and **IBR-ISM** as IBR-Instrument. Then click the **Service** button to enter the service dialogue of the IBR-ISM module :

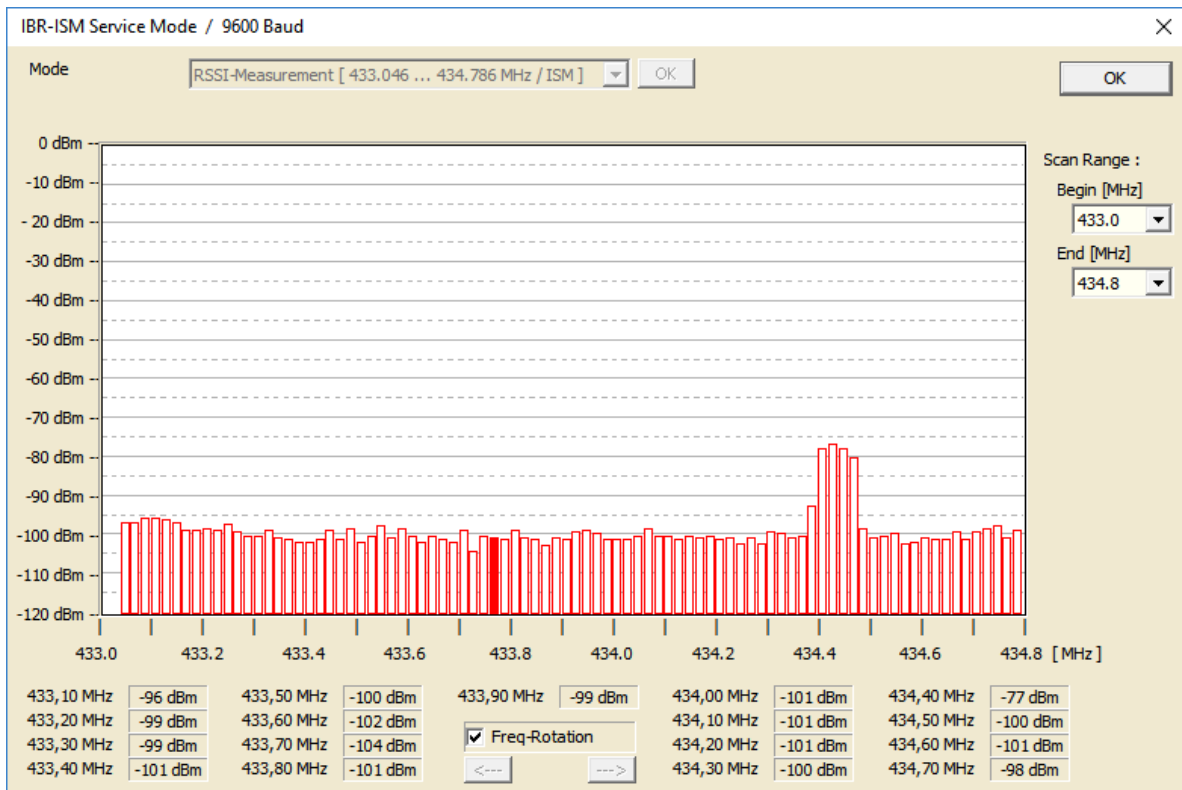


The service dialogue of the IBR-ISM radio receiver opens :





Now, please click **Spectrum analysis** to start the RSSI analysis :



The dialogue shows the current signal strengths in the used frequency range. In this way you can see if there are additional radio signals in the frequency range which might prevent the radio receiver from receiving the measuring values or superimpose its radio signal. If this is the case, please try to place the radio receiver in an area without interferences.

The example above shows the background noise on all frequencies and a weak signal at about 434.4 MHz. Both will in this strength not influence the receiving of values from the ISM or IBRit-rf1 radio modules.

But a stronger signal might interfere with the communication, even if it is at 434.4 MHz.

Note : *Because the communication between ISM or IBRit-rf1 radio transmitter and radio receiver is bidirectional, you should additionally do an RSSI measurement in the work area of the radio transmitter. In this way you can determine if there are radio signals that could interfere with the communication between transmitter and receiver.*





6. Important conditions concerning the use of IBR_SimKey PC software

1. The **IBR_SimKey** software is an accessory for the **IBRit-rf1-usb** or **ISM-usb** PC - Radio station. It is free of charge and so **IBR** does not give any guarantees for the **IBR_SimKey** software.
2. IBR software products are not developed and tested for the high demands in the medical field, in combination with applications in the medical field or in critical components of life-saving systems whose malfunctions or failure can lead to personal injury.
3. On absolutely all applications the stability of the software can be influenced by different factors, e.g. fluctuations in the power supply, computer hardware errors, operating system errors, compiler errors, application development software errors, installation errors, software and hardware compatibility problems, malfunctions or errors of electronic supervisory systems and controller units, transmission errors within electronic systems (hardware and/or software), unintended use or misuse as well as errors by the operator or system developer (harmful influences such as the factors mentioned above are in the following referred to as "SYSTEMERRORS").
4. All applications which contain the risk that SYSTEMERRORS can lead to damages or personal injuries should not only depend on electronic systems. In order to avoid damages, injuries or death the operator or system developer should create reasonable, suitable precautions against SYSTEMERRORS or their consequences. These precautions can include backup or shutoff mechanisms.
5. Because all computer systems are adapted for the operator the systems are different in comparison with the IBR test systems. Because the IBR products can also be integrated in applications not tested or not intended in this way by IBR the operator or system developer is completely responsible for the test and release of the applications in which IBR products are embedded. This contains the structure, the procedure and the security level of the application.
6. In no event IBR will be liable for any damages including lost profits or any special, indirect, incidental or consequential damages arising out of the use or inability to use the product, whether claimed under the safety instructions or otherwise.
7. Corporate guidelines and safety regulations enforced by the industrial trade associations for the prevention of industrial accidents must be strictly observed. Make sure to consult the safety officer at your company.
8. All rights depend on German law.
9. All rights for the **IBR_SimKey** software belong to **IBR Messtechnik GmbH & Co. KG**



7. Safety Instructions

The instrument has been designed and manufactured according to the state of the art and approved technical safety regulations. It is nevertheless mandatory to observe the following instructions in order to prevent personal injuries or accidental death of staff members and other persons.

- 1) All operators must read the present instructions and this manual very carefully **prior to starting operation**.
- 2) The instrument may be used only **in proper operational** condition. Malfunctions or errors that may potentially impair the operational safety must be eliminated immediately.
- 3) The instrument is to be used only for its intended purpose and according to the Instruction Manual. The Instruction Manual is to be kept near the place of operation and ready for use.
- 4) Any modification to or change in procedures concerning the instrument is permitted only with the prior written consent of IBR Messtechnik GmbH & Co. KG and must be carried out by trained staff. Unauthorised opening of the instrument or tampering with the device shall void the guarantee and exempt the manufacturer from any liability. Before opening the instrument, make sure to effectively cut the power supply, e.g. by disconnecting the power cable.
- 5) Disconnect the instrument prior to cleaning.
Never let any liquids penetrate the inside of the instrument.
Do not use cleaners that dissolve plastic.
- 6) Replace faulty fuses only with fuses of **identical** amperage and current characteristics following the instructions given in this manual.
- 7) Corporate guidelines and safety regulations enforced by the industrial trade associations for the prevention of industrial accidents must be strictly observed. Make sure to consult the safety officer at your company.
- 8) Do not operate the instrument in an environment containing explosive gases, because an electric spark can cause an explosion.

We reserve the right to change the design and technical data contained in our documentation without notifying our customers. IBR is not obliged to notify buyers of product changes.

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Windows, EXCEL and Word are registered trademarks of Microsoft Corporation.

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8. Declaration of conformity

Thank you very much for your confidence in purchasing this product. We herewith certify that it was manufactured and inspected in our works.

We declare under our sole responsibility that this product is in conformity with technical data as specified in this instruction manual.

Furthermore, we certify that the measuring equipment used to check this product refers to national master standards. The trace ability of measuring values is guaranteed by our Quality Assurance System.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions. This device may not cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures :

- ◆ Reorient or relocate the receiving antenna.
- ◆ Increase the separation between the equipment and receiver.
- ◆ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ◆ Consult the dealer or an experienced radio/TV technician for help.

Important Notice :

This device complies with Part 15 of the FCC Rules

Operation is subject to the following two conditions :

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning : Changes or modifications made to this equipment not expressly approved by IBR may void the FCC authorization to operate this equipment.



9. Guarantee

The quality of this instrument is guaranteed for a period of 12 months from the date of delivery. This guarantee covers all material and manufacturing defects.

Our liability is limited to product repair services or, should we deem it necessary, replacing or crediting the goods.

This guarantee does not include the batteries or damage due to:

- ◆ *Disregard of operating instructions*
- ◆ *Incorrect handling*
- ◆ *Tampering by unauthorised staff*
- ◆ *Attempts by any unauthorised person to repair the instrument.*

We are not to be held liable for any subsequent damage caused by, directly or indirectly, the instrument or its use.

Notice : If you are returning the instrument under guarantee, please use the original packaging.

Should you detect an irregularity of any kind, please contact one of our authorised distributors or our service department.

D-36166 Haunetal, May 3rd, 2019

I B R Messtechnik GmbH & Co. KG