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Manual

BlueSYSTEM BASIC BlueLEVEL BASIC – BlueMETER BASIC with WyBus-Technology



Two BlueLEVEL BASIC with a BlueMETER BASIC
with cables for data transmission

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Modifications:

Date	Modified by	Description of modifications
5.2.2008	HEH	New with wireless data transmission
01.05.2009	HEH / TRA	New with WyBus technology
9.1.2015	HEH	New: Conformity Declarations and Approvals

In the link list below, you will find more information on different important topics:

- Important Product Information (e.g. Important Conformity Declarations and Approvals)
<http://www.wylerag.com/en/support/certificates/>
- Imagefilms, Instructional videos and Tutorials
<https://www.youtube.com/user/wylerag>
- Manuals und Compendium
<http://www.wylerag.com/en/support/documentation/manuals/>
- Representatives WYLER AG/ Product Training
<http://www.wylerag.com/en/contact/representatives/>

The following **ADDITIONAL MANUALS** may be downloaded from <http://www.wylerag.com>:

- **LEVELSOFT PRO**, the software for measuring flatness and inclination with WYLER inclination measuring instruments
- **MT-SOFT**, that gives the possibility to measure individual elements of machine tools with standard inclination measuring instruments. The measured results can be saved and at a later stage used for comparison and put together to receive a thorough result of the **over all accuracy of the machine tool**.
- **COMPENDIUM**, the guide to our products, technology and to a variety of applications.
- **Description of the interface RS485**

If for any reason it is not possible to download the respective data we will gladly supply against a nominal charge a CD "**ALL-IN-ONE**" with all the manuals in different languages included

1. **BASICS / INTRODUCTION**

The new **BlueSYSTEM BASIC series** has been developed as a basic model to the well known and well proven measuring instruments of the BlueSYSTEM family with wireless data transmission. Compared to the existing systems with wireless data transmission the BlueSYSTEM BASIC series has an excellent price/performance ratio and is easier to operate.

The BlueSYSTEM BASIC is **available with wireless data transmission or cable transmission**. It is however possible to upgrade the system without wireless data transmission at a later stage by WYLER to use BLUETOOTH™ wireless technology.

As its predecessor this newest generation of high precision electronic inclination measuring instruments is specifically suitable for the precision measurement of smallest angles. Applications are therefore in particular the measurement of flatness of surface plates or the measurement of the geometry of machine tools. The sensor itself, the heart of every precision measuring instrument, has been further developed as well, to allow precise measurements even under critical environmental conditions.

The new measuring instruments of the BlueSYSTEM BASIC family can not be used as stand-alone instruments as they do not feature an integrated display. The instrument must be combined with an external display unit (BlueMETER BASIC) in a set.

A set of instruments, also called **ENGINEER SET**, normally consists of one or two BlueLEVEL BASIC and one BlueMETER BASIC, forming the ideal tool for measuring flatness and machines under work shop conditions. Furthermore the ENGINEER SET can be used for any levelling task or analysis of rotations.

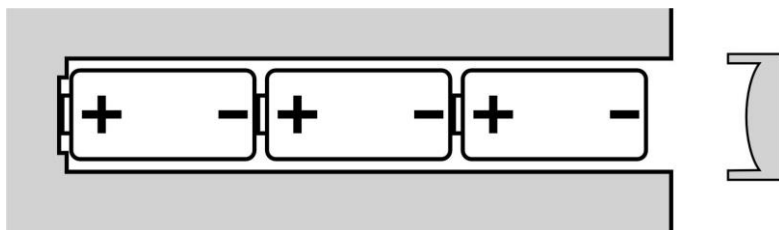
2 PREPARATION AND START-UP OF THE MEASURING INSTRUMENTS BEFORE STARTING

2.1 INSERTING RESPECTIVELY REPLACEMENT OF BATTERIES IN BLUELEVEL BASIC AND/OR BLUEMETER BASIC

2.1.1 EXCHANGE OF BATTERIES IN THE BLUEMETER BASIC

The batteries are not installed in the new instruments they are delivered separately. It is recommended to remove the batteries when transporting the instruments.

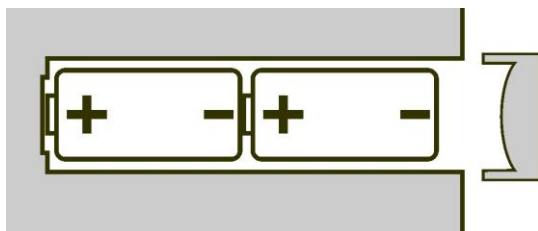
3 pieces 1.5V, Size "C" ALKALINE



2.1.2 INSERTION RESPECTIVELY EXCHANGE OF THE BATTERIES IN THE BLUELEVEL BASIC

The lowest voltage is **1,7 Volt**. After a further voltage drop the red LED "low Power" on top of the handle will start blinking. The batteries should then be replaced.

2 pieces 1.5V, Size "C" ALKALINE



2.2 INITIAL START-UP OF THE INSTRUMENTS

General remarks for instruments with wireless data transmission:

- The operation "Combine a group of Instruments" described in chapter 2.4 has already been done at WYLER's when the instruments are delivered.
- If a configuration is shut off, e.g. after completion of a measurement, the group-setup remains saved. When started again, the communication will be re-activated immediately, i.e. no new grouping will be required.
- If the group of instruments is extended or amended, e.g. by adding or exchanging an instrument, the new instrument must be joined to the group as described in chapter 2.4 "Combine a group of instruments"

First time **start-up of a measuring group** (BlueLEVEL BASIC and BlueMETER BASIC) **with radio transmission** (wireless transmission of the measuring data)

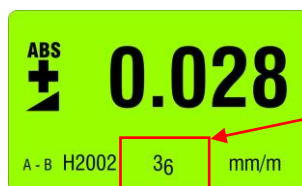
1. Remove the instruments carefully from the transport and storage case and insert the batteries
2. For **groups of instruments with wireless data transmission** (BlueLEVEL BASIC and BlueMETER BASIC) the instruments are delivered in a set-up enabling them to recognise each other after the start-up
3. Place the instruments on a clean horizontally aligned surface. Switch on the instruments (BlueLEVEL BASIC and BlueMETER BASIC). Press the two keys **<ON/OFF>** and **<ON>** on either side of the BlueLEVEL BASIC simultaneously respectively the key **<ON/MODE>** on the BlueMETER BASIC until all 5 LEDs are on. When you release the keys "SYSTEM TEST" will appear on the display.
If the two keys **<ON/OFF>** and **<ON>** of the BlueLEVEL respectively the key **<ON/MODE>** of the BlueMETER BASIC are pressed **longer than 10 seconds when starting the instrument**, all the LEDs start blinking and thus **the automatic shut-off system is deactivated**. In the standard mode the instrument is shut-off automatically after 60 minutes
4. The instruments are now communicating and after a few seconds the measured values will appear on the display of the BlueMETER BASIC. The battery power should be checked (see below)
5. The actual measurement may now be started

First time **start-up of a measuring group** (BlueLEVEL BASIC and BlueMETER BASIC) **without radio transmission** (transmission of the measuring data by cables)

1. Remove the instruments carefully from the transport and storage case and insert the batteries
2. Place the measuring instruments on a clean horizontally aligned surface. Connect the instruments (BlueLEVEL BASIC and BlueMETER BASIC) with the cable(s) supplied
3. Switch on the instruments. Press the two keys **<ON/OFF>** and **<ON>** on either side of the BlueLEVEL BASIC simultaneously respectively the key **<ON/MODE>** on the BlueMETER BASIC until all 5 LEDs are ON. When you release the key(s) "SYSTEM TEST" will appear on the display
If the two keys **<ON/OFF>** and **<ON>** of the BlueLEVEL respectively the key **<ON/MODE>** of the BlueMETER BASIC are pressed **longer than 10 seconds when starting the instrument**, all the LEDs start blinking and thus **the automatic shut-off system is deactivated**. In the standard mode the instrument is shut-off automatically after 60 minutes
4. The instruments are ready without delay and after a few seconds the measured values will appear on the display of the BlueMETER BASIC. The battery power should be checked (see below).
5. The actual measurement may now be started

Remarks concerning the battery power:

BlueMETER BASIC



Display of the actual battery power
(Example: 3,6 V)

2.3 CONNECTING THE INSTRUMENTS (BLUELEVEL BASIC AND BLUEMETER BASIC)



CONNECTOR "A"



- CABLE CONNECTION FOR INSTRUMENT BLUELEVEL BASIC
- CABLE CONNECTION FOR EXTERNAL POWER SUPPLY

CONNECTOR "B"

- CONNECTION TO PC OR LAPTOP
- CABLE CONNECTION FOR EXTERNAL POWER SUPPLY

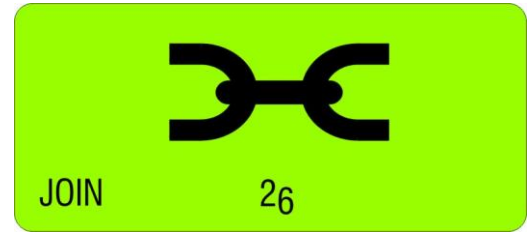
REMARKS:
AN EXTERNAL POWER SUPPLY UNIT MAY BE CONNECTED TO ANY FREE CONNECTOR

2.4 COMBINE A GROUP OF INSTRUMENTS USING THE FUNCTION "JOIN"

The function "JOIN" enables the grouping of instruments through wireless data transmission. The grouping prevents the accidental reading of measuring values from instruments of another measuring group. The function "JOIN" can be performed using the cable connection or with wireless data transmission.

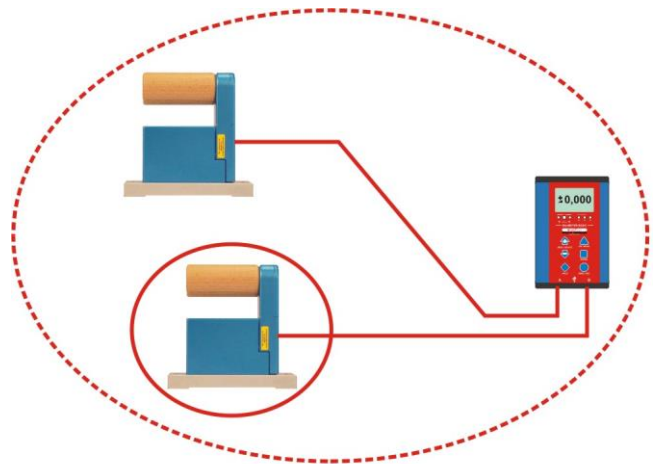
The function "JOIN" through cable connection joins all the instruments connected to a group. Previously used groupings are cancelled.

For the function "JOIN" in wireless mode only one instrument can be added to the group at a time. No instruments must be connected by cables at the same time.



2.4.1 PROCEDURE "JOIN" WITH CABLE CONNECTION

1. Connect all instruments (BlueLEVEL BASIC and BlueMETER BASIC) to be joined to a group with the cables provided and switch on all the instruments
2. Select on the BlueMETER BASIC the menu "JOIN" using the <ON/MODE> key. Confirm with the <ENTER> key. All instruments connected are now searched and joined to a group.
3. After establishing the group a "REFRESH" will be performed.
4. After the grouping the command "SENSOR" will be performed. As the measuring mode is still to be defined, the message "not-defined" will be displayed
5. The measuring mode ("A", "B", "A B" or "A-B" must now be selected. Select the mode preferred using the <ZERO/SELECT> keys (corresponding to the menu [SENSOR]) and confirm with <ENTER>



It is also possible to execute any other function of the menu. For instance it is possible to integrate with further "JOIN" commands additional instruments with wireless connection into the group

6. The sensors must be selected. Select the sensors for A and - depending on the measuring mode - also for B using the <ZERO/SELECT> keys and confirm with <ENTER>. The measuring values are now shown in the display according to the selected configuration.
7. After a successful grouping on both instruments the green LED "READY" will blink shortly as many times as instruments are joined in the measuring group (including the own address)
8. For using the wireless mode (the wireless mode must be switched-on on each instrument) the cables can now be removed. After removing the cables the measuring values will be "freezed" for a short while and replaced by empty zeroes until, after successful connection, the measuring values will be displayed again

After successful connection the blue LED "LINK" will be lighting on all the instruments connected.

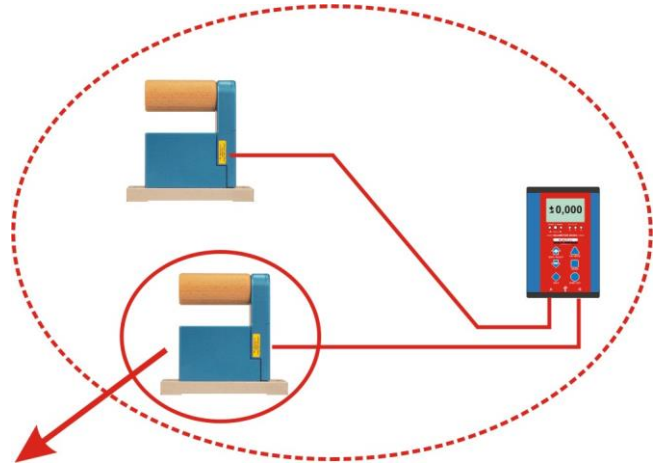
The procedure "JOIN" through cables cancels and overwrites all previously registered groups in the BlueMETER BASIC as well as in the BlueLEVEL BASIC.

2.4.2 PROCEDURE "LEAVE"

Using the function "LEAVE" unleashes an existing measuring group.



1. Press the **<ON/MODE>** button on the BlueMETER BASIC repeatedly until the menu [LEAVE] appears on the display. Confirm with **<ENTER>**.
2. During the log-off the blue LED under "LINK" is lit continuously, the green LED "READY" is blinking or does not shine any more.
3. After successful completion the green LED is blinking for approx. 1 second. This erminates the process.



2.5 RESTART OF A MEASURING GROUP

After a measuring group has been stopped e.g. after the termination of a measurement, the group of instruments remains intact. After the restart the communication is automatically activated and the communication is started. The process JOIN must not be repeated.

3 DESCRIPTION AND FUNCTION OF THE BLUELEVEL BASIC WITH AND WITHOUT RADIO MODULE

Starting the BlueLEVEL BASIC

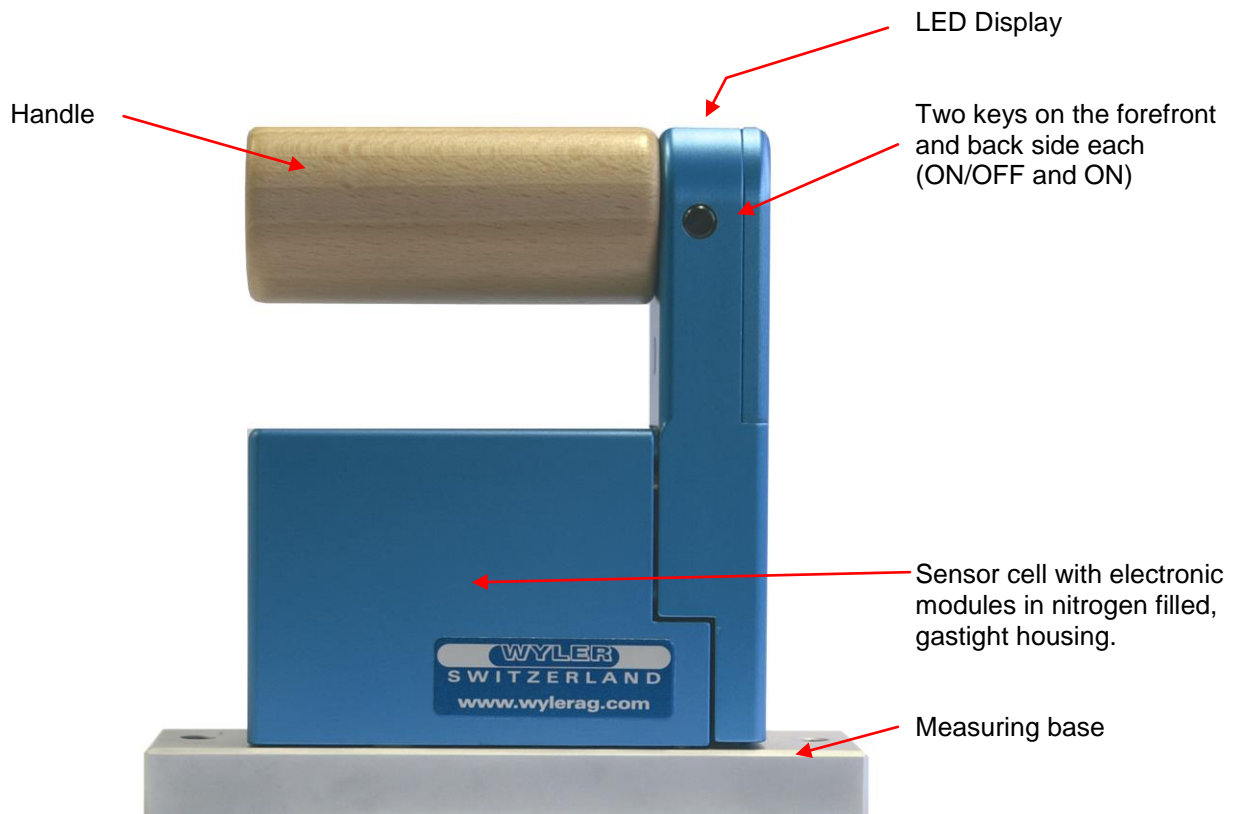
The BlueLEVEL BASIC is started using the <ON/MODE> and <ON> keys located opposite on the handle. The two keys must be pressed simultaneously until all the LEDs on the top of the handle are lit.

In case the BlueLEVEL BASIC is connected to a BlueLEVEL BASIC with external power supply, the BlueLEVEL BASIC is started automatically when the BlueMETER BASIC is switched on.

As soon as the BlueMETER BASIC has reached the operational mode the green LED is blinking.



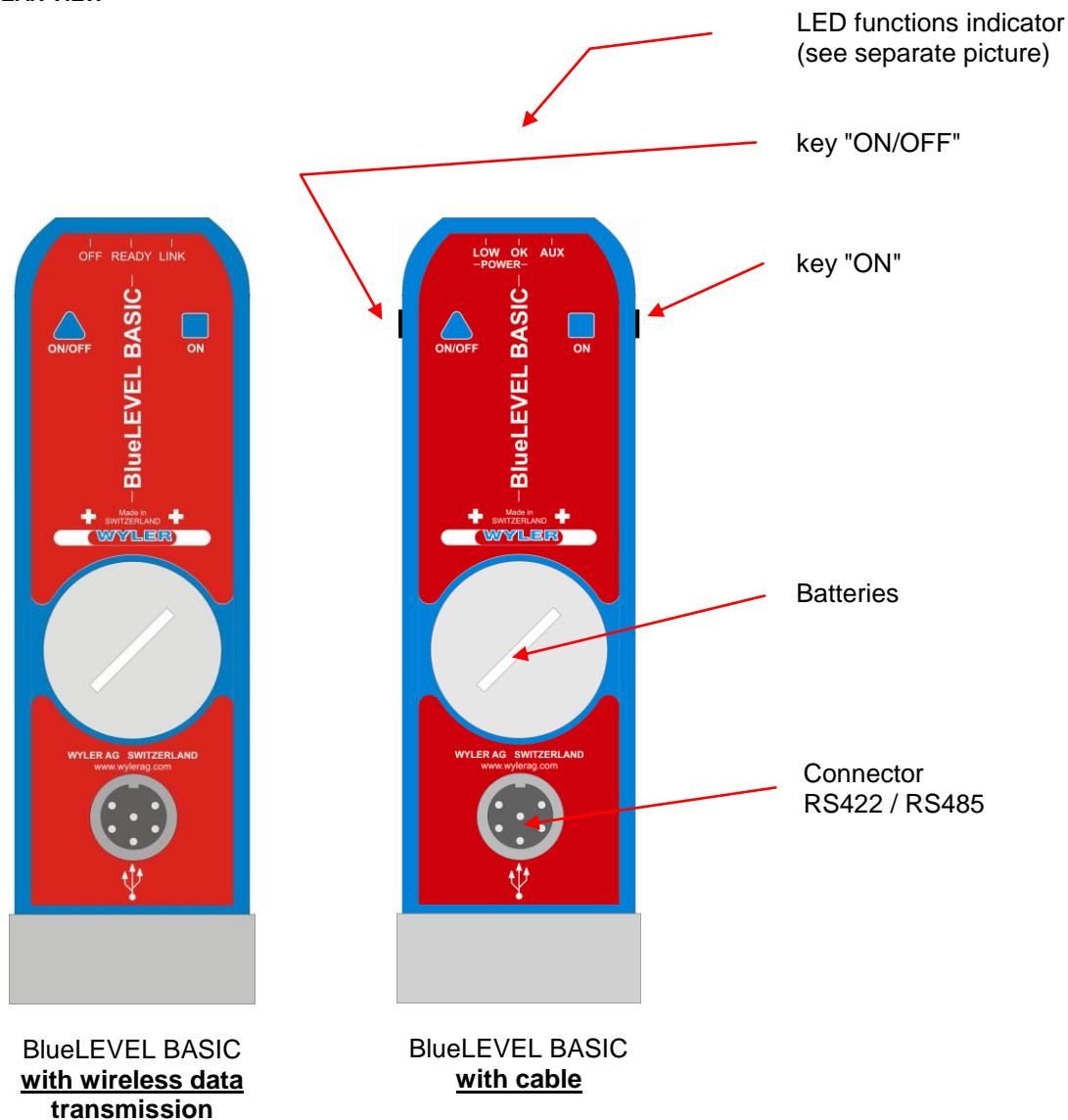
3.1 THE BLUELEVEL BASIC (OVERVIEW)



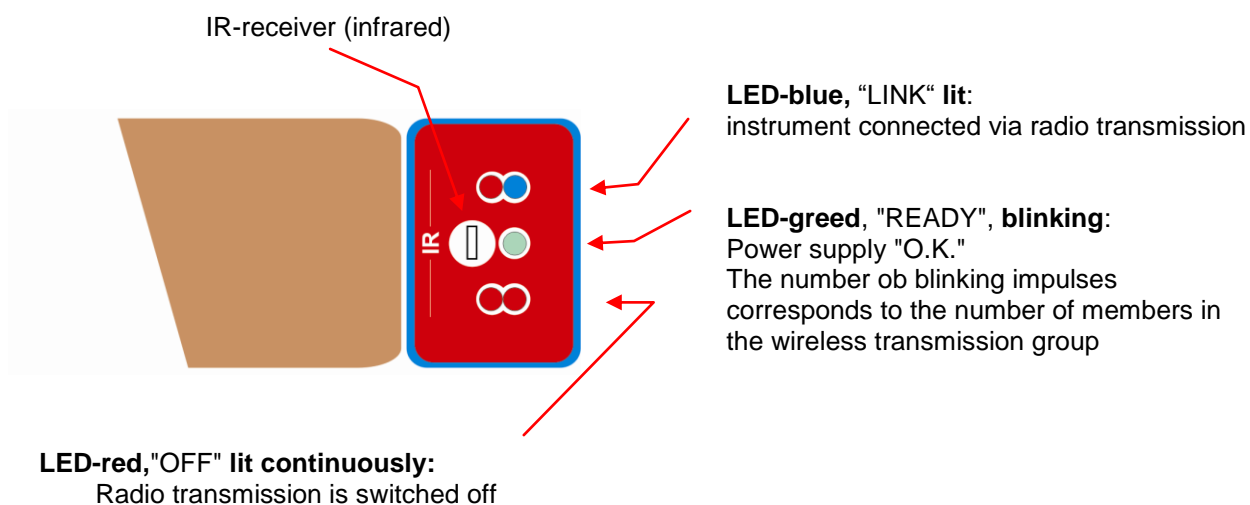
Attention: The housing is NOT rigidly fixed to the measuring base for avoiding mechanical tensions.

3.2 VIEW OF FUNCTIONAL KEYS BLUELEVEL BASIC

3.2.1 REAR VIEW



3.2.2 TOP VIEW OF THE BLUELEVEL BASIC WITH RADIO

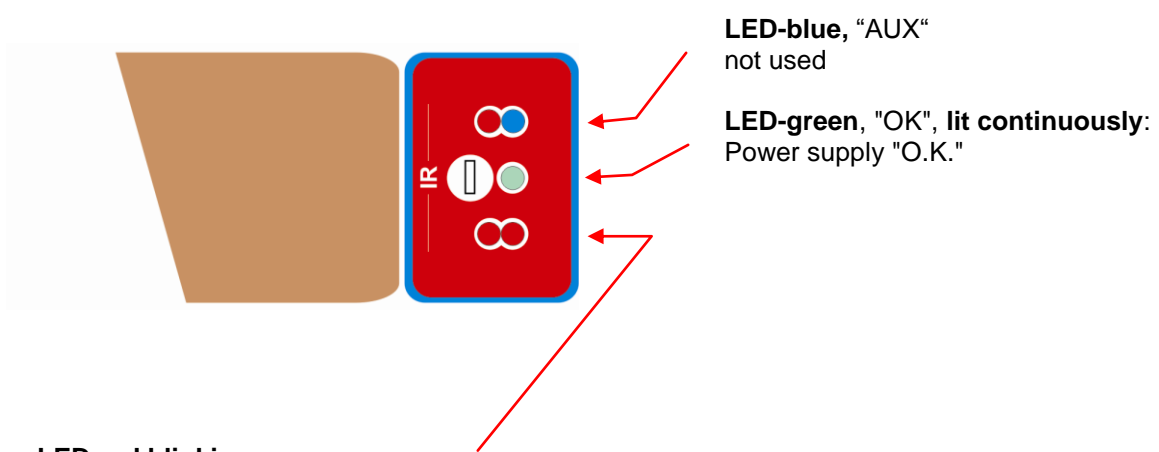


LED-red "OFF" blinking:

Power supply "insufficient" no further measurements possible.- on the BlueMETER BASIC display a remark appears instead of the measuring value, saying that the measuring instrument is not sufficiently powered. **Replace the batteries or supply the systems with a mains adapter**

3.2.3 TOP VIEW OF THE BLUELEVEL BASIC WITHOUT RADIO

IR-receiver (infrared)



LED-red blinking:

Power supply "insufficient" no further measurements possible.- on the BlueMETER BASIC display a remark appears instead of the measuring value, saying that the measuring instrument is not sufficiently powered. **Replace the batteries or supply the systems with a mains adapter**

4 DESCRIPTION OF THE BLUEMETER BASIC

The BlueMETER BASIC is an intelligent digital display unit developed by WYLER AG for the inclination measuring instrument BlueLEVEL BASIC. Besides the excellent measuring accuracy the BlueLEVEL instruments supply a fully digital signal for transmitting these over long distances without any loss of quality.



The BlueMETER BASIC is

- a display unit
- an interface between instrument and PC/Laptop

On the BlueMETER BASIC various parameters may be set or changed, such as:

- Measuring units
- Address of instruments/sensors, port definition (Port)
- Filter-settings
- Relative base length etc.

It is possible to send measured data via a RS 232 port to a printer, a PC/Laptop or the WYLER software **LEVELSOFT PRO**, **MT-SOFT** and **LabEXCEL**

- Compact and pleasant design in aluminium housing and state of the art technology.
- Wireless data transmission based on the internationally approved Bluetooth™-standard
- Large and well readable LCD display
- Display showing the automatically recognized instruments connected
- Powered by standard 1.5 V batteries type "C"
- In compliance with CE regulations and all applicable EMC regulations

4.1 STARTING THE BLUEMETER BASIC (AND THE INSTRUMENTS BLUELEVEL BASIC)

Please read the manual carefully before working with the BlueMETER BASIC and the BlueLEVEL BASIC for the first time.

Switching the BlueMETER BASIC on

Press the key <ON/MODE> until all 5 LEDs are ON, release the key and "SYSTEM TEST" will appear in the display. After the start-up you will see the actual measuring value of the instruments connected in the last saved measuring configuration and measuring unit.

Using the battery, mode the instrument is automatically shut off after 60 minutes.

If the key <ON/MODE> is pressed for more than 10 seconds when starting the BlueMETER BASIC all the LEDs start blinking and the **automatic shut-off** is deactivated.

4.2 TYPICAL CONFIGURATIONS WITH BLUEMETER BASIC AND BLUELEVEL BASIC

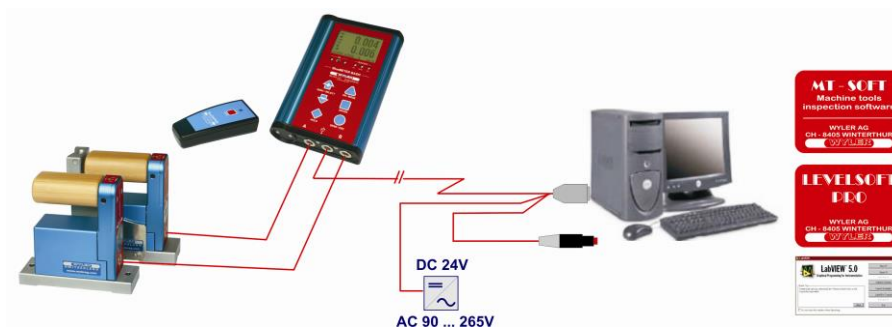
Configurations using BlueLEVEL BASIC instruments and BlueMETER BASIC



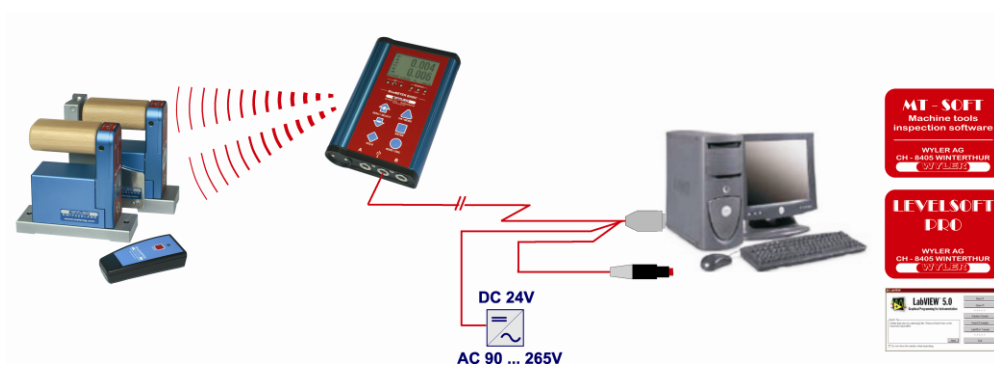
Data transmission via cables



Configurations with wireless data transmission



Configurations with data transmission via cables and with connection to a PC/Laptop



Configurations with wireless data transmission and with connection to a PC/Laptop

Remarks:

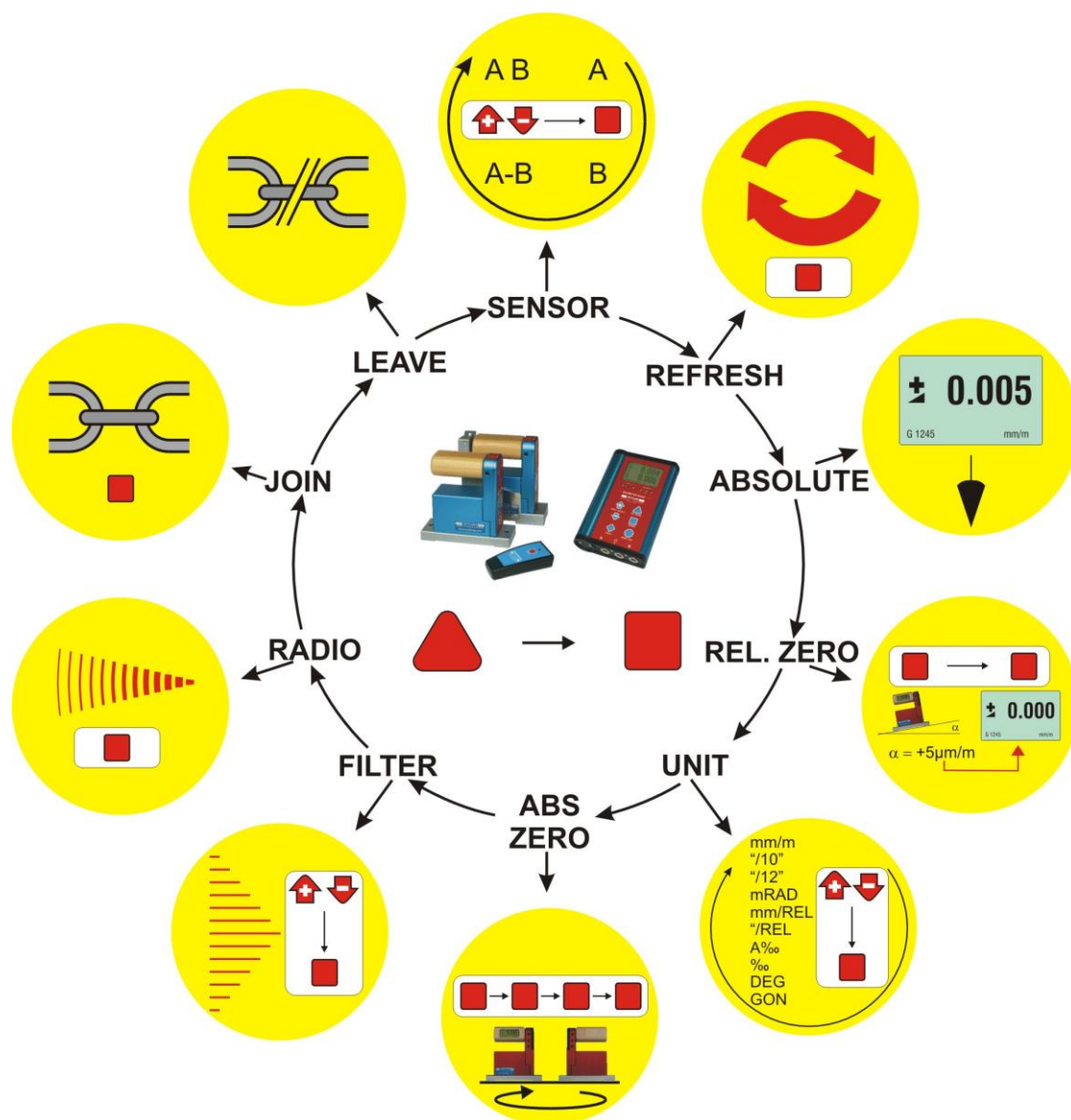
Systems equipped with wireless data transmission can alternatively be used with cable connection. The radio module will be deactivated.

4.3 Overview of the BLUEMETER BASIC

Large LCD display with actual measured value, instrument's address and measuring unit



4.4 FUNCTIONAL MENU WITH BLUEMETER BASIC USING THE FUNCTION KEY (according to G. Lasczyk) using the key <ON/MODE> on the BlueMETER BASIC only



Switching the instrument on

- **Switching on the display instrument BlueMETER BASIC.** Press the <ON/MODE> key until all 5 LED's are illuminated then release the key and "SYSTEM CHECK" is shown on the display. After starting, the actual measured value as well as the last used unit in the last used configuration is displayed. Using the battery mode, the instrument is automatically shut off after 60 minutes.

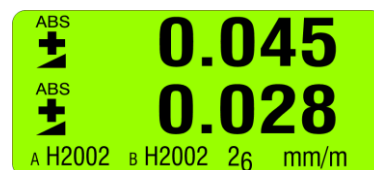
When pressing the key <ON/MODE> continuously for more than 10 seconds all the LEDs start flashing and the **automatic shut off** is disabled.

SENSOR

(BlueMETER BASIC only)

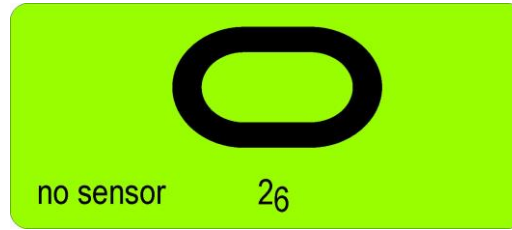
- Setting the active sensors/ports and selection of the single or differential measurement display / **BlueMETER only.**
The following possibilities are available:

- Instrument Port "A"
- Instrument Port "B"
- Instrument Port "A" – Instrument Port "B"
- Instruments on Ports "A" and "B" simultaneously (see picture)



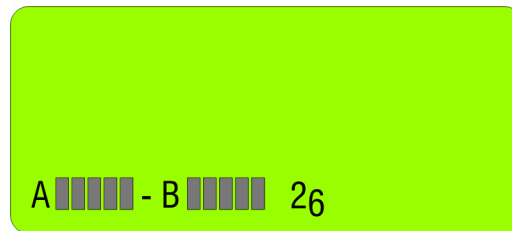
cont.
SENSOR
(BlueMETER
BASIC only)

Possible error messages in the **status line** of the display:



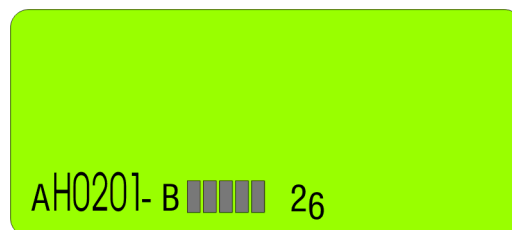
- "no sensor": no sensors found yet. NO sensors are connected via cables and no instruments with wireless data transmission are registered.
In case the sensors should have been connected through cables, a REFRESH must be performed after these have been connected. Press the key **<ON/MODE>** repeatedly until **[REFRESH]** appears on the display. Confirm with **<ENTER>**.
- Now the measuring mode and the sensors can be selected. Confirm with **<ENTER>** and select the required configuration using the **<ZERO/SELECT ±>** key.
 - measuring instrument port "A"
 - measuring instrument port "B"
 - measuring instrument port "A - measuring instrument port "B"
 - measuring instruments port "A" and "B" simultaneously

During the selection the following picture will be shown (example)



Confirm the configuration selected with **<ENTER>**. The address of the sensor "A" can now be selected with the keys **<ZERO/SELECT ±>**. Confirm the selection with **<ENTER>**.

Select the address of the first sensor (measuring instrument) using the keys **<ZERO/SELECT ±>** and confirm with **<ENTER>**.



The second sensor (measuring instrument) can be selected with the same procedure

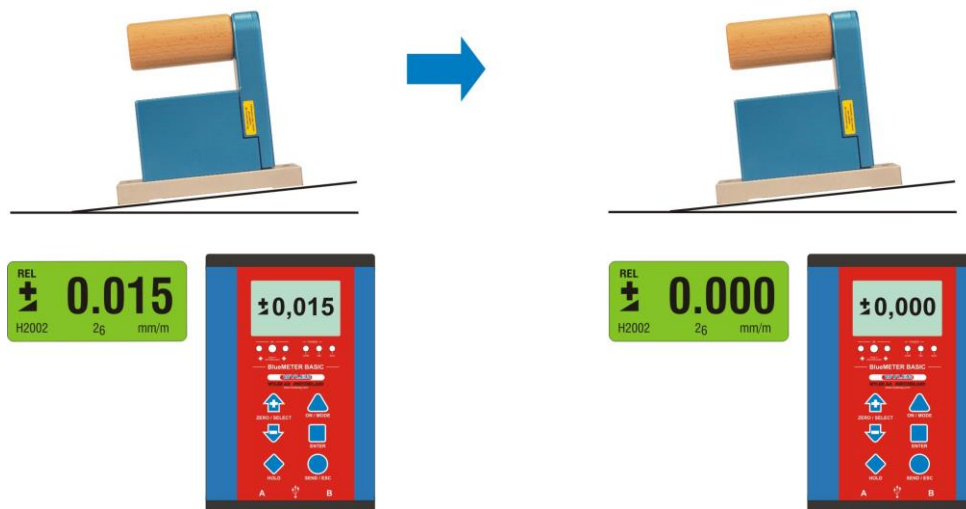
When setting the measuring system in operation next time a selection as described above is not necessary again. The configuration last used will automatically be started.

<p>cont. SENSOR</p> <p>(BlueMETER BASIC only)</p>	<p>- Possible error messages in the display:</p> <div data-bbox="668 221 1187 445" data-label="Image"> </div> <ul style="list-style-type: none"> • When starting the system a cross between to arrows appears (picture above) • If a cross between two arrows appears this is a hint that the sensor is listed in the configuration of instruments but cannot be detected due to one of the following reasons: <ul style="list-style-type: none"> ○ The measuring instrument is not switched on ○ The distance between the BlueMETER BASIC and the Blue LEVEL BASIC is to long ○ The wireless communication element on the measuring instrument is not switched on
<p>REFRESH</p> <p>(BlueMETER BASIC only)</p>	<p>Starts the search for instruments connected and registers them in the internal list of instruments. Instruments not connected any more are marked in the list of instruments as not present. To make a later search easier these remain, however, in the list.</p> <p>The function REFRESH must be performed when new instruments have been connected. After the REFRESH the instrument automatically executes the function SENSOR and waits for the selection of a sensor.</p> <p>If BlueLEVEL BASIC or BlueTC instruments, which have never before been linked to this BlueMETER, should be used, these must be integrated step by step. After each new instrument connected to a set of cables the function REFRESH must be performed again.</p> <p><u>For BlueMETER only</u></p>
<p>ABSOLUTE</p> <p>(BlueMETER BASIC only)</p>	<p>Standard measuring mode, absolute measured value (Zero-offset considered). Provided that a reversal measurement has been performed before, the instrument displays the actual deviation from the absolutely horizontal plane.</p>

REL.ZERO

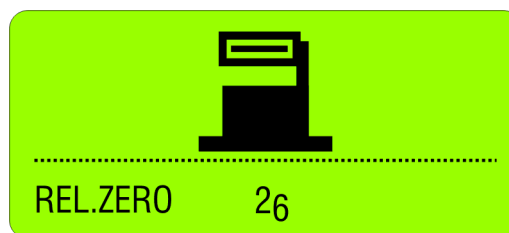
(BlueMETER BASIC only)

With one instrument (Display on the BlueMETER BASIC only)

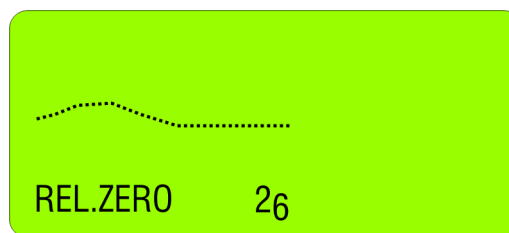


Relative measured value (In the relative mode a "ZERO-OFFSET" determined e.g. by reversal measurement is superimposed by the value "REL ZERO OFFSET")

Use the key **<ON/MODE>** select the menu [REL.ZERO] and confirm with **<ENTER>**. First the following picture is shown in the display of the BlueMETER BASIC.



Use **<ENTER>** or the IR-zapper for confirming the choice. The actual values are collected and constantly displayed.



When the values have stabilized the relative ZERO can be confirmed with **<ENTER>** or with the IR-zapper.



On the display the value "0.000" is seen. This is now the relative value considering the offset. This value is used for all additional measurements as reference.

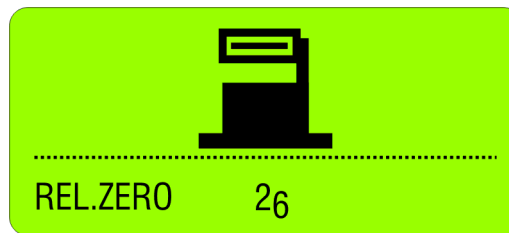
Cont.

REL.ZERO

(BlueMETER
BASIC only)

Option / Manual setup

Use the key **<ON/MODE>** select **[REL.ZERO]** and confirm with **<ENTER>**. First the following picture is shown in the display of the BlueMETER BASIC



Use **<ON/MODE>** for cancelling the procedure

The following picture is seen. It shows an earlier value for a **ZERO OFFSET**.

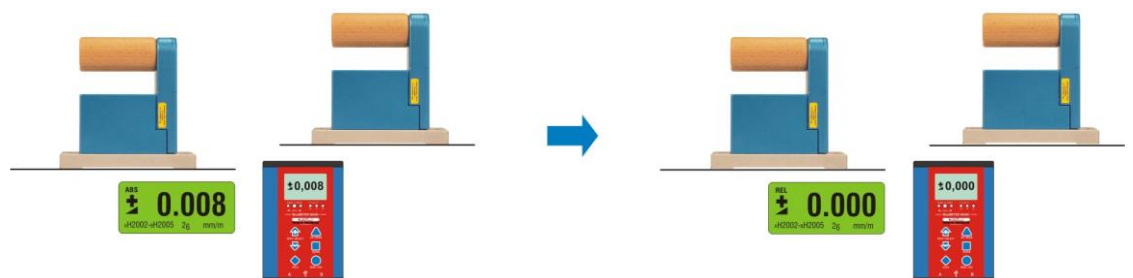


This value may now be changed manually with the keys **<ZERO/SELECT ±>** and then confirmed with **<ENTER>**.

On the display the value is seen. This is now the relative value considering the offset. This value is used for all additional measurements as reference. E.g.



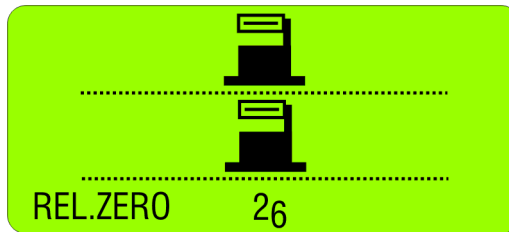
Two instruments connected, differential measurement Instrument "A" minus instrument "B"



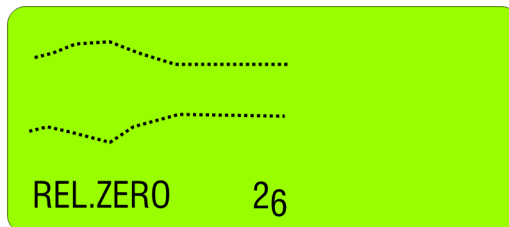
Use the key **<ON/MODE>** select **[REL.ZERO]** and confirm with **<ENTER>**. First the following picture is shown in the display

REL.ZERO

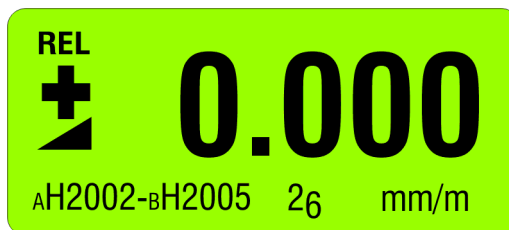
(BlueMETER
BASIC only)



Use **<ENTER>** or the IR-zapper for confirming the choice. The actual values are collected and constantly displayed.



When the values have stabilized the relative ZERO can be confirmed with **<ENTER>** or with the IR-zapper.



On the display of the BlueMETER BASIC the value "0.000" is seen. This is now the relative value considering the offset. This value is used for all additional measurements as reference.

UNIT
(BlueMETER
BASIC only)

Setting the measuring unit.

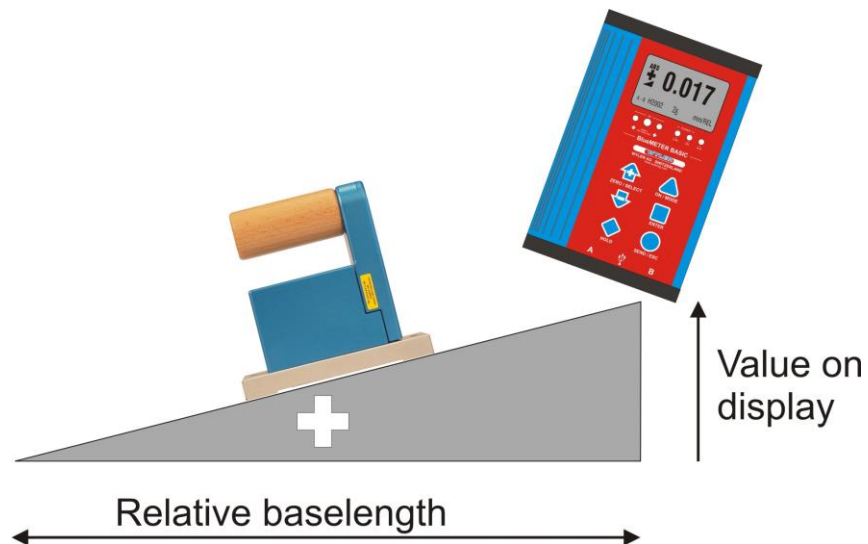
The desired measuring unit can be selected by repeatedly pressing the key **<ON/MODE>** until the selection pointer is below the function **UNIT**. Confirm with the **<ENTER>** key.

The following **measuring units** can be chosen at the BlueMETER BASIC:

XXX.XXX	GON	New degree, 3 decimals
XX.XXXX	GON	New degree, 4 decimals
XXXX.XX	mm/m	mm per m / 2 decimals
XXX.XXX	mm/m	mm per m / 3 decimals
XX.XXXX	"/10"	Inch per 10 Inch / 4 decimals
XX.XXXX	"/12"	Inch per 12 Inch / 4 decimals
XXXX.XX	mRad	Milliradian / 2 decimals
XXX.XXX	mRad	Milliradian / 3 decimals
XXXX.XX	mm/REL	mm per relative base / 2 decimals
XXX.XXX	mm/REL	mm per relative base / 3 decimals
XX.XXXX	"/REL	Inch per relative base / 4 decimals
XXXX.XX	A ‰	Artillerie-permille
XXXX.XX	‰	Permille
XXX.XXX	DEG	Degree / 3 decimals
XXXX°XX'	DEG	Degree / Minutes
XXXX°XX"	DEG	Minutes / Seconds
XXXXXX"	DEG	Seconds
XXXXX.X"	DEG	Seconds / 1 decimal
XX°XX'XX''	DEG	Degree / Minutes / Seconds

CHANGE RELATIVE BASE / SAVE SET-UP

A mode, displaying inclination by the height in mm [**mm/REL**] / inch [**"/REL**] at the end of a straight line with the length previously set, is included in the BlueMETER BASIC. Factory default settings for base length are: 1000 mm or 10.000 inch.



After selecting the unit [**mm/REL**] or [**"/REL**] the last defined relative base length is displayed. If no relative base length has been selected previously a standard base length of either 1000 mm or 10.000 inches is shown. This relative base length can be changed as follows:

- The displayed values may be changed by using the key **<ZERO/SELECT ±>**, the change begins with the last (lowest) digit
- Using the key **<ON/MODE>** the next digit to be changed is selected
- At the end the changes will be saved by using the key **<ENTER>**

The displayed value is from now on the measured height related to the relative base length

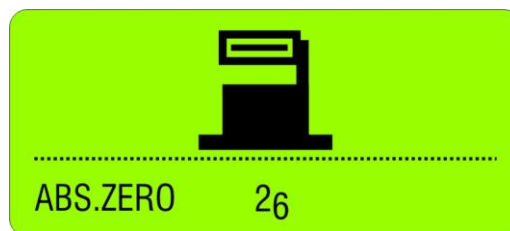
ABS.ZERO
(BlueMETER
BASIC only)

Setting of absolute ZERO with a **reversal measurement**.

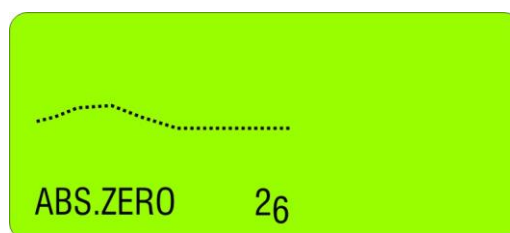
Using the reversal measurement is a simple way to determine the exact **ZERO OFFSET** of the instrument as well as the exact inclination of the surface where the instrument is placed.

- Slide the instrument onto a flat, horizontally levelled surface (e.g. engineer's surface plate).
- The position of the instrument is to be marked on the surface.
- Use the key **<ON/MODE>** to get to the menu point **[ABS.ZERO]** and confirm with **<ENTER>**

On the BlueMETER BASIC the following display is seen:

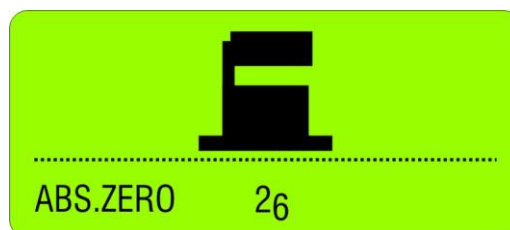


- Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are visible in graphic form.



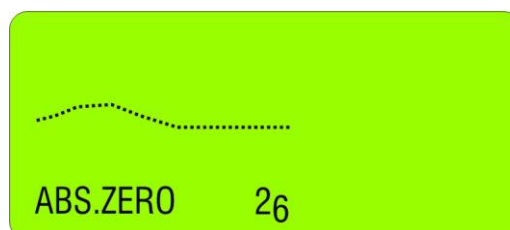
When the curve is getting a straight line confirm the first value with the zapper or with **<ENTER>**

- After the first reading the following display is seen:



This display means the first reading was successful. The instrument must be turned 180 degrees without lifting and slid exactly onto the previously marked position

- Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are again visible in graphic form.



**Cont.
ABS.ZERO**

**(BlueMETER
BASIC only)**

- When the curve is getting a straight line confirm the second value with the zapper or with **<ENTER>**
- After the second reading the following display is seen:

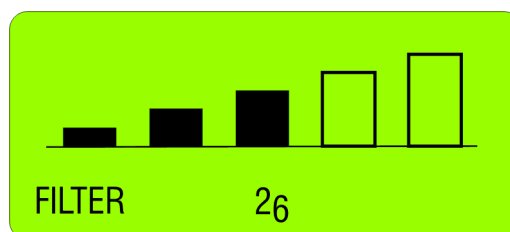


With this the reversal measurement is finished and the instrument shows the true absolute value.

FILTER

**(BlueMETER
BASIC only)**

Setting a filter type



Using the key **<ON/MODE>** select the menu [FILTER] and confirm with **<ENTER>**. With the key **<ZERO/SELECT ±>** choose the filter type and confirm with **<ENTER>**.

Filter description:

- FILTER 1: No filter, no integration of measured values (T const. = 0.33 Sec.)
- FILTER 2: Floating average over 3 measured values (T const. = 1 Sec.)
- FILTER 3: **Floating average over 15 measured values (T variable. = 0.33 ... 5 Sec)**
- FILTER 4: Floating average over 6 measured values (T const. = 2 Sec.)
- FILTER 5: Floating average over 15 measured values (T const. = 5 Sec.)

T: Reply time in case of position changes. With filter 3 the amount of change of the measuring value defines the number of values to be integrated in the floating average. With larger changes the number of values will be reduced, with small changes the number is increased.

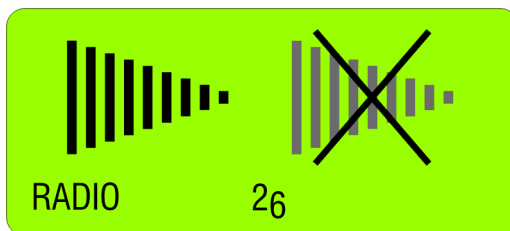
Standard (factory) setting is **Filter "3"**

If BlueLEVEL instruments are connected the filter is used in the differential mode only. In all other modes the filter settings in the instruments are used. A change of filter settings must thus be made on the instruments.

RADIO

Switching the wireless transmission ON respectively OFF (using cables / save on batteries!)

Select the Menu [RADIO] using the key <ON/OFF> and confirm with <ENTER>.



For definitively switching the wireless transmission ON or OFF confirm again with <ENTER>. As a sign that the radio transmission is switched off, the **red LED** on the handle will be ON.

The switching on of the wireless transmission is done in the same way. As a sign that the wireless transmission is switched ON, the **green LED** on the handle is blinking.

JOIN

Combine a group of instruments which should communicate together to a measuring group

See detailed description in chapter 2.4 / Combine a group of instrument to a measurement group using the function "JOIN"

LEAVE

Disconnect the instrument from a measuring group

See detailed description in chapter 2.5 / Removing an instrument from a measuring group using the function "LEAVE"

**For additional details please consult the
flow charts chapter "L" / [flowcharts](#) pages 68 - 79**

ADDITIONAL FUNCTIONS OF THE BLUEMETER BASIC:

Adjusting the display contrast

Using the key <ZERO/SELECT ±> the contrast of the BlueMETER BASIC display can be adjusted according to the requirement.

4.5 TEACH-IN of the IR-trigger (Zapper) to the BlueMETER BASIC and to the BlueLEVEL BASIC)

In order to eliminate interference of the zapper signals when several measuring groups are active in the triggering range the IR trigger can be assigned to a specific measuring group by applying the function TEACH-IN

Procedure **TEACH-IN**:




- The measuring or display instrument must be started
- Keep the key **<ON>** on the measuring instrument (BlueLEVEL BASIC)
or
the key **<ZERO/SELECT>** on the display instrument (BlueMETER BASIC) pressed
- Point the trigger (IR-zapper) in direction of the measuring or display instrument
- Press the **actuator key** on the IR Zapper until both red IR LEDs are lighting up

When the instruments are dispatched this procedure is already factory set standard.



4.6 OPERATING THE BLUEMETER BASIC

4.6.1 DESCRIPTION OF THE VARIOUS KEYS

 <ON/MODE> - Key	
Function - 1 -	<p>Starting the BlueMETER BASIC. Press the <ON/MODE> key until all the 5 LED's are illuminated and on the display it is shown "SYSTEM TEST".</p> <p>After starting the actual measured value as well as the last used unit is displayed. E.g.:</p> <div><p>Actual value and unit set actual leading sign and showing the measurement mode (in the example: ABS = ABSOLUTE mode)</p><p>Unit in [mm/m], resp. [µm/m] or in [Arcsec]</p><p>Serial number of instrument used as identification.</p><p>Actual battery power</p></div> <p>Deactivating the automatic instrument shut off of the BlueMETER BASIC: When pressing the <ON/MODE> key at the starting of the instrument longer than 10 seconds all LED's start blinking and the automatic shut off is deactivated.</p> <p>Exception: When the BlueMETER BASIC is connected to an external power supply the instrument never shuts off automatically.</p>
Function - 2 -	The key <ON/MODE> is used for handling the internal menu . When pressing several times other menu points are displayed.
Function - 3 -	<p>For shutting off the BlueMETER BASIC the key <ON/MODE> must be pressed continuously until all 5 LED's are on and the instrument's display is completely off.</p> <p>When the key <ON/MODE> is continuously pressed for longer than 15 seconds, a date and a 4-digit number is displayed. This number shows the software version loaded in the instrument.</p>
Function - 4 -	Setting the displayed values (memory values) of the functions " REL.ZERO " and " ABS.ZERO " to ZERO. When a value is displayed in this function the value can be set to ZERO by pressing the key <ON/MODE> or the value can be altered step by step by using the key <ZERO/SELECT ±> . The action must be confirmed by using <ENTER> .



<ENTER> – Key

Function – 1 –

The key <ENTER> is used for saving data or for confirming taken actions.

Function - 2 -

In connection with the software LEVELSOFT PRO and MT-SOFT the key is used for collecting the actual measured value.

Function – 3

The key <ENTER> is used for turning on resp. turning off the backlight in the display



<SEND/ESC>- Key

Function - 1 -

Using the key <SEND/ESC> will send the displayed value to a port of a connected PC, or Laptop. It is recommended to use the infrared zapper instead of the <SEND/ESC> key.

OUT-port data format

MeasuringMode_A	[sss xxxxxx sn.nnnnnn<cr>]
MeasuringMode_B	[sss xxxxxx sn.nnnnnn<cr>]
MeasuringMode_A_minusB	[sss xxxxxx - xxxxxx sn.nnnnnn<cr>]
MeasuringMode_A_B	[sss xxxxxx sn.nnnnnn xxxxxx sn.nnnnnn<cr>]

sss = 0 .. 255 - Sequence number

xxxxxx = **Sensor Serial Number and Type**

H4001B	BlueLEVEL or BlueLEVEL BASIC
H4001C	+CLINO PLUS+
H4001M	MINILEVEL NT
H4001Z	ZEROTRONIC Sensor
H4001x	ZEROMATIC 2/1 X - Axis
H4001y	ZEROMATIC 2/1 Y - Axis
H4001X	ZEROMATIC 2/2 X - Axis
H4001Y	ZEROMATIC 2/2 Y - Axis

sn.nnnnnn =	+9.999999 - Positive Overrange
	-9.999999 - Negative Overrange
	Measured value - Angle in rad e.g. +0.226349

Data transmission format:

asynchron, 7Bit, 2 Stopbits, no parity

Function - 2 -

Delete the "HOLD" function and return to the mode **MEASURE**.

Function - 3 -

Cancel the functions of the various menus



<ZERO/SELECT ±> - Keys

Function - 1 -

The keys <ZERO/SELECT ±> are used for selecting different settings, such as:

- Measuring unit
- Ports ("A" / "B" / "A - B" / "A B")
- Relative base settings
- Set "**Zero-Offset**"
- Set "**REL Zero-Offset**" etc.

Function - 2 -

Adjustment of display contrast



<HOLD> - Key







Function - 1 -

With the <HOLD> key a measured value may be "frozen". After pressing the key <HOLD> without further action by the user, the measured value is collected during 15-17 seconds and then displayed. When the conditions are stable this data collection may be reduced by earlier pressing the key <ENTER>. The display shows "on hold". This "frozen" value will be displayed until - by pressing the key <SEND/ESC> - the BlueMETER BASIC will return to the measuring mode.

Function - 2 -

When using the mode "**REL.ZERO**" and "**ABS.ZERO**" the actual measuring value can be accepted by pressing the <HOLD> key.

4.6.2 DESCRIPTION OF VARIOUS DISPLAY FORMS ON THE BLUEMETER BASIC

<p>Main display</p> 	<p>Display of the actual measured value</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>0.025</p> <p>AH2002-BH2005 26 mm/m</p> <p>Display in [mm/m]</p> <p>The display of the BlueMETER BASIC shows the difference value between instrument "A" H2002 and instrument "B" H2005</p> </div> <div style="text-align: center;">  <p>0.019</p>  <p>0.008</p> <p>AH2002 BH2005 26 mm/m</p> <p>Display in [mm/m]</p> <p>The display of the BlueMETER BASIC shows the measured values of the instrument "A" H2002 (above) as well as the instrument "B" H2005 (below)</p> </div> </div>																				
<p>Display of the inclination</p>	<p>The picture shows the direction of the value's inclination</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Inclined to the right: positive</p> </div> </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Declined to the right: negative</p> </div> </div>																				
<p>Menu</p>	<table border="0"> <tr> <td>SENSOR</td><td>Setting the active sensors/ports and selection of the single or differential measurement display. BlueMETER BASIC only</td></tr> <tr> <td>REFRESH</td><td>Update of the list of instruments</td></tr> <tr> <td>ABSOLUTE</td><td>Standard measuring mode</td></tr> <tr> <td>REL.ZERO</td><td>Relative measurement</td></tr> <tr> <td>UNIT</td><td>Setting the required units</td></tr> <tr> <td>ABS.ZERO</td><td>Setting absolute zero</td></tr> <tr> <td>FILTER</td><td>Setting a filter type (ZEROTRONIC only)</td></tr> <tr> <td>RADIO</td><td>Switch radio mode ON or OFF</td></tr> <tr> <td>JOIN</td><td>Joining a group of instruments</td></tr> <tr> <td>LEAVE</td><td>Leaving a group of instruments</td></tr> </table>	SENSOR	Setting the active sensors/ports and selection of the single or differential measurement display. BlueMETER BASIC only	REFRESH	Update of the list of instruments	ABSOLUTE	Standard measuring mode	REL.ZERO	Relative measurement	UNIT	Setting the required units	ABS.ZERO	Setting absolute zero	FILTER	Setting a filter type (ZEROTRONIC only)	RADIO	Switch radio mode ON or OFF	JOIN	Joining a group of instruments	LEAVE	Leaving a group of instruments
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FILTER	Setting a filter type (ZEROTRONIC only)																				
RADIO	Switch radio mode ON or OFF																				
JOIN	Joining a group of instruments																				
LEAVE	Leaving a group of instruments																				

Status of battery power "BATT"

BlueLEVEL BASIC
without radio

Battery indication of the BlueLEVEL BASIC without radio module

- **LED-blue**, "AUX": not used Verwendung
- **LED-green**, "OK", **lit continuously**:
Power supply "O.K."
- **LED-green**, "OK" **lit continuously** and the battery symbol (see illustration next page) in the display of the BlueMETER BASIC is **blinking**:
Power supply "sufficient". Measuring still possible.
It is, however, recommended to replace the batteries in the BlueMETER BASIC or to connect the system to an external power supply.
- **LED-red**, "LOW" **blinking continuously**:
Power supply "insufficient". **Batteries must be replaced or the system must be powered from an external power supply**

BlueLEVEL BASIC
with radio

Battery indication of the BlueLEVEL BASIC without radio module

- **LED-blue**, "LINK" **is lit continuously**:
a connection via wireless transmission is active
- **LED-green**, "READY", **blinking**:
Power supply "O.K."
the number of impulses corresponds to the number of members connected in the wireless transmission group
- **LED-green**, "READY" and the battery symbol (see illustration next page) in the display of the BlueMETER BASIC are **blinking**:
Power supply "sufficient". Measuring still possible.
It is, however, recommended to replace the batteries in the BlueMETER BASIC or to connect the system to an external power supply.
- **LED-red**, "OFF" **lit continuously**:
radio module is switched off
- **LED-red**, "OFF" **blinking continuously**:
Power supply "insufficient". **Batteries must be replaced or the system must be powered from an external power supply**

Battery indicator "BATT"

BlueMETER BASIC

Usually the actual battery power is displayed. E.g. **4.2** (4.2 Volt)

Regarding the status indication of the internal power the following options are possible:

Usually the actual battery power is displayed, e.g. **3.6** (**3.6 Volt**)

Regarding the status indication of the internal power the following options are possible:

Note: The internal voltage U_{INT} must not be confused with the Battery voltage U_{BATT} respectively the external supply voltage U_{EXT} !

External Power Supply U_{EXT}

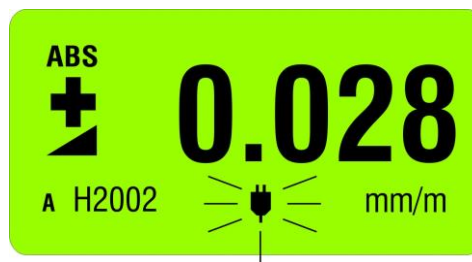
Battery supply U_{BATT}



Indication with sufficient voltage
 $U_{INT} > 4,75V$



Indication with sufficient voltage
 $U_{INT} > 4,75V$



Supply voltage $U_{INT} < 4.75V$



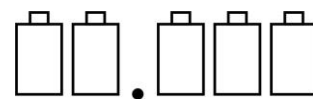
Supply voltage $U_{INT} < 4.75V$

Attention:

The following indications refer to the status of the supply voltage in the measuring instruments which are connected to the BlueMETER; e.g. BlueLEVEL. Instead of a measuring value the following symbols are displayed. These symbols indicate that it is no longer possible to acquire or transmit any values!



Supply voltage in the external
Instrument $U_{INT} < 4.5V$
Measuring no longer possible




Supply voltage in the external
Instrument $U_{INT} < 4.5V$
Measuring no longer possible

Measuring unit

Display of the actual unit set

Key lock

The symbol  indicates that the instrument is performing a critical action and that all keys and entries are blocked.

Sensor-Address

- Function – 1**
- Display of active port address
 - of the instrument showing the measured value
 - connected instrument/sensor used for calibration
- Function - 2**
- Display of the measuring mode, e.g. individual instrument or differential measurement (Sensor A - Sensor B)

APPENDIX

A BASICS AND GENERAL REMARKS ABOUT BLUESYSTEM BASIC AND INCLINATION MEASUREMENT

A1 INTRODUCTION TO THE BLUESYSTEM BASIC

The new **BlueSYSTEM BASIC series** has been developed as a basic model to the well known and well proven measuring instruments of the BlueSYSTEM family with wireless data transmission. Compared to the existing systems with wireless data transmission the BlueSYSTEM BASIC series has an excellent price/performance ratio and is easier to operate.

The BlueSYSTEM BASIC is **available with wireless data transmission or cable transmission**. It is, however, possible to upgrade the system without wireless data transmission at a later stage by WYLER to use Bluetooth™ wireless technology.

As its predecessor this newest generation of high precision electronic inclination measuring instruments is specifically suitable for the precision measurement of smallest angles. Applications are therefore in particular the measurement of flatness of surface plates or the measurement of the geometry of machine tools. The sensor itself, the heart of every precision measuring instrument, has been further developed as well, to allow precise measurements even under critical environmental conditions.

The key features of these new series of instruments are:

- Compact and pleasant new design which is functionally optimized for precision measurement
- Wireless data transmission using the internationally recognised Bluetooth™ wireless technology (optional)
- Complete new sensor design
- Sensor as well as amplifying electronic fully sealed and encapsulated in inert gas
- Increased temperature stability
- Increased long term stability
- Large and well readable LCD display on the BlueMETER BASIC
- Recognition of the specific instrument's address and shown in display of BlueMETER BASIC
- Correct assignment of an instrument
- Activate measurement via IR through the BlueMETER BASIC or one of the BlueLEVEL BASIC
- Compatible to existing measuring bases
- One range only in every instrument
- There are three different BlueLEVEL BASIC types available
 - BlueLEVEL BASIC 1 µm/m: Range ±10mm/m
 - BlueLEVEL BASIC 5 µm/m: Range ±50mm/m
 - BlueLEVEL BASIC 10 µm/m: Range ±100mm/m
- Linearity throughout the measuring range according to DIN 2276
- All instruments are equipped with RS 232 / RS 422 / RS 485 interfaces
- Powered by standard 1.5 V batteries type "C"
- In compliance with CE regulations

The new measuring instruments of the BlueSYSTEM BASIC family can must be used in combination with a display instrument, e.g. with a BlueMETER BASIC, or can be used combined in a set (2 BlueLEVEL BASIC and 1 BlueMETER BASIC).

A set of instruments, also called **ENGINEER SET**, normally consists of one or two BlueLEVEL BASIC and one BlueMETER BASIC, forming the ideal tool for measuring flatness and machines under work shop conditions. Furthermore the ENGINEER SET can be used for any levelling task or analysis of rotations.

The **ENGINEER SET** is specifically adapted to the needs of the metrology specialist taking care of machine tool components. There is a broad range of applications due to the possibility to use differential measurement. The system is universally applicable for inclination and for rotational measurements Thanks to its outstanding features and to the special transportation case the ENGINEER SET can be used in-house or be taken along to customers.

A2 INSTRUMENT'S OVERVIEW

THE INSTRUMENTS OF THE BLUESYSTEM BASIC - FAMILY IN DETAIL

The following instruments are part of the BlueSYSTEM family



BlueLEVEL BASIC

The measuring instrument with different sensitivities available



BlueMETER BASIC

Display unit with various functions also serving as interface between PC/Laptop. The BlueMETER Basic is available only without radio module.

Common features of all the BlueSYSTEM BASIC family instruments:

- One international standard in Bluetooth™ wireless technology, if equipped with the radio modules
- All instruments are equipped with RS232 / RE422 / RS485 interfaces
- All instruments compatible to WY-BUS (RS485+)
- All instruments working equivalently on the same level of communication

Additional features only available in the BlueMETER BASIC:

Additional functional keys for:

- Choice of sensor connections A or B, A and B, A minus B
- Refresh function in order to up-date the list of instruments
- Install relative ZERO
- HOLD Function, e.g. for "freezing" a measured value.
- Display of the measured value of one or two instruments connected
- Display of the difference between two connected instruments
- Change of display unit using mm/m ($\mu\text{m}/\text{m}$) or Arcsec
- Set various filter types



BlueLEVEL BASIC
with flat horizontal base



BlueLEVEL BASIC
with prismatic angular base



BlueMETER BASIC

A3 MEASURING PROCEDURE / GENERAL HANDLING TYPICAL CONFIGURATIONS WITHOUT RADIO TRANSMISSION



Used as stand alone instruments not possible as no display on the instruments. A BlueMETER BASIC is needed.

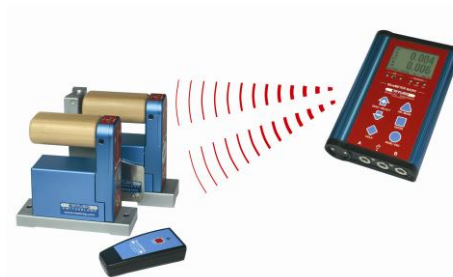
Available sensitivities:

- 1µm/m (0.2 ArcSec)
- 5µm/m (1 ArcSec)
- 10µm/m (5 ArcSec)



Data transmission via cables

Two BlueLEVEL BASIC and one BlueMETER BASIC



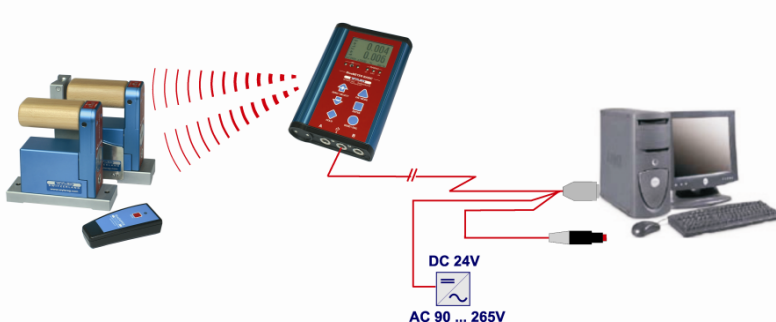
Wireless transmission of the measuring data (via Bluetooth™ wireless technology)

Two BlueLEVEL BASIC with BlueMETER BASIC and Infrared-Zapper to initiate the measurement



Data transmission via cables to PC/Laptop

Two BlueLEVEL BASIC with BlueMETER BASIC and infrared-zapper for triggering the data transmission



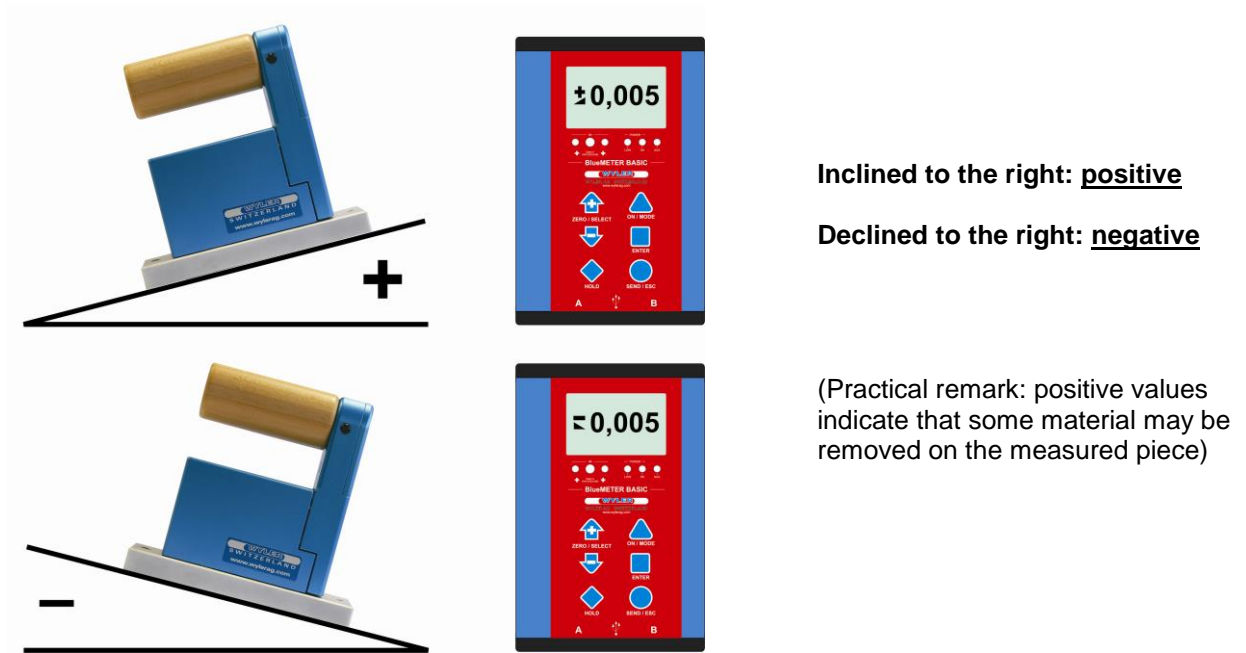
Wireless transmission of the measuring data (Bluetooth™ wireless technology) with connection to a PC / Laptop

Two BlueLEVEL BASIC with BlueMETER BASIC and Infrared-Zapper to initiate the measurement

According to the WyBus compatibility scheme even more than 2 sensors can be connected to a BlueMETER BASIC. With connection via cables up to 63 sensors and with wireless data transmission up to 15 sensors are possible. One or two of sensors can be selected for display on the BlueMETER at a time.

A4 BASIC SETUP OF THE INCLINATION MEASURING INSTRUMENTS / PLUS - MINUS RULE

The instrument should always be placed in a way that the cable output is on the right hand side.

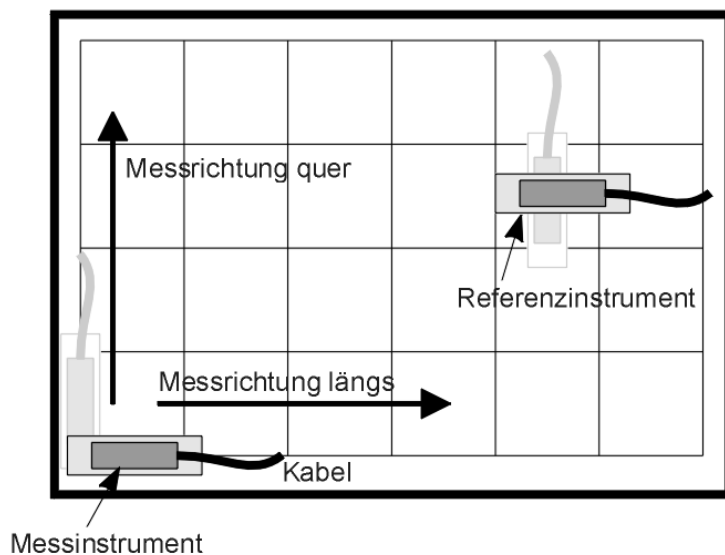


Before starting the measurement enough acclimatisation time must be allowed for the instruments.

Place the instrument carefully to the required measuring spot. (Surface) and read the value on the BlueMETER BASIC.

It is important to measure always in the direction of the cable connector, respectively the cable.

Example: Flatness measurement of a surface plate



IMPORTANT:

- Touch the instruments only at the handle (Temperature!!!)
- Measuring from left to right and from close to far.
- Cable in measuring direction

A5 ABSOLUTE MEASUREMENT / RELATIVE MEASUREMENT / DIFFERENTIAL MEASUREMENT

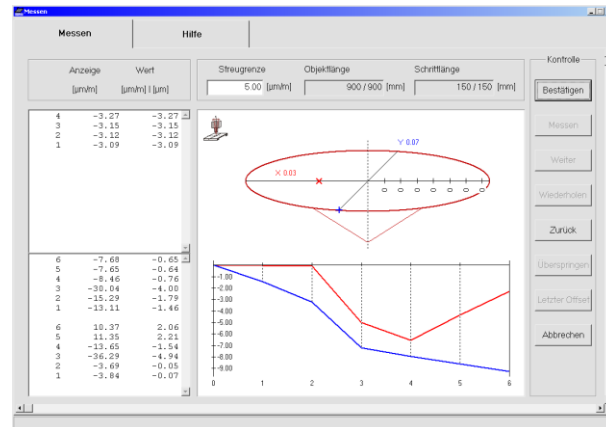
Absolute measurement

(Absolute ZERO)

Condition for the absolute measurement is the performing of a **reversal measurement** for determining the absolute zero (to the centre of the earth).

After this procedure the instrument will display the effective deviation from the centre of gravity. This means the **value is an absolute angle** of the measured surface.

Example: if the object to be measured is absolutely level, the display is "0"
Practical example



Position defined of the vertical spindle in relation to the machine table of a machine tool.

Measurement with **WYLER-software MT-SOFT**

Relative measurement

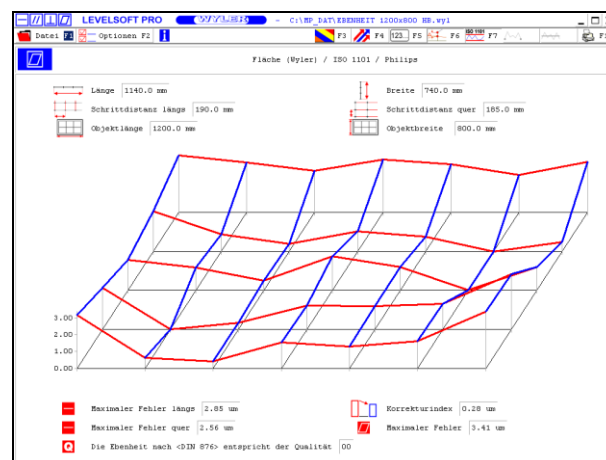
(Relative ZERO)

A number of measurements do not require the absolute ZERO as described above.

Example: Angular deviation between two objects. (Lines, surfaces, guide ways) The measurement instrument is placed on an object and the displayed value is changed to "0". Then the instrument is relocated to a second object and the displayed value of the angle is the angular difference between the two surfaces. If the display is also "0", then both surfaces are parallel.

Most important is that always the instrument is placed on both positions in the same direction.

Practical example



Flatness measurement with **WYLER-software LEVELSOFT PRO**

Differential measurement

A differential measurement is a measurement with two instruments **Measuring instrument (A)** and **Reference instrument (B)**, measuring the angular difference between the two. This means e.g. if the angular change in both instruments is the same the displayed value (Difference A - B) does not change. In principle this is a special relative measurement.

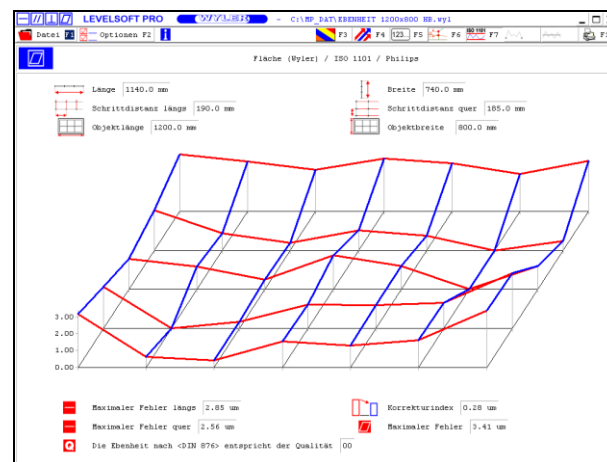


In the following measuring tasks the differential measurement is especially used

- Measurement on object with vibrations imposed.
- Measurements on unstable systems or objects

Example: Measuring the flatness of a machine bed. The reference instrument is placed on a stable part of the machine where the measurement is not interfered. With the measuring instrument the measurement is taking place without removing the reference instrument.

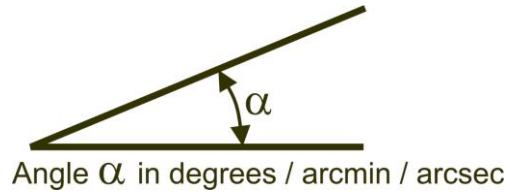
Practical example



Flatness measurement with
WYLER-software
LEVELSOFT PRO

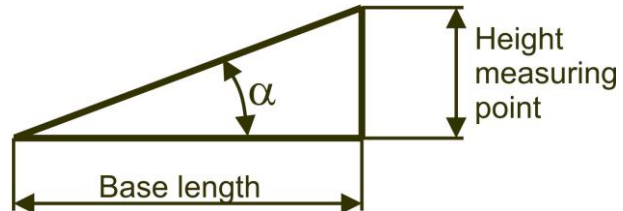
A6 GENERAL REMARKS ABOUT "ANGLES" AND "INCLINATION"

Every angle may be defined in different ways. The most popular way is a definition in Degrees / Minutes / Seconds. This is shown in the graph.



Such a definition is especially useful for larger angles.

With an angular measuring instrument not only an angle may be measured but also the height of a certain point over a defined base length can be calculated. for a profile of a line or a surface) Due to this simple and reliable method a number of tasks are possible, especially for measuring guide ways and surface plates definition.

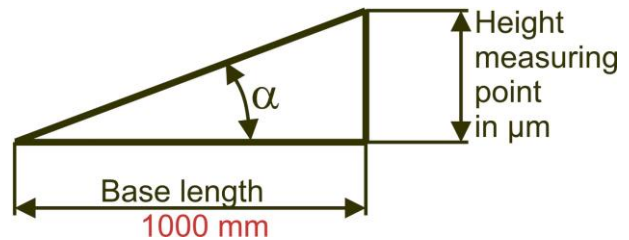


Angle α = Height of the measuring point related to a defined base.

Height of the measuring point = $\tan \alpha \times \text{length of base}$

Example:

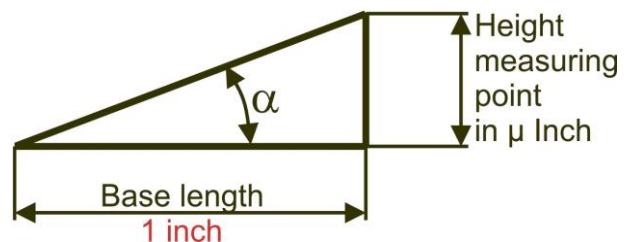
Angle = Height related to a defined base.
e.g. **22 $\mu\text{m}/\text{m}$**



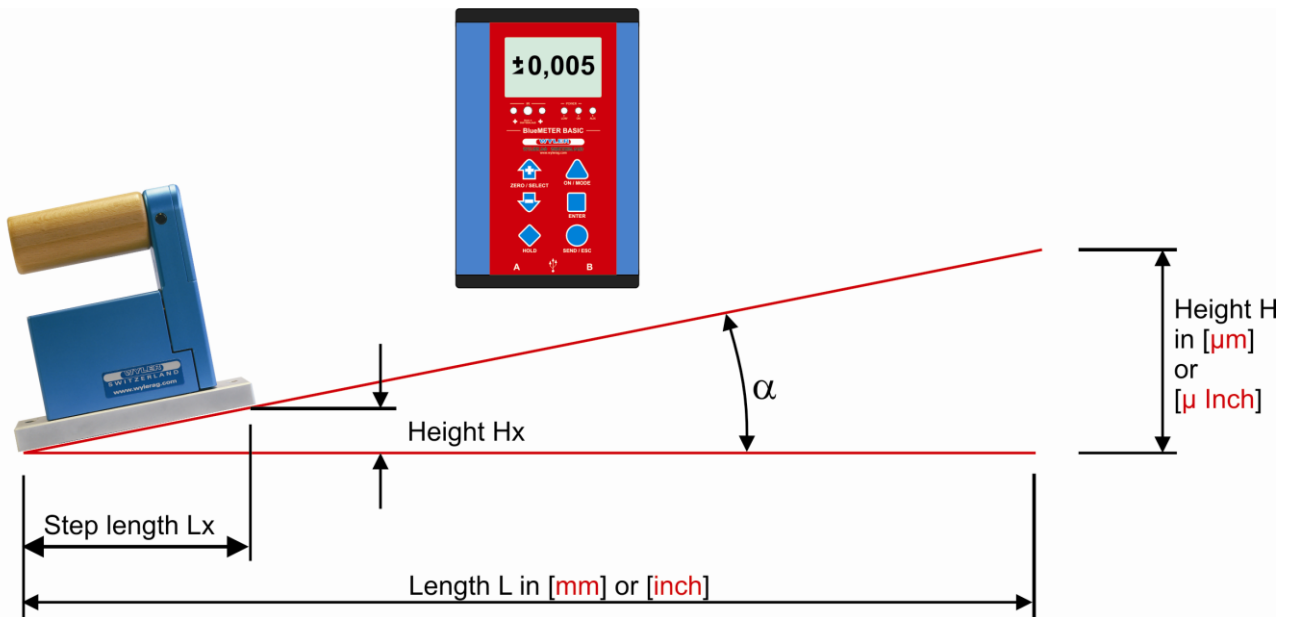
Example:

Because the relation $\mu\text{m}/\text{m}$ is 1/1'000'000 the same relation can also be applied to micro inch/inch

Angle = Height related to a defined base.
e.g. **22 $\mu\text{m}/\text{m}$ are equal to 22 micro inch/inch or 0,00002 Inch / Inch**



A7 HEIGHT RELATED TO THE STEP LENGTH



Height H_x in $[\mu\text{m}]$ related to step length

$$\text{Height } H_x [\mu\text{m}] = \frac{\text{Height } H [\mu\text{m}] \times \text{Step length } L_x [\text{mm}]}{\text{Length } L [\text{mm}]}$$

Height H_x in $[\text{micro Inch}]$ related to step length

$$\text{Height } H_x [\text{micro Inch}] = \frac{\text{Height } H [\text{mikroINCH}] \times \text{Step length } L_x [\text{Inch}]}{\text{Length } L [\text{Inch}]}$$

1 micro Inch = 0,000001 Inch

because Length $L = 1 \text{ Inch} \rightarrow$

$$\text{Height } H_x [\text{micro Inch}] = \text{Height } H [\text{micro Inch}] \times \text{Step length } L_x \text{ in } [\text{Inch}]$$

Height H_x in $[\mu\text{m}]$ related to step length

$$\text{Height } H_x [\mu\text{m}] = \tan \frac{\alpha [\text{arc sec}]}{3600} \times \text{Length } L_x [\text{mm}] \times 1000$$

Height H_x in $[\text{micro Inch}]$ related to step length

$$\text{Height } H_x [\text{micro Inch}] = \tan \frac{\alpha [\text{arc sec}]}{3600} \times \text{Length } L_x [\text{Inch}] \times 1'000'000$$

1 micro Inch = 0,000001 Inch

A8 ZERO SETTING BY REVERSAL MEASUREMENT (ABSOLUTE ZERO)

Using the reversal measurement is a simple way to determine the exact zero point deviation of the instrument (which can thus be compensated) as well as the exact inclination of the surface the instrument is placed

Reversal measurement for determining

- I. Zero point deviation of the instrument N_m
- II. Inclination of the measured surface N_p

Zero point deviation of the instrument N_m :

$$N_m = \frac{X + X'}{2}$$

Inclination of the measured surface N_p :

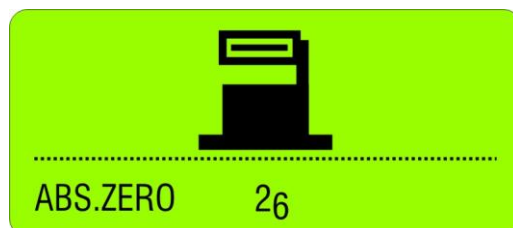
$$N_p = \frac{X - X'}{2}$$

Practical procedure:

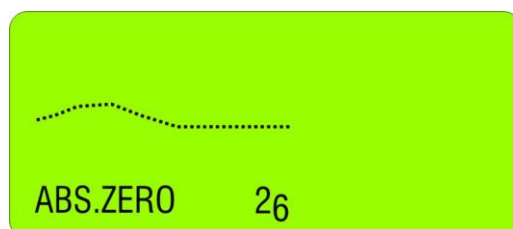
Prior to adjusting the zero point, the BlueLEVEL BASIC instrument should be allowed time to acquire the ambient, respectively the work-piece temperature. In addition the measuring system should be switched on for at least 1 minute (at least 3 minutes for instruments with sensitivity 1 $\mu\text{m/m}$)

- Slide the instrument onto a flat, horizontally levelled surface (e.g. engineer's surface plate)
- The position of the instrument is to be marked on the surface

Use the key **<ON/MODE>** on the BlueMETER BASIC to get to the menu point **[ABS.ZERO]** and confirm with **<ENTER>**. The following display is seen:

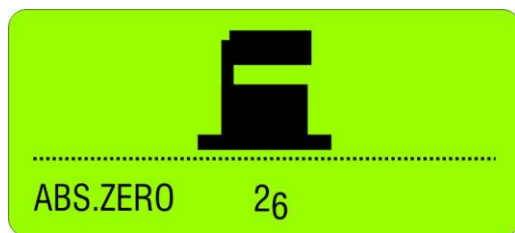


Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are visible in graphic form.



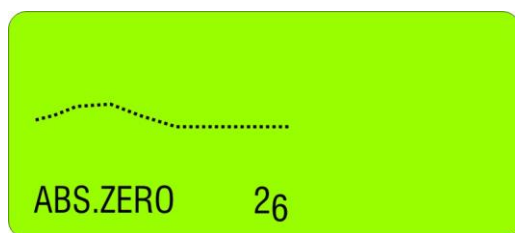
When the curve is getting a straight line confirm the first value with the zapper or with **<ENTER>**

After the first reading the following display is seen:



This display means the first reading was successful. The instrument must be turned 180 degrees without lifting and slid exactly onto the previously marked position

Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are again visible in graphic form.



When the curve is getting a straight line confirm again the second value with the zapper or with **<ENTER>**

After the second reading the following display is seen:



With this the reversal measurement is finished and the instrument shows the true absolute value.

B APPLICATIONS

B1 MEASURING ABSOLUTE

Zero point is to be set by reversal measurement. Now the BlueLEVEL BASIC will read deviations from the absolute horizontal position.

Using BlueLEVEL BASIC with a BlueMETER BASIC the value of the display is shown in [Arcsec] or in [$\mu\text{m}/\text{m}$].

B2 RELATIVE MEASUREMENT

It is not always required to set the instrument to zero by a reversal measurement (absolute ZERO). If e.g. the straightness of a line is measured most of the time the relative straightness is only required.

The same applies when lines, parallels, flatness is measured with the **WYLER LEVEL SOFT PRO**. These are relative measurements.



Using the machine tool software **MT-SOFT** an **absolute measurement** is important because different elements of a machine tool must be compared even at a later stage of the measurement. E.g. the horizontal guide way must be compared to the vertical axis of the spindle. Only when the measurement is done in **absolute mode** such a comparison is possible.



B3 DIFFERENTIAL RESPECTIVELY REFERENCE MEASUREMENT USING AN ENGINEER SET

Such a differential measurement, mostly done with an engineer set (two BlueLEVEL BASIC and one BlueMETER BASIC), is useful or necessary in some of the following cases:

- Measurement on an object with vibrations imposed
- The inclination of the object to be measured will change by the weight of the instrument
- The floor is unstable (heavy loads in the close surroundings)
- The relative pitch and roll on a machine must be measured.

The **Engineer set** usually consists of:

Two BlueLEVEL BASIC and one BlueMETER BASIC;
Data transmission via cables

Picture:
Two BlueLEVEL BASIC and
one BlueMETER BASIC



Connecting the instruments performing a differential measurement

- One of the instruments is used as measuring instrument and the other as reference instrument.
- The measuring instrument is connected to port "A" the reference instrument to port "B".
- Both instruments must be placed looking the same direction.

Examples for differential / reference measurement:

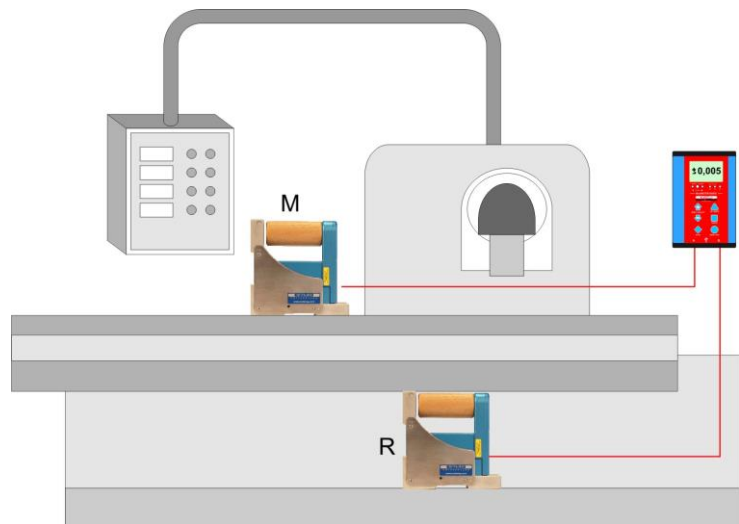
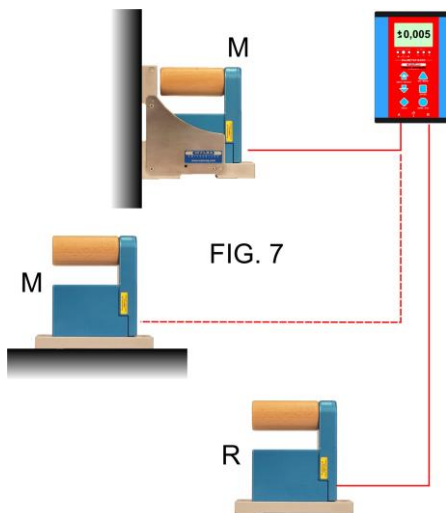
R = Reference instrument, connected to port "B"

M = Measuring instrument, connected to port "A"

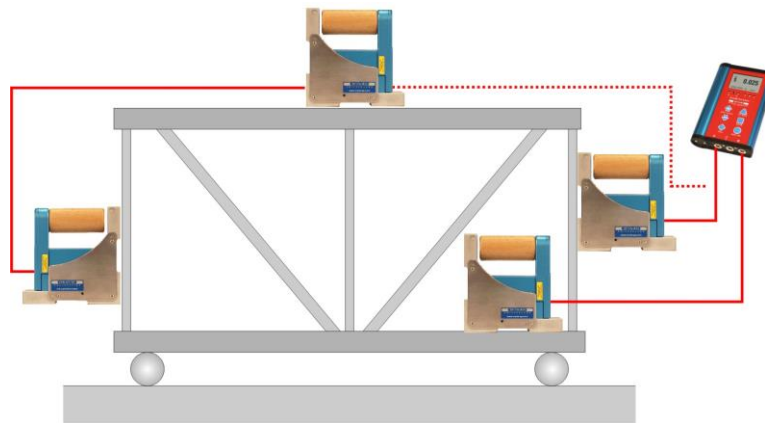
Rectangularity resp. parallelism of machine spindle in relation to work table (Fig. 7).

For precise square measurements an angular model fitted with magnets in the vertical face should be used.
(Elimination of deformation due to manual pressure).

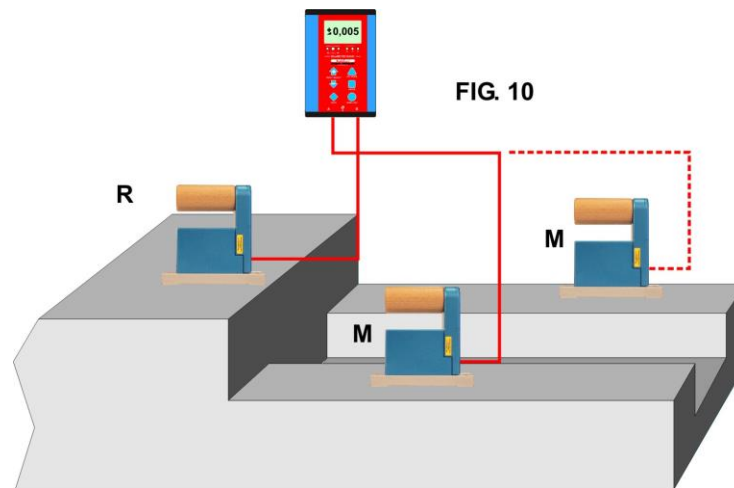
Straightness of table motion (Fig. 8) in relation to the machine's base. The table must be moved step by step and the measured value at each step should be noted/recorded after stabilisation only.



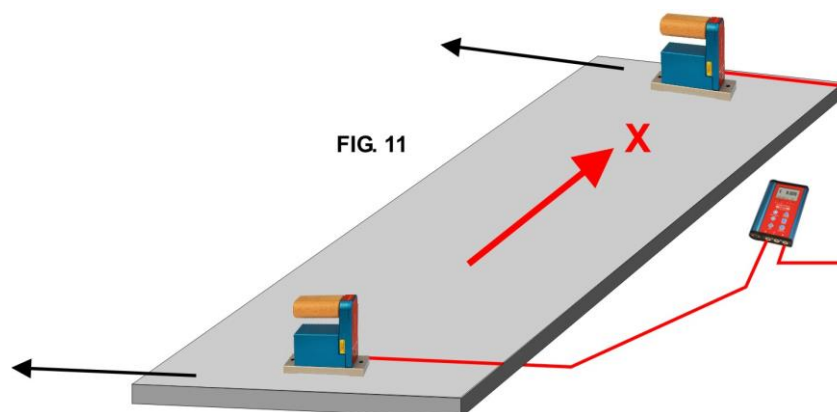
Inspection of perpendicularity and parallelism on large structures (Fig. 9). Suitable instrument for outdoor applications.



To conduct **high precision measurements of parallelism** (Fig 10) (e.g. guide way rails two or more)
The reference instrument (R) will compensate for all changes in the objects orientation while measurements are made. Using this method the instrument (sensitivities up to 1 $\mu\text{m/m}$) allows determination of the exact shape of the guide ways.



Torsion in guide ways and work piece surfaces (Fig 11). The instrument (M) is moved step by step in direction of X, noting the reading at each step after allowing sufficient time for the instrument to settle. (Attention: Measuring axes have to be parallel!!)
This procedure is also applied when fastening work pieces in order to see possible tensions.



B4 ANGULAR MEASUREMENTS

a) Small angles

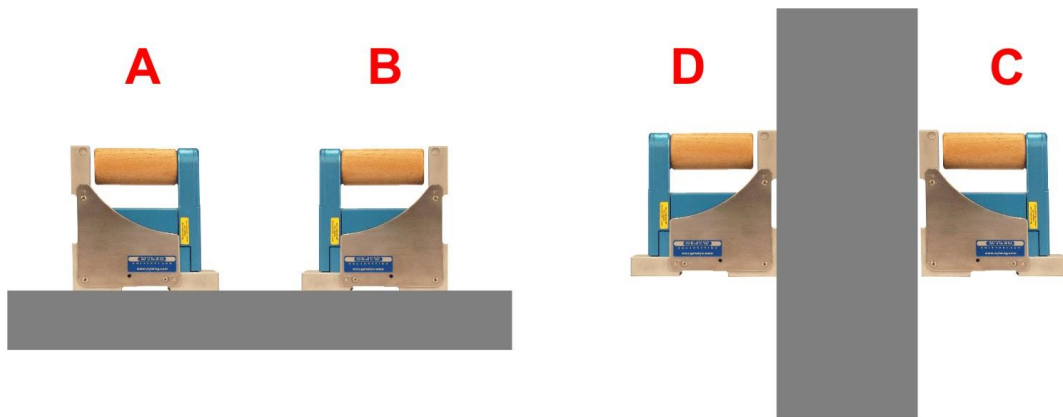
The measuring instruments BlueLEVEL and BlueLEVEL BASIC are especially well suited for measuring small angles. It is however to be considered that the larger the angle is getting, the larger the linearity error of the instrument is. It is therefore important to level the object to be measured (e.g. surface plate) as good as possible in both axes.

b) 90°-angle (squareness)

For measuring 90° angles (square angles) instruments with an angular base can best be used. Before starting a precision measurement the angular error of the instrument must be determined by a reversal measurement on a suitable object.

After the reversal measurement precision measurement with **measuring uncertainty of 3 to 5 µm/m** is possible.

The determination of the instrument's angular error is done as follows:



$$\text{Index of correction} = \{(C + D)/2\} - \{(A + B)/2\}$$

In the **WYLER LEVELSOFT PRO** a new set-up allows the easy measurement of squareness of rectangular objects.

Principal procedure of a 90° measurement with WYLER LEVEL SOFT PRO

The angular error of the instrument must be determined (optional)

The measurement follows the required set-up (Step length, number of measurements etc.)

After the measurement the respective lines may be adjusted according to different methods. For the following three methods the angular errors are computed and displayed:

- Method Endpoints
- Method ISO1101
- Method Linear regression (least square)

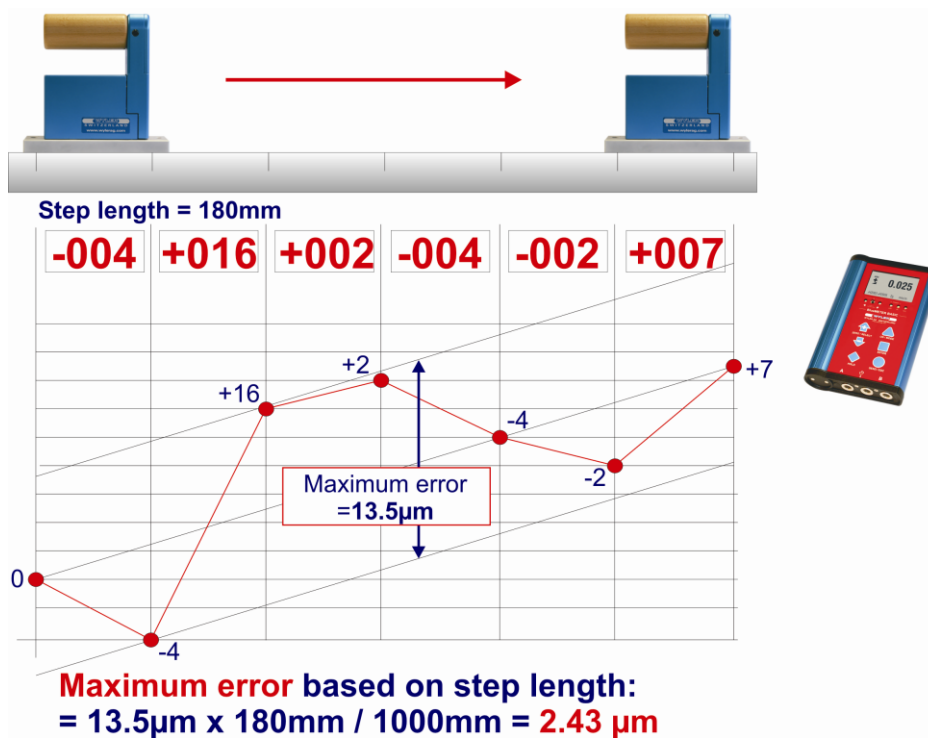
Ask your local WYLER representative for further information on the software LEVEL SOFT PRO

B5 LINES AND FLATNESS MEASUREMENT (MANUAL PROCEDURE)

A principal procedure of a measurement of a line with WYLER instruments is described below:

Example:

- Sensitivity of the instrument 1 $\mu\text{m}/\text{m}$
- Length of measuring base 200 mm/ step length 180 mm
- The line to be measured must be divided in equal sizes according to the base available (calculated step length) Overlapping of the steps is important, otherwise measuring errors are inevitable.
- Place the instrument at the begin of the line measurement
- Slide the instrument step by step along the line to be measured. Note all the measuring results after allowing enough settling time. Then the line can be drawn as shown below considering the base length and the sensitivity of the instrument.



The picture to the left shows the measurement of a line using a BlueLEVEL BASIC combined with a BlueMETER BASIC with integrated radio module for wireless data transmission

Measurements on granite surface plates are done with instruments equipped with hardened steel bases with dust grooves. The sharp edges prohibit dust particles to get between the plate and the base when sliding the instrument.

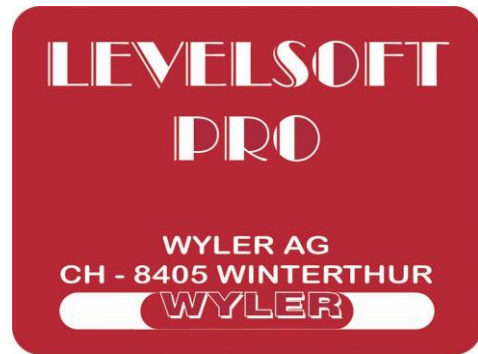
The manual measuring and the computing effort is quite big - if possible at all - and the source of errors is large. Such a task is best done with the **WYLER LEVELSOFT PRO**.

C WYLER SOFTWARE LEVELSOFT PRO

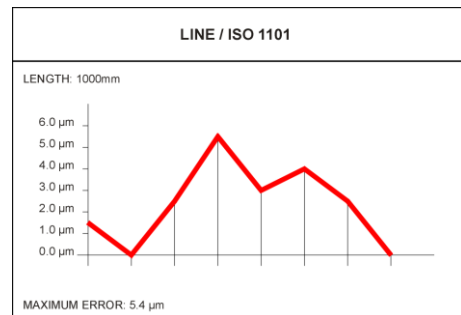
The WYLER software LEVELSOFT PRO is a well proven package based on ISO 1101 for measuring lines and surface flatness which is constantly upgraded to the demands of the user.

The following measurements can be done with the WYLER LEVELSOFT PRO in combination with the correct measuring instruments:

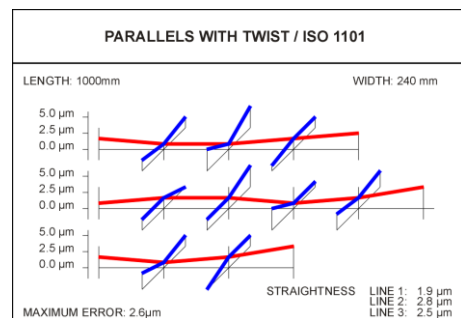
- Lines (Straightness)
- Lines with twist (torsion)
- Parallelism
- Rectangularity
- Surface flatness
- Partial surface flatness
- Measurement on machine tools



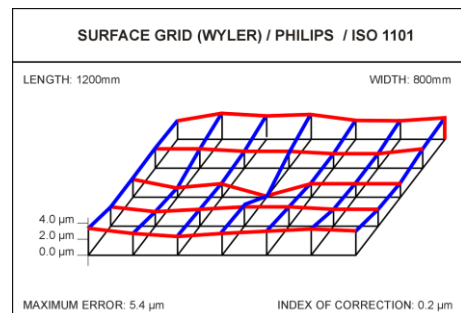
**Measurement of line according to ISO1101
with and without twist (torsion)**



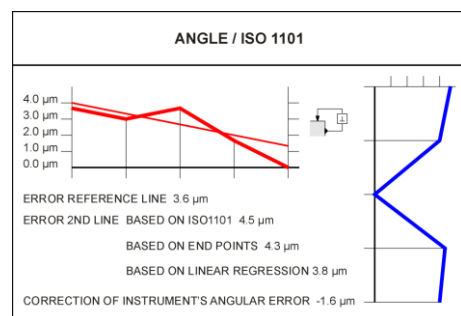
**Measurement of parallel lines according
to ISO1101 with and without twist (torsion)**



**Surface flatness according to ISO 1101
as well as "U-Jack" method**

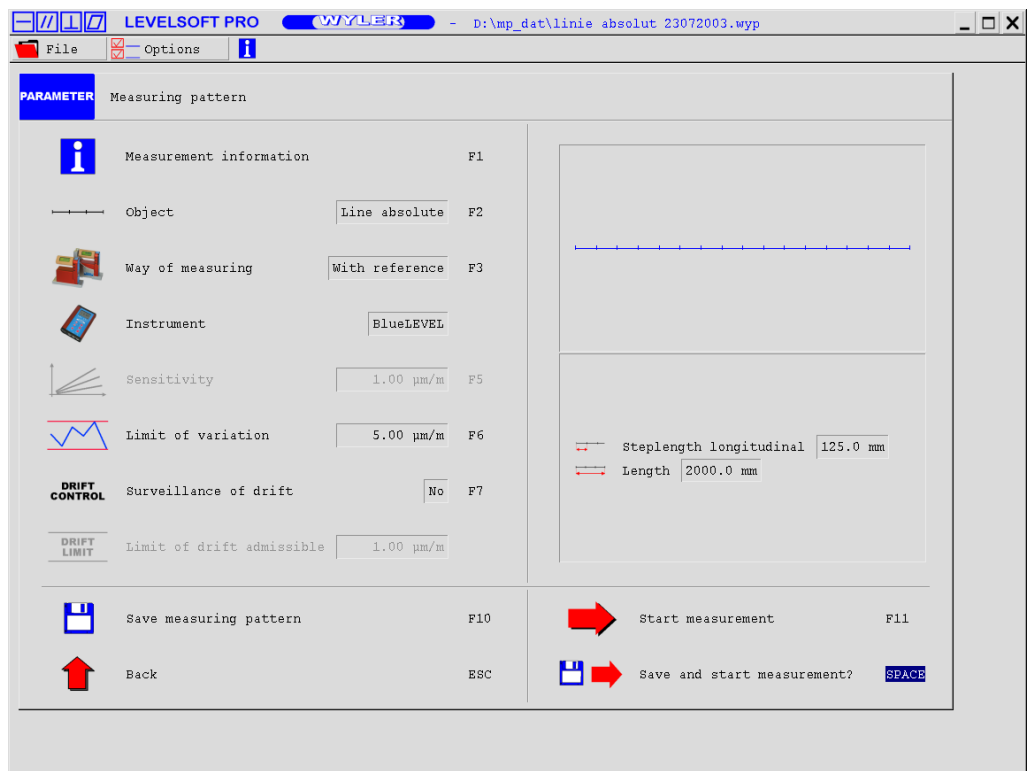


Rectangularity according to ISO1101



In order to connect the instruments to a PC/Laptop a cable connection between the BlueMETER BASIC and the PC/Laptop is required.

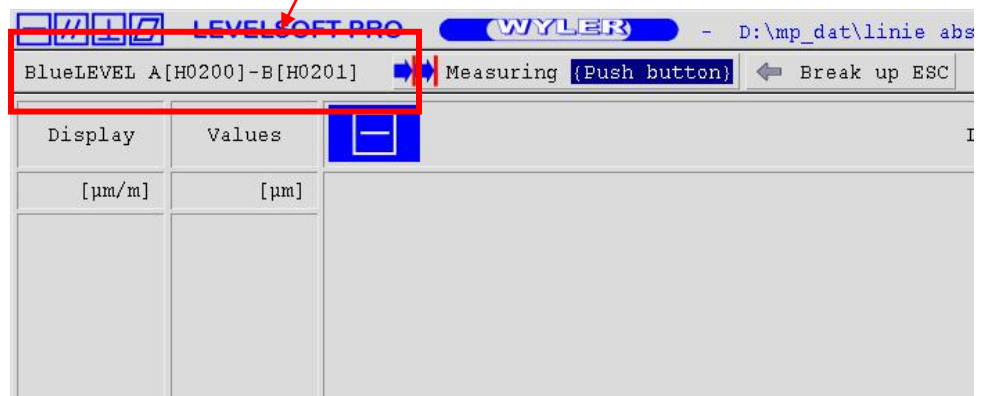
Remarks:



With the Software LEVELSOFT PRO the instruments of the BlueSYSTEM BASIC are automatically recognised

Address, respectively serial number(s) of the instruments

As a new feature the address, respectively serial number of the instruments is displayed.



D SOFTWARE FOR THE DEFINITION OF MACHINE TOOL GEOMETRY

MACHINE TOOL INSPECTION SOFTWARE MT-SOFT

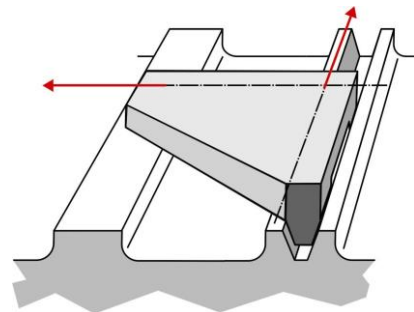
MT-SOF gives the possibility to measure individual elements of machine tools with standard inclination measuring instruments. The measured results can be saved and at a later stage used for comparison and put together to receive a thorough result of the **over all accuracy of the machine tool**. E.g. the horizontal guideway must be compared to the vertical axis of the spindle. Only when the measurement is done in **absolute mode** such a comparison is possible. The logical and clear structure of the software makes even the measurement of complex machines an easy task.

The following measurement tasks can be done by using suitable instruments and the WYLER MT-SOFT:

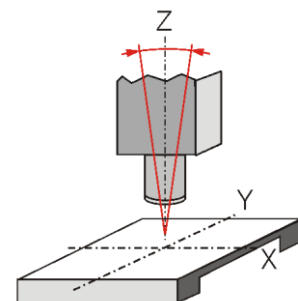
- **GUIDE WAYS**
- **ROTATING AXIS**
- **ROTATION OF MACHINE TOOL ELEMENTS**
- **CIRCLES**



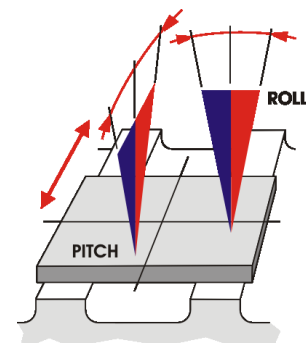
GUIDE WAYS
Measurement of guide ways using inclination measuring instruments



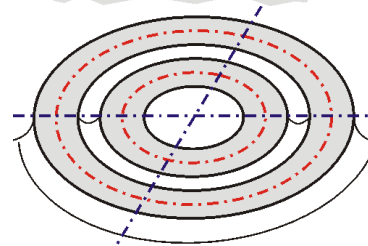
ROTATING AXIS
Definition of rectangularity between the surface of the table and the vertical rotating spindle



ROTATION OF MACHINE TOOL ELEMENTS
Measuring and defining the geometrical roll and pitch errors on a machine tool element moving horizontally



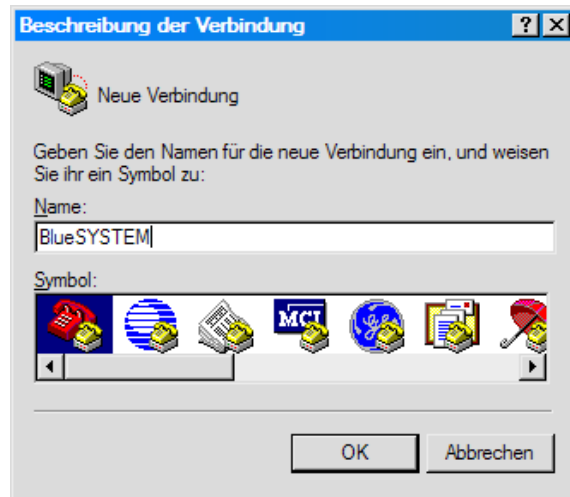
CIRCLES
Flatness measurement and defining the position in space of circles as well as co planarity of circles.



E EXAMPLE USING THE HYPER TERMINAL OF WINDOWS OR WINDOWS TERMINAL PROGRAM (EXAMPLE IS WIN XP)

1. Open the Terminal-Program in Windows / Accessories. and insert a name

Confirm with **<OK>**



2. Enter the serial port definition connected to the BlueMETER BASIC.

Confirm with **<OK>**



3. Enter the parameters

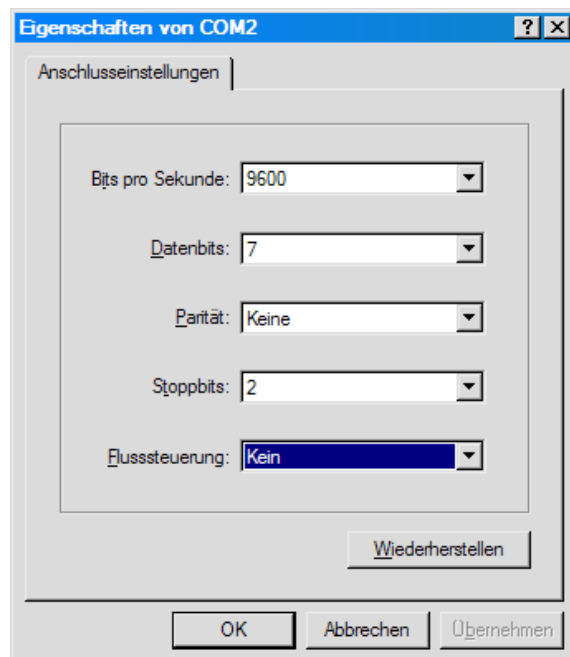
Bits per Second:	9600
Data bits:	7
Parity:	no
Stop bits:	2
Protocol:	no

Confirm with **<OK>**

The HyperTerminal-Window appears.

Repeatedly pressing the key **<SEND/ESC>** the actual value will be transmitted in [Rad]

Alternatively the value can be called by pressing the key "P" on the PC keyboard.

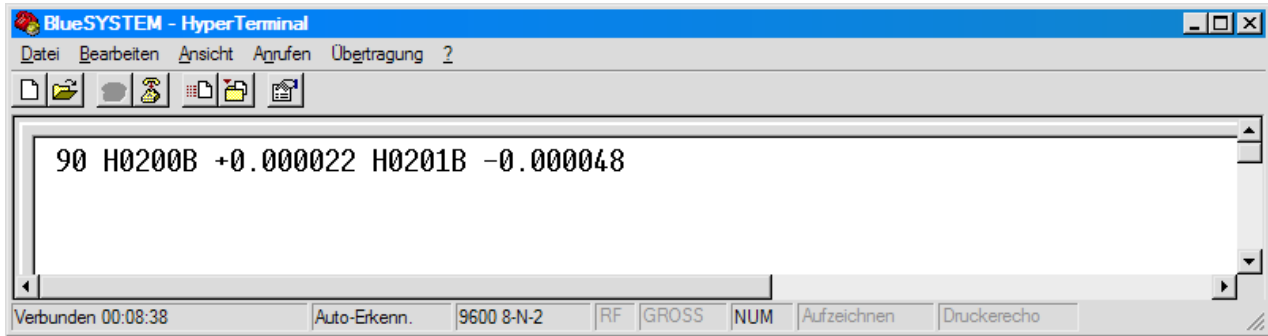


Example: Two BlueLEVEL BASIC and a BlueMETER BASIC are connected

Remark:

The configuration has to be done first on the BlueMETER BASIC

- 1 BlueLEVEL BASIC with the address H0200 is connected to Port "A"
- 1 BlueLEVEL BASIC with the address H0201 is connected to Port "B"
- Measuring-mode: Display of values instruments on Port "A" and "B" simultaneously



Meaning of the display:

090

Continuous number

H0200B

BlueLEVEL BASIC with the address H0200 is connected to Port "A"

+0.000022

+0.000022 Rad respectively +22 μ Rad

H0201B

BlueLEVEL BASIC with the address H0201 is connected to Port "B"

-0.000048

-0.000048 Rad respectively -48 μ Rad

F WYBUS COMPATIBLE INSTRUMENTS

The WyBus concept allows to connect, besides the new sensors, also most of the previous sensors to a BlueMETER, a BlueMETER BASIS or a BlueTC. It is, however, important to differentiate whether they are connected through a short cable, through a longer cable up to maximum 1200 m or via wireless transmission.

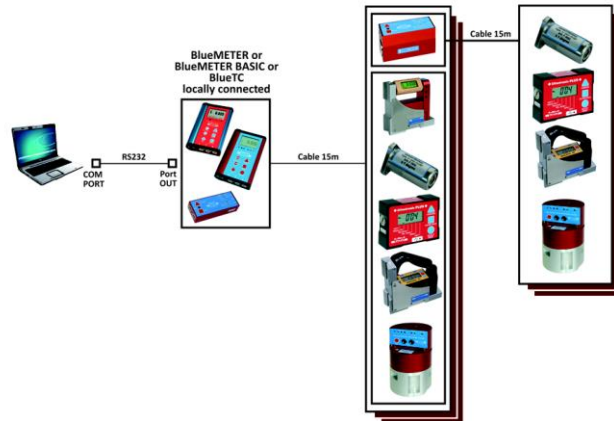
F1 CONNECTION THROUGH A SHORT CABLE

The following sensors can be connected through a cable of maximum 15 m length to a BlueMETER, a BlueMETER BASIC or a BlueTC.

- BlueLEVEL
- Zerotronic
- Clinotronic
- Minilevel NT
- Zeromatic2/1
- Zeromatic2/2

Through a cable of maximum 15 m length and with a BlueTC as an intermediate the following sensors can be connected:

- Zerotronic
- Clinotronic
- Minilevel NT
- Zeromatic2/1
- Zeromatic2/2



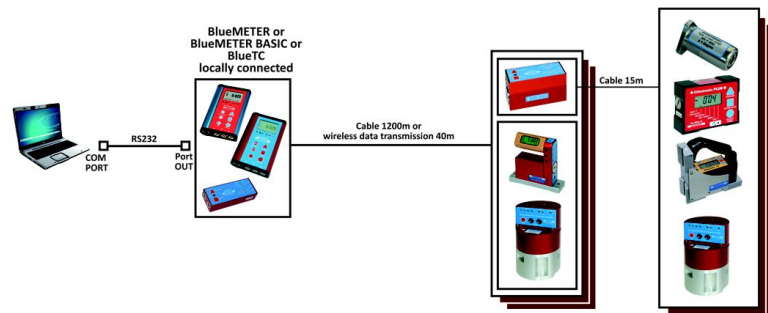
F2 CONNECTION THROUGH A LONG CABLE OR THROUGH WIRELESS TRANSMISSION

The following sensors can be connected through a cable of maximum 1200 m length or via wireless data transmission to a BlueMETER, a BlueMETER BASIC or a Blue TC:

- BlueLEVEL
- Zeromatic2/1
- Zeromatic2/2

Through a cable of maximum 1200 m length or via wireless data transmission and with a BlueTC as an intermediate the following sensors can be connected:

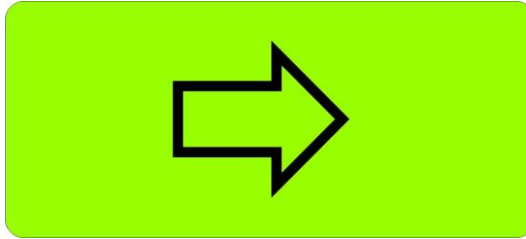
- Zerotronic
- Clinotronic
- Minilevel NT
- Zeromatic2/1
- Zeromatic2/2



G SPECIAL FUNCTIONS

G1 RESET TO FACTORY PRE-SETTINGS

You can reset all adjustments and settings to the factory pre-settings. For this action press simultaneously the keys <ENTER> and <ON/MODE> until an arrow to the right hand side appears in the display.



The following values will be set and the following actions performed:

BlueMETER:

- Filter Type 3
- Unit mm/m
- Display mode Absolute
- Relative Base in millimetres, value 1000
- Relative Base in Inch, value 10
- All members of the wireless data transmission group are deleted
- All members of the list of instruments are deleted

BlueLEVEL

- Filter Type 3
- Unit set to
 - 1 μ instrument: mm/m, 3 decimals
 - 5 μ instrument: mm/m, 3 decimals, rounded to 5 μ m/m
 - 10 μ instrument: mm/m, 2 decimals
- Display mode Absolute
- Relative Base in millimetre, value 1000
- Relative Base in Inch, value 10
- All members of the wireless data transmission group are deleted
- Relative Zero is set to 0
- Absolute Zero is set to 0

G2 FIRMWARE VERSION

With a special key operation you can read the version number of the firmware installed. After turning off the instrument hold the <ON/MODE> key down for another 10 seconds.



The display shows in large figures the date of issue and at the bottom the version number of the firmware.

H TECHNICAL DATA BLUESYSTEM BASIC

H1 TECHNICAL DATA OF THE RADIO MODULES BLUESYSTEM BASIC (OPTIONAL)

SENDER / RECEIVER SENDER / EMPFÄNGER	Frequency	ISM-Band / 2,4000 - 2,4835 GHz
	Modulation	FHSS (Frequency Hopping Spread Spectrum)
	Used Net-structure	Point to point / Point to multi-point
BlueSYSTEM with Bluetooth™ wireless technology	RF Output power	Max. +17 dBm / Class 1
	Sensitive level Receiver	-80 dBm
	Batteries BlueLEVEL / BlueTC Batteries BlueMETER	2 x 1.5V, Size "C" Alkaline 3 x 1.5V, Size "C" Alkaline

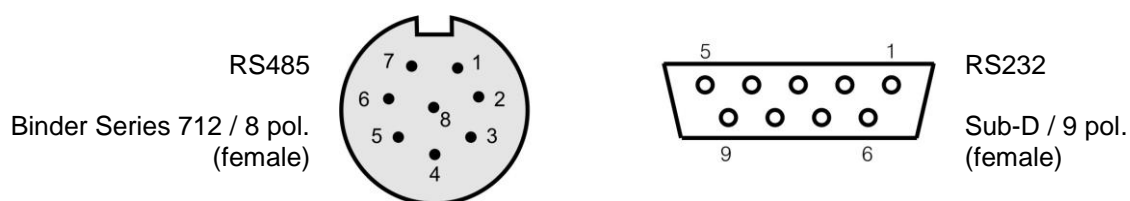
H2 TECHNICAL DATA BLUELEVEL BASIC

Sensitivity / Empfindlichkeit	1 µm/m 0.2 Arcsec	5 µm/m 1 Arcsec	10 µm/m 2 Arcsec
Display range external display / Anzeigebereich externe Anzeige	± 10 mm/m	± 50 mm/m	± 100 mm/m
Limits of error / Fehlergrenze <0.5 Full-scale (DIN 2276)	max. 1% of measured value / max. 1% des aktuellen Messwertes		
Limits of error / Fehlergrenze >0.5<Full-scale (DIN 2276)	max. 1% of (2 x measured value - 0.5 x Full-scale) / max. 1% von (2 x aktueller Messwert - 0.5 x Messbereichsendwert)		
Temperature error / Temperaturkoeffizient /°C	max. 0.1% Full-scale / max. 0.1% Messbereichsendwert		
Display available / Anzeige verfügbar	within 3 seconds / innerhalb von 3 Sekunden		
Digital output / Digitalausgang	RS232 / RS422 / RS485, asynchron, 7 DataBits, 2 StopBits, no parity, 9600 bps		
External power supply Externe Stromversorgung	BlueMETER BASIC: + 5V DC, max. 450 mW or/oder 8...28 V DC		
Operating temperature range / Betriebstemperatur Storage temperature range / Lagertemperatur	0 ... +40°C -20 ... +70°C		
Net weight without measuring base, including batteries and handle Netto-Gewicht ohne Messbasis, inklusive Batterien und Griff	BlueLEVEL BASIC: 1200g BlueMETER BASIC: 775g		

H3 TECHNICAL DATA OF THE BLUEMETER BASIC

Display available / Anzeige verfügbar	within 3 seconds / innerhalb von 3 Sekunden
Digital output / Digitalausgang	RS232 / RS422 / RS485, asynchron, 7 DataBits, 2 StopBits, no parity, 9600 bps
External power supply Externe Stromversorgung	BlueMETER BASIC: + 5V DC, max. 450 mW or/oder 8...28 V DC
Operating temperature range / Betriebstemperatur	0 ... +40°C
Storage temperature range / Lagertemperatur	-20 ... +70°C
Net weight, including batteries Netto-Gewicht, inklusive Batterien	BlueMETER BASIC: 775g

H4 PIN-DEFINITION FOR BLUELEVEL + BLUEMETER, BLUELEVEL + BLUEMETER BASIC AND BLUETC



Pin Number	Pin Name	Pin Type	Pin Function
1	VPP	Power in	Unregulated Power
2	VSS	GND	Ground
3	VDD	Power out	Power +5V
4	RTA	Input/Output	RS485-Line A
5	RTB	Input/Output	RS485-Line B
6	-	-	-
7	-	-	-
8	KEY*	Input	Trigger Key

* Measuring can be triggered via "Key-Cable" / WY 065-025-KEY

I SERVICE AND REPAIR

I1 REPAIR OF MEASURING INSTRUMENTS AND DISPLAY UNITS

Normally any instruments requiring repair can be sent to the local WYLER partner (local distributor) who will take the necessary steps and make the arrangements for repair on behalf of the customer.

Express Repair Service, ERS

A large number of customers can not miss the instruments for a longer period as these are in daily operation. For these cases WYLER SWITZERLAND has created a new service called "Express Repair Service, ERS". Employing this service the transport time from the user to WYLER SWITZERLAND and back and thus the complete repair time can be reduced considerably.



A simplified description of this service:

- The customer announces the repair request to the local WYLER partner in his country.
- The WYLER partner will inform the customer about the possibility of the ERS service outlining the advantages and consequences of this service, such as e.g.
 - reduced total repair time
 - required acceptance to repair without quote up to 65 % of the price for a new instrument
 - suitable packing for air transport
 - expenses of the ERS
- In case the customer decides to use the ERS, the customer informs the local WYLER partner or directly WYLER SWITZERLAND providing the necessary data.
- The customer will receive all information and instructions necessary for a smooth handling, the customer has just to pack the product suitably and to fill in a form for the **TNT courier service** as well as to announce the readiness to the local TNT office for pick-up. Everything else will run automatically.
- Products reaching WYLER SWITZERLAND under this service will be handled with **first priority, and** the instrument will be returned using the same carrier.
- The invoicing will be through the WYLER partner in your country.

Please do not hesitate to make use of this service in order to have your WYLER instrument back at your disposal as soon as possible. In case of any questions please contact WYLER SWITZERLAND or your local distributor, we will gladly help you to use the ERS successfully.

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12 SERVICE- AND MAINTENANCE CONTRACTS

Measuring systems are becoming more and more complex and are therefore subject to continuous supervision in respect of quality and reliability. For this purpose WYLER AG offers the option of a **MAINTENANCE CONTRACT** with the purchase of new instruments.

Such a MAINTENANCE CONTRACT offers the following services to the customer:

- Complete **inspection and re-adjustment** of the instrument / system in a bi-yearly interval.
- The scope of delivery includes an **internationally recognised Calibration Certificate SCS** for the entire system confirming the performance after the service intervention. Traceable certificates SCS are issued according to our accreditation as a calibration laboratory by the Swiss authorities
- **Highest priority for any repair works** (actual repair work is not included and will be quoted separately)
- **Technical enhancements and modifications** published by WYLER, if considered suitable
- **Costs for packing and transport** of the instrument(s) from the customer to WYLER and back, either directly or through the WYLER distribution partner
- **Extension of warranty period to 24 months:** If a maintenance contract is signed within 6 months of the purchasing of a new instrument the warranty period is extended to 24 month.



Options:

Depending on the customers requirement the re-calibration interval can be shortened (every year) or be extended (every 3rd year)

The following services are **excluded** from all maintenance contracts:

- The contract does not include any repair work. If it is determined during the inspection or the re-calibration process that the instrument requires repair, such work will be quoted separately to the customer.

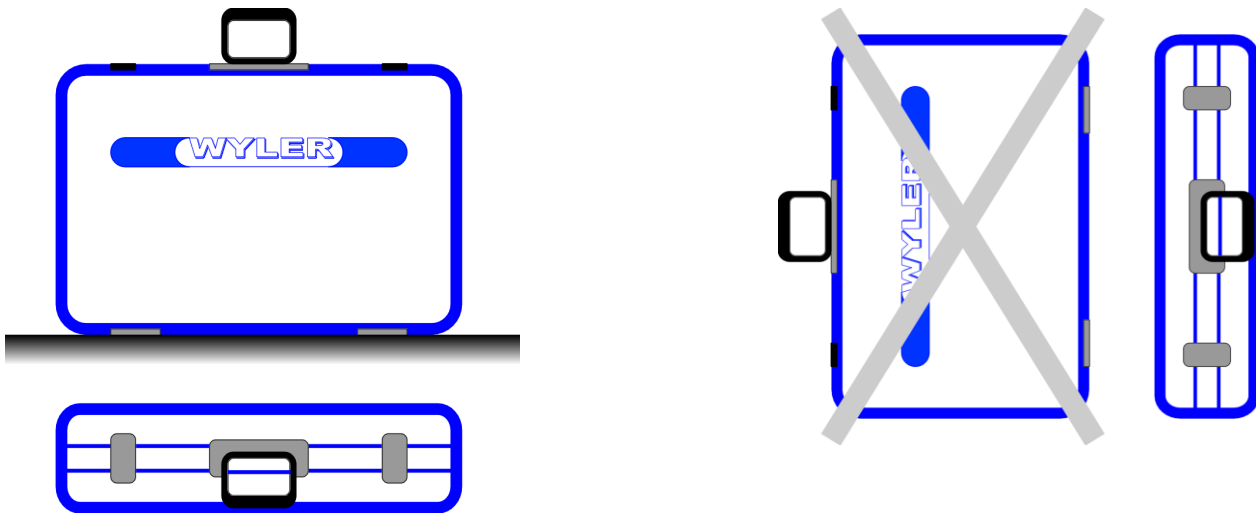
**We help you to keep your valuable and important instruments always accurate and ready for use!
We would be glad to offer you a maintenance contract adapted to your specific requirements.**



J STORAGE OF THE INSTRUMENTS / CARE AND HANDLING OF THE BATTERIES

J1 STORAGE OF THE INSTRUMENTS

For storage periods the measuring instrument should be placed in a position in which the instruments are also used when measuring (upright position). Unsuitable storage may result in a longer period of zero creeping due to overload of the pendulum system.



J2 CARE AND HANDLING OF THE BATTERIES

BATTERY REPLACEMENT

BlueLEVEL BASIC: 2 pieces 1.5V, Size "C" ALKALINE

BlueMETER BASIC: 3 pieces 1.5V, Size "C" ALKALINE

Read the instructions in your manual before installing batteries. Make sure to insert the batteries properly, following the symbols showing you the correct way to position the positive (+) and negative (-) ends of the batteries. Keep battery contact surfaces clean by gently rubbing with a clean pencil eraser or cloth. Replace batteries with the size and type specified by the device's manufacturer. Remove all used batteries from the device at the same time, and then replace them with new batteries of the same size and type. Store batteries in a cool dry place at normal room temperature. Remove batteries from devices that will be stored for extended periods. Don't dispose of batteries in a fire - they may rupture or leak. Don't recharge a battery unless it is specifically marked "rechargeable." Attempting to recharge a normal battery could result in rupture or leakage.

Disposal of Batteries / Accumulators

You are required by law (Battery Ordinance) to return all spent batteries/accumulators. Disposing of spent batteries/accumulators in the household waste is prohibited!

Batteries / accumulators that contain hazardous substances are marked with the symbols on the side. These symbols indicate that it is prohibited to dispose of these batteries in the household waste.



You can return spent batteries respectively accumulators that can no longer be charged free of charge to the collection points in your community, our outlets or everywhere else where batteries or accumulators are sold.

You thus fulfil the legal requirements and contribute to the protection of our environment!

K CONFORMITY DECLARATIONS AND APPROVALS

All documents relating to

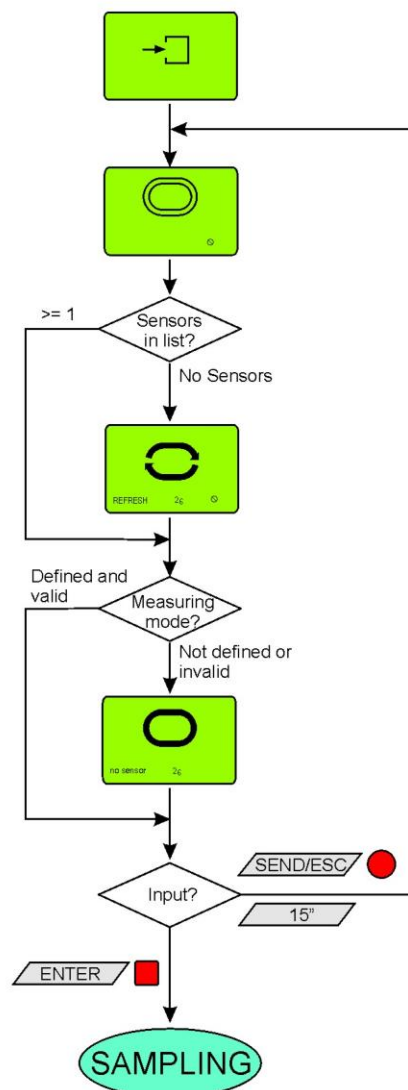
- Declaration of Conformity "DoC"
- FCC Compliance, Statement for cB-0946
- IC Compliance
- Japan Radio Equipment Compliance (TELEC)
- Batteries / WEEE

can be found on our website WYLER AG, <http://www.wylerag.com/en/support/certificates/>

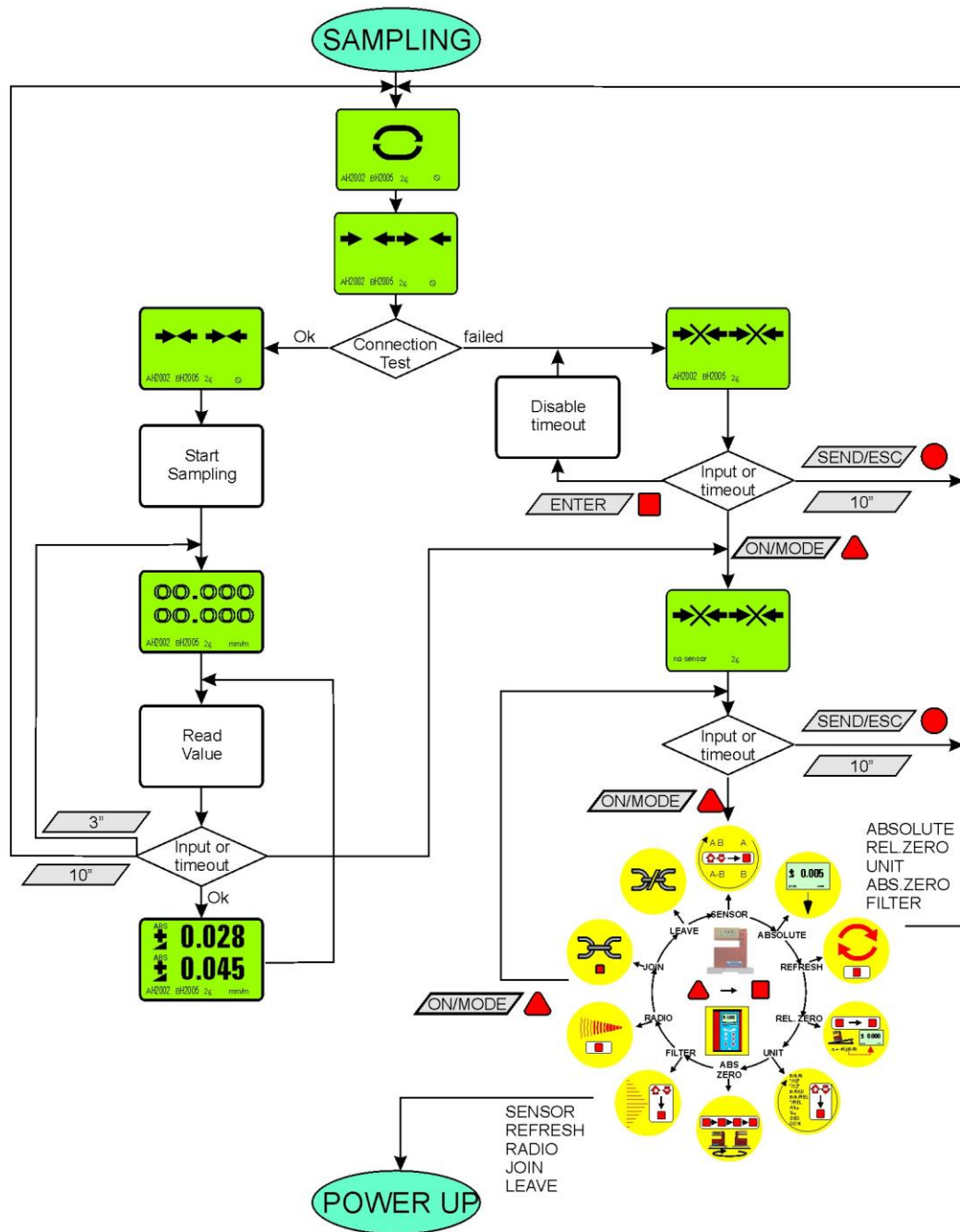
L FLOWCHARTS (BLUEMETER BASIC ONLY)

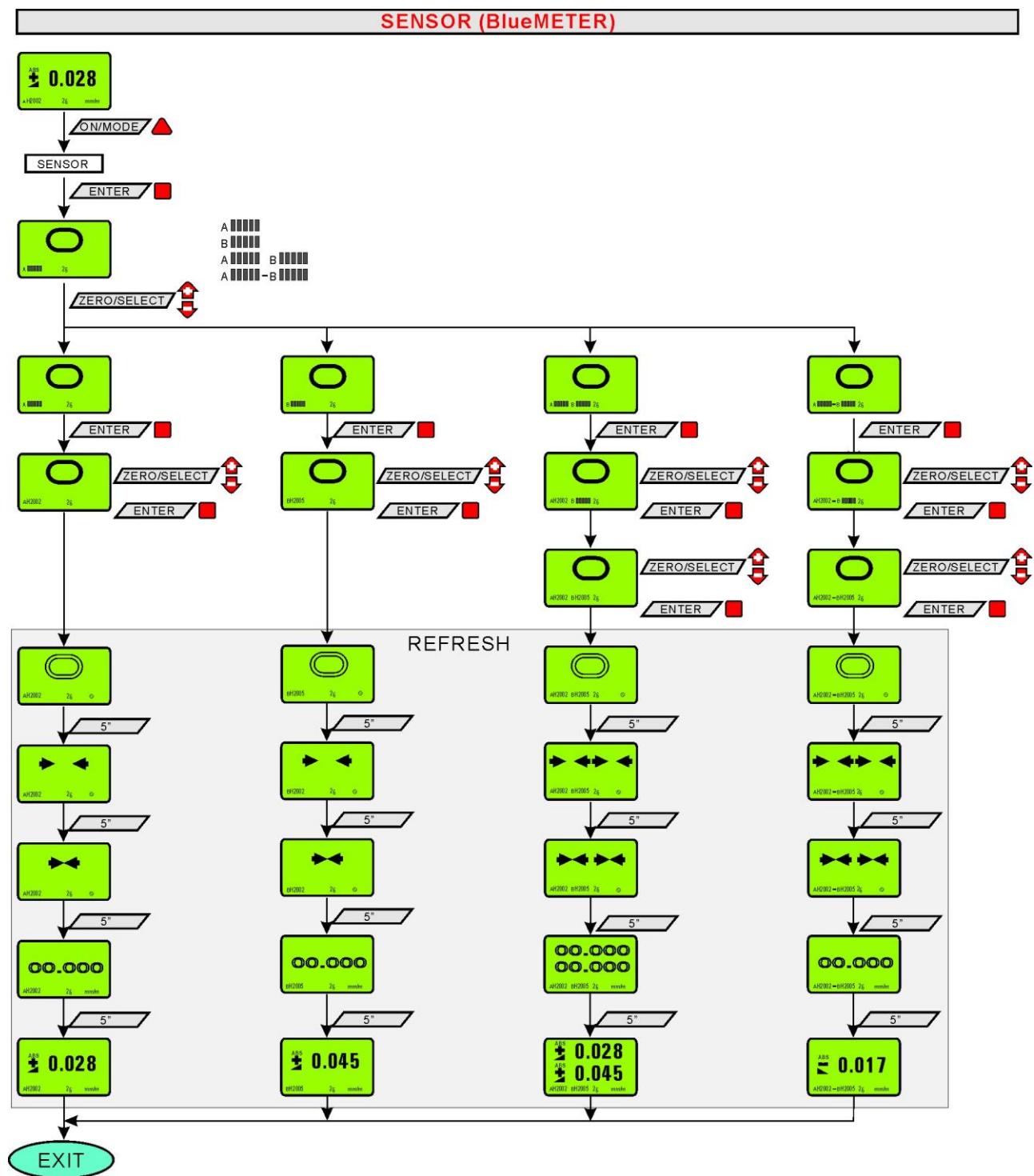
L1 POWER UP

POWER UP (BlueMETER)

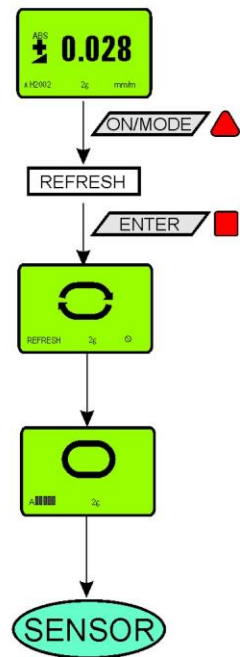


SAMPLING (BlueMETER)

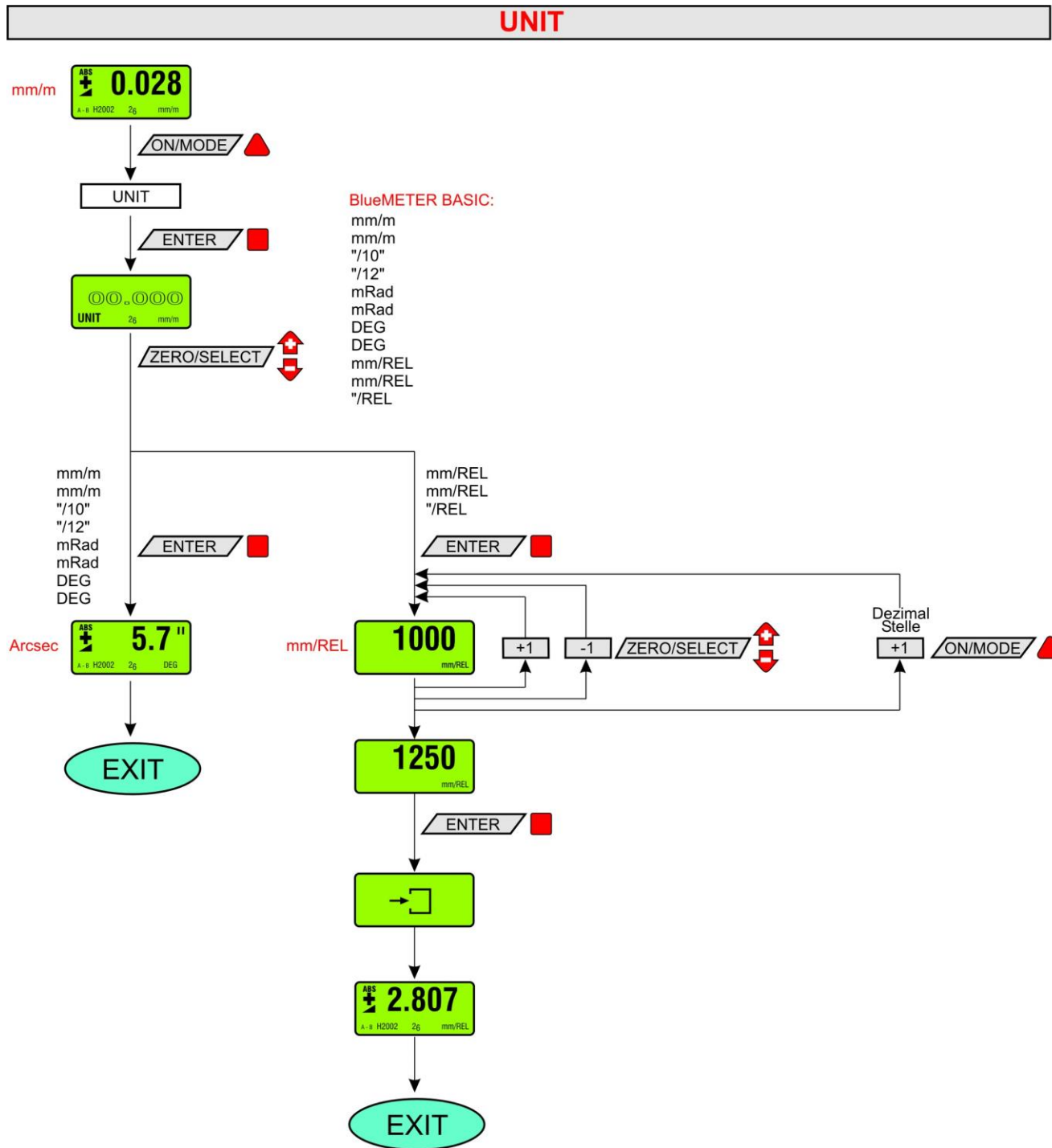


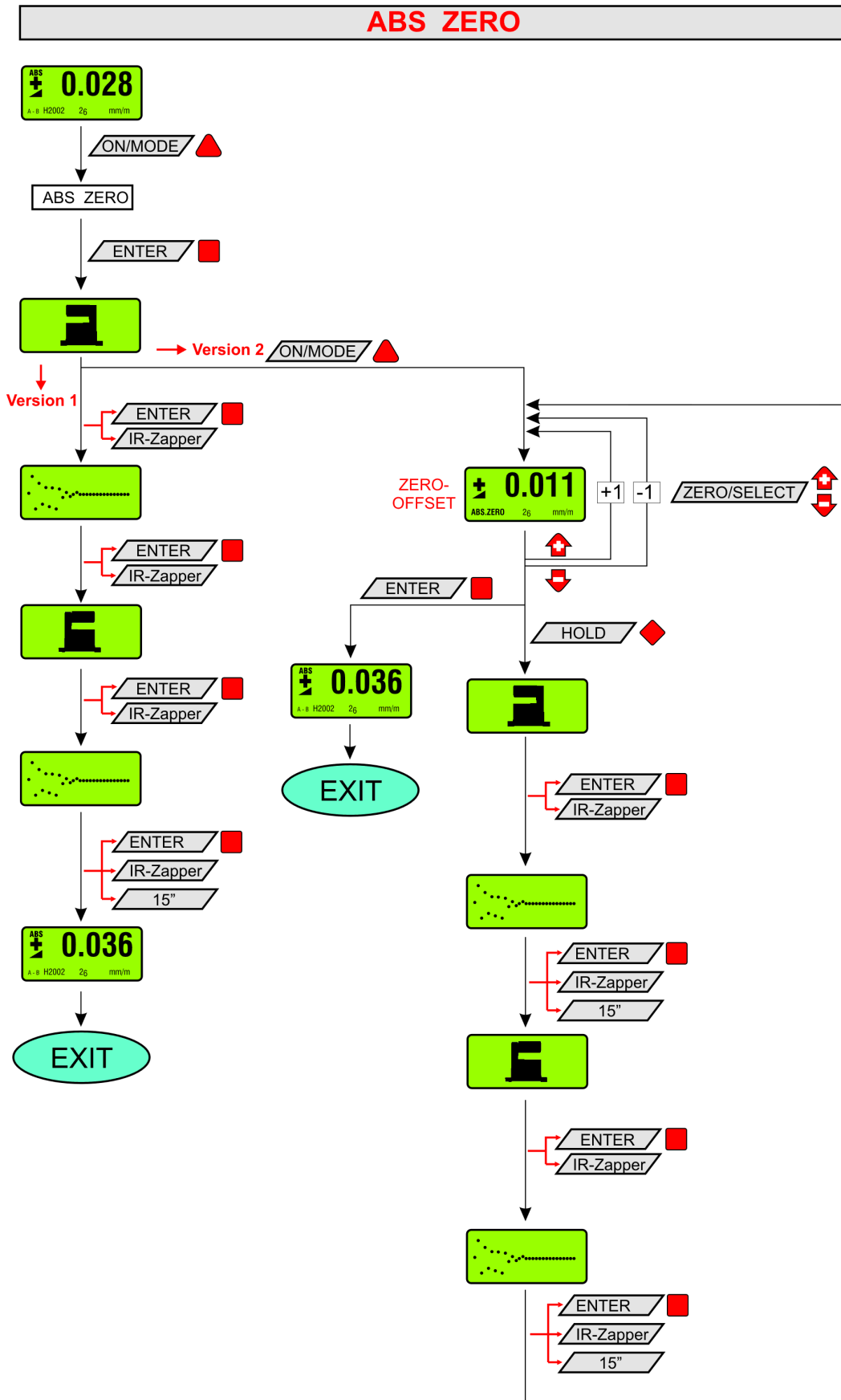


REFRESH

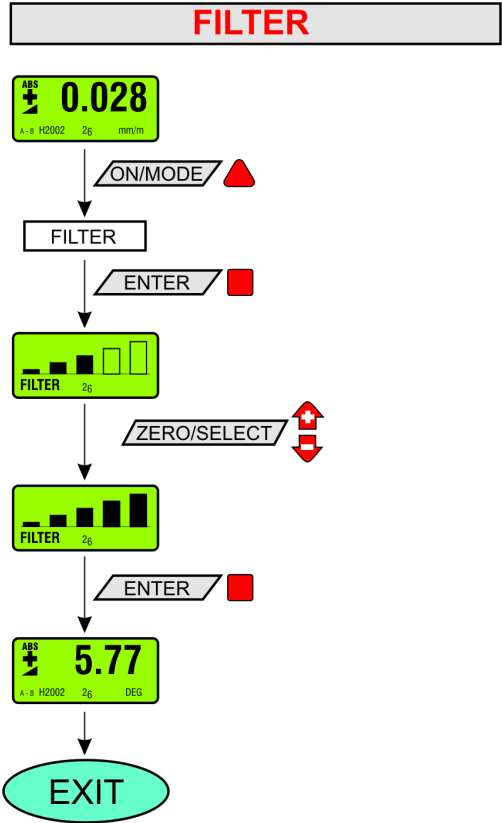


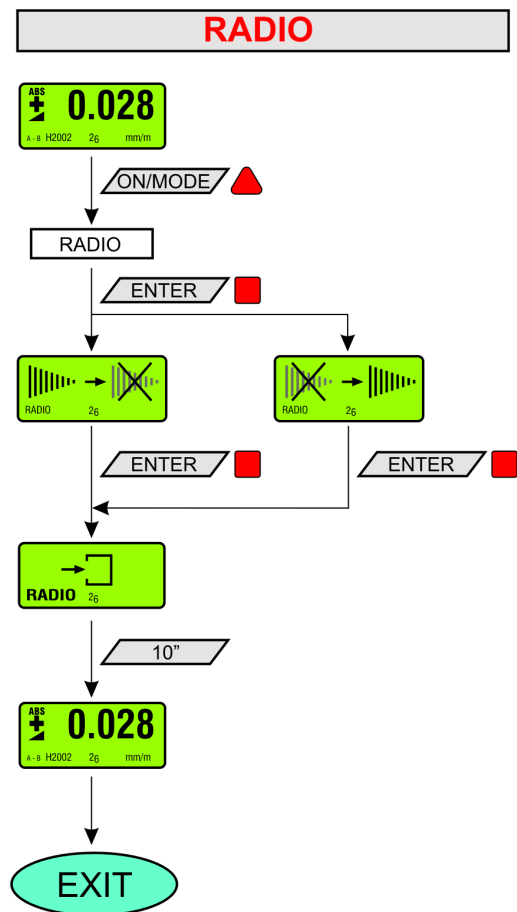




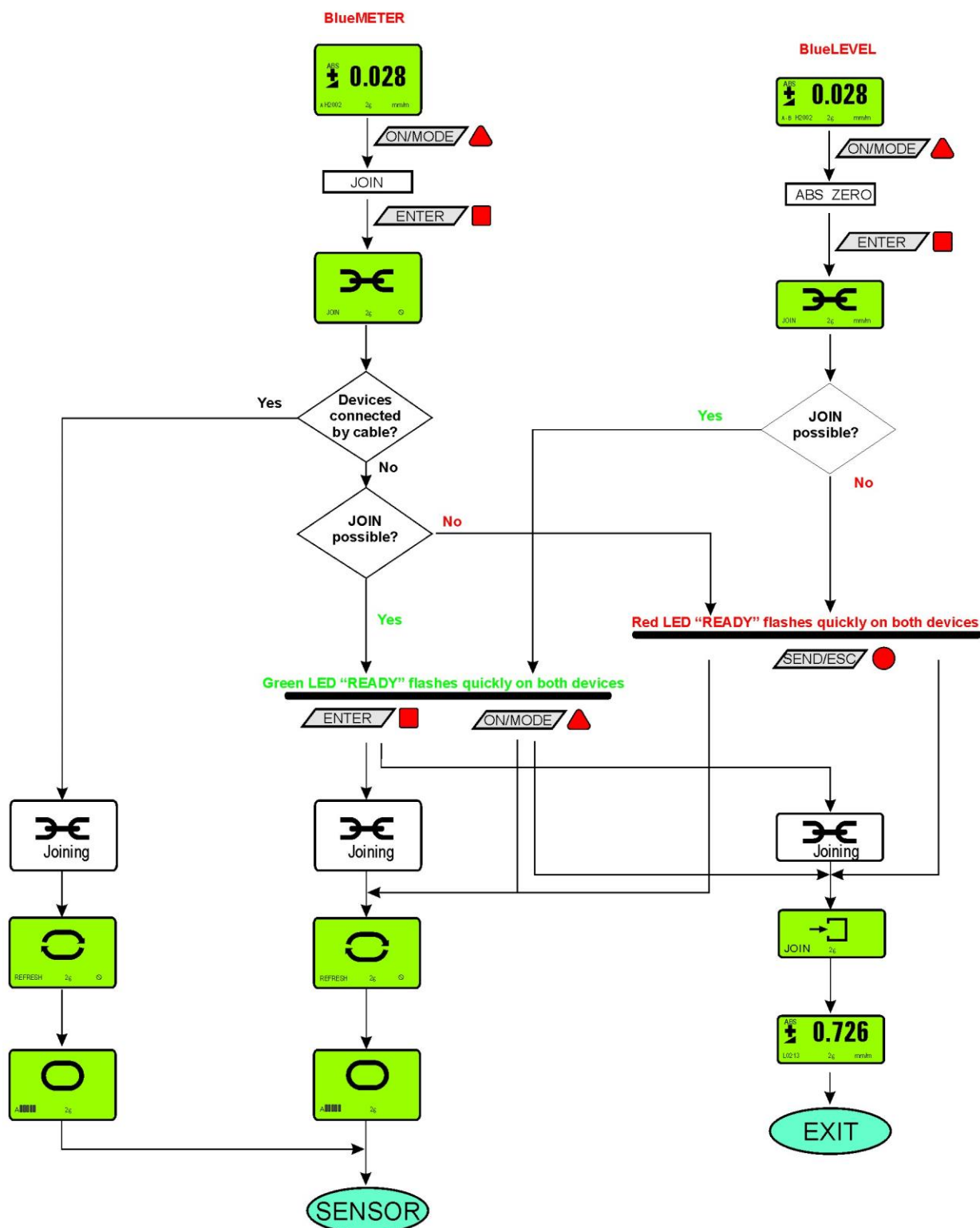


L8 FILTER

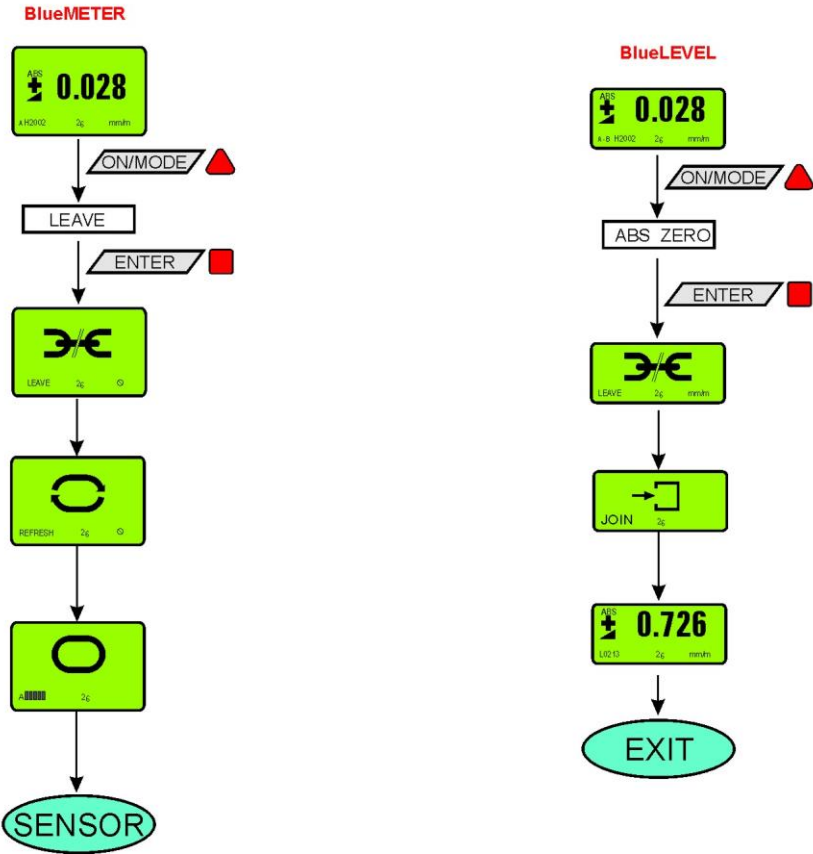


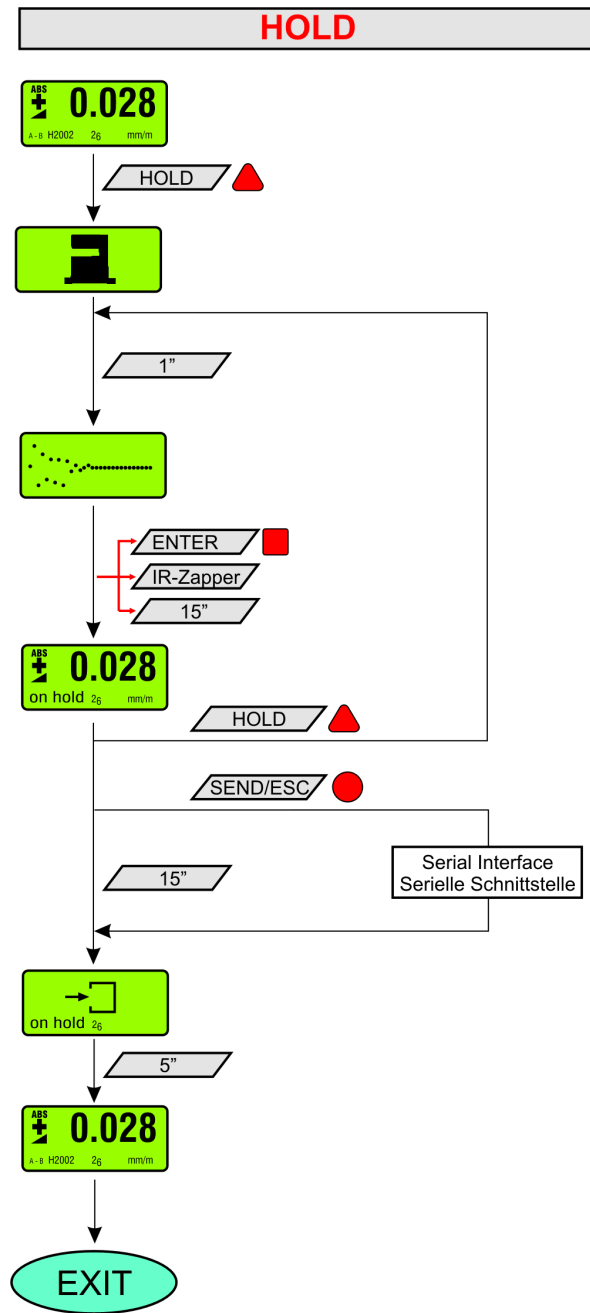


JOIN



LEAVE





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