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Manual

BlueSYSTEM

BlueLEVEL - BlueMETER - BlueTC

Two BlueLEVEL with BlueMETER with wireless radio transmission for the data transmission

CONTENT

MODIFICATIONS / ÄENDERUNGEN:

Date	Modified by	Description of modifications
12.8.2005	HEH	“SEARCH” new defined
3.10.05	HEH/MO	New: Flowcharts
11.11.2005	HEH	Teach-In new; SEND new; Key-Lock new
15.6.2006	HEH	Manual modified
29.1.2009	MG	WyBus-Integration
6.1.2015	HEH	New version: CONFORMITY DECLARATIONS AND APPROVALS

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

- Important Product Information
  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:

- **DYNAM**, the software for measuring and monitoring data delivered by the ZEROTRONIC-sensors

- **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** is a continuous further enhancement of the well known and well established measuring instruments MINILEVEL NT + LEVELTRONIC NT with or without wireless data transmission. A BlueSYSTEM normally consists of one or two measuring instruments BlueLEVEL and a display unit BlueMETER. Depending on the application the BlueMETER can also be connected to a PC with evaluation software allowing the online evaluation and presentation of the values.

The BlueSYSTEM is available with or without radio transmission. When using the system with cable connections it is possible to upgrade to wireless transmission at a later stage.

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 enhanced as well, to allow precise measurements even under critical environmental conditions.

The new measuring instruments of the BlueSYSTEM family can be used as individual instruments as well as combined in a set. Instead of using a BlueMETER it is also possible to use a BlueTC as an interface to the PC/Laptop. The functions are all the same with the exception of the LCD display which is only available with the BlueMETER.

The BlueSYSTEM also forms part of the WyBus. Therefore a wide variety of other WYLER sensors can be integrated in the BlueSYSTEM: For instance the BlueMETER can read the measuring values of ZEROTRONIC sensors or it can serve as a command and adjustment tool for ZEROMATIC sensors.

A set of instruments, also called **ENGINEER SET**, normally consists of one or two BlueLEVEL(s) and one BlueMETER, forming the ideal tool for measuring flatness and machines under workshop 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 BATTERIES

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

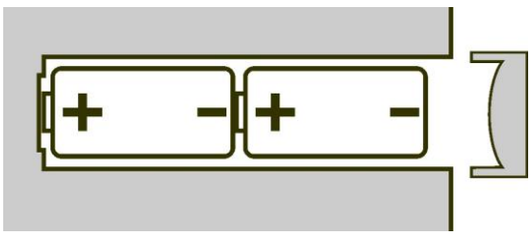
2.1.1 INSERTING RESPECTIVELY REPLACEMENT OF BATTERIES IN BLUELEVEL

The status of the battery power is displayed e.g. **2_7 (2, 7 Volt)**

The lowest voltage is **1, 7 Volt**. After this limit has been reached a battery symbol blinking is displayed.

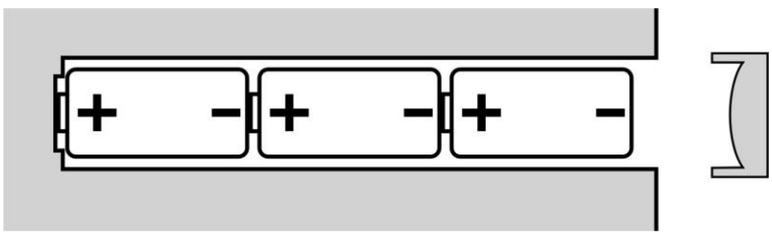
When the „▯“symbol is blinking the batteries should be replaced.

2 pieces 1.5V, Size “C” ALKALINE



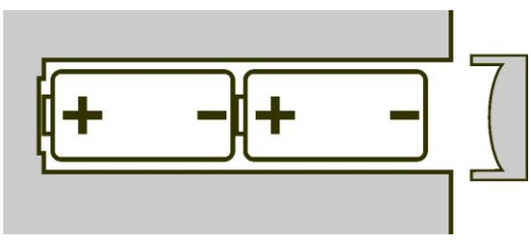
2.1.2 INSERTING RESPECTIVELY REPLACEMENT OF BATTERIES IN BLUEMETER

3 pieces 1.5V, Size “C” ALKALINE



2.1.3 INSERTING RESPECTIVELY REPLACEMENT OF BATTERIES IN BLUETC

2 pieces 1.5V, Size “C” ALKALINE



2.2 INITIAL STARTUP OF THE INSTRUMENTS

General remarks:

- *The instruments belonging to a measuring group as described below in Pt. 2.4 is already done at WYLER's when the instruments are delivered.*
- *When a group of instruments are shut off e.g. after a measurement is completed, the group set-up remains saved. When started again, the communication is immediately ready, no additional set-up is required.*
- *When a group of instruments is extended e.g. by joining or replacing an instrument, this newly added instrument must be joined according Pt. 2.4 „Combine a group...."*

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

1. Remove the instruments with care from the transport and storage case and insert the batteries
2. Place the instruments on a clean horizontally aligned surface and switch on the instruments (BlueLEVEL and BlueMETER). Keep the two keys **<ON/MODE>** and **<ZERO/SELECT±>** (BlueLEVEL), respectively the key **<ON/MODE>** (BlueMETER) pressed until all 5 LED's are on. When the keys are released on the display is seen „SYSTEM TEST".
   If the keys **<ON/MODE>** and **<ZERO/SELECT±>** (BlueLEVEL), respectively the key **<ON/MODE>** (BlueMETER) **are pressed longer than 10 seconds when STARTING the instrument** all the LED's are beginning to blink and the automatic shut-off system is deactivated. In the standard mode the instrument is automatically shut off after 60 minutes.
3. The instruments are now communicating and after a few seconds the measured values are displayed. The battery power should be checked (see below)
4. The measuring task may now be started.

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

1. Remove the instruments with care from the transport and storage case and insert the batteries
2. Place the instruments on a clean horizontally aligned surface and connect the instruments with the cables supplied
3. Switch on the instruments. Keep the two keys **<ON/MODE>** and **<ZERO/SELECT±>** (BlueLEVEL), respectively **<ON/MODE>** (BlueMETER) pressed until all 5 LED's are on. When the keys are released on the display is seen „SYSTEM TEST".
   If the keys **<ON/MODE>** and **<ZERO/SELECT±>** (BlueLEVEL), respectively **<ON/MODE>** (BlueMETER) **are pressed longer than 10 seconds when STARTING the instrument** all the LED's are beginning to blink and the automatic shut-off system is deactivated. In the standard mode the instrument is automatically shut off after 60 minutes.
4. The instruments are ready for use and the measured values are displayed. The battery power should be checked (see below)
5. The measuring task may now be started.

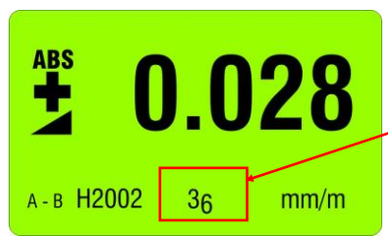
Remarks concerning the battery power:

BlueLEVEL

Display of the actual battery power (Example: 2,6 V)

The lowest voltage is **1,7 Volt**. After this limit has been reached a battery symbol blinking is displayed. The batteries should now be replaced in due time.

BlueMETER

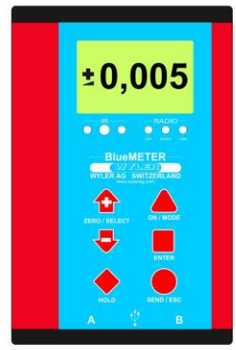


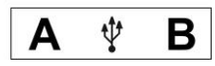
Display of the actual battery power (Example: 3,6 V)

The lowest voltage is **2.8 Volt**. After this limit has been reached a battery symbol blinking is displayed. The batteries should now be replaced in due time.

2.3 CONNECTING THE INSTRUMENTS

2.3.1 CONNECTING THE BLUEMETER





CONNECTOR „A“

- CABLE CONNECTION FOR INSTRUMENT BLUELEVEL OR WYBUS COMPATIBLE INSTRUMENT
- CABLE CONNECTION FOR EXTERNAL POWER SUPPLY

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

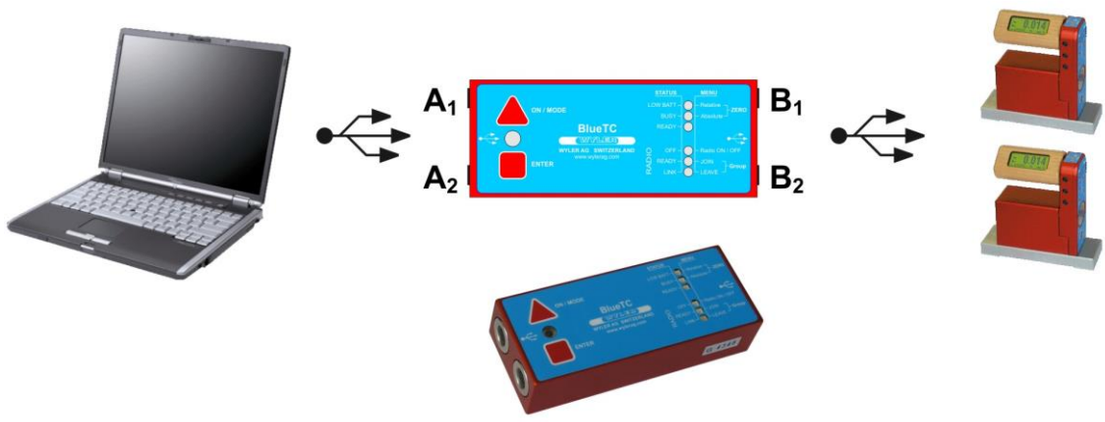
CONNECTOR „B“

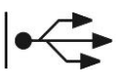
- CABLE CONNECTION FOR INSTRUMENT BLUELEVEL OR WYBUS COMPATIBLE INSTRUMENT
- CABLE CONNECTION FOR EXTERNAL POWER SUPPLY

REMARKS:

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

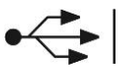
2.3.2 CONNECTING THE BLUETC





A_1
A_2

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



B_1
B_2

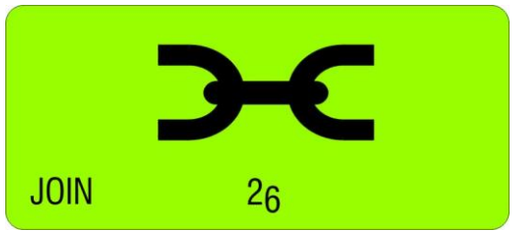
- CABLE CONNECTION FOR INSTRUMENT BLUELEVEL OR WYBUS COMPATIBLE INSTRUMENT
- CABLE CONNECTION FOR EXTERNAL POWER SUPPLY

REMARKS:

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

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

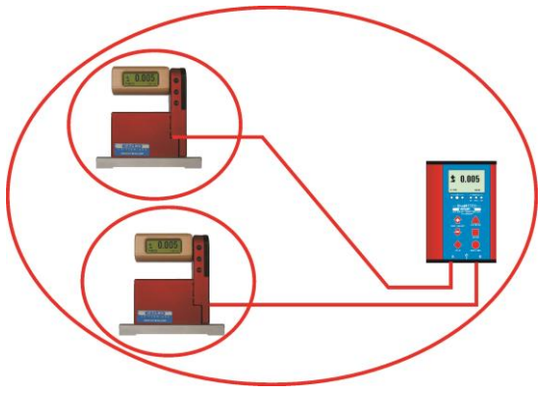
The function "JOIN" enables the grouping of instruments. The grouping prevents the accidental reading of measuring values from instruments of another measuring group. The function "JOIN" can be performed using the cable connection or with wireless data transmission.



The function "JOIN" 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 and BlueMETER) to be joined to a group with the cables provided and switch on all the instruments
2. Select on the BlueMETER 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" 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)

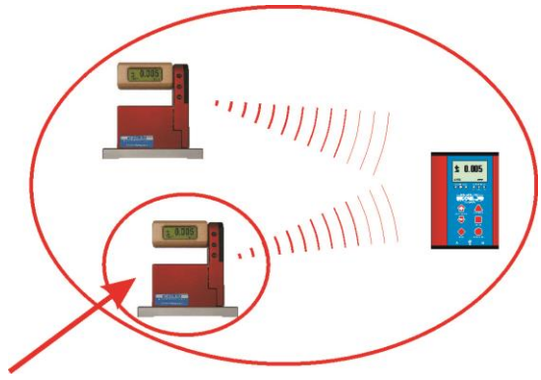
8. For using the wireless mode (the wireless mode must be switched-on on each instrument) the cables can now be removed. After removing the cables the measuring values will be "freezed" for a short while and replaced by empty zeroes until, after successful connection, the measuring values will be displayed again

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

2.4.2 PROCEDURE "JOIN" WITH WIRELESS DATA TRANSMISSION

With the function "JOIN" an instrument can be added by wireless data transmission to an existing group. During this procedure no instrument must be connected by cables as otherwise the "JOIN" procedure for cables will be performed.

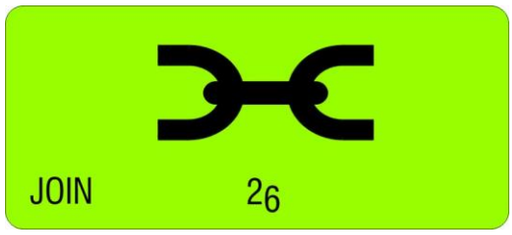
IMPORTANT:
Only two instruments can be grouped in one procedure. If more instruments are members of a measuring group, e.g. a BlueLEVEL "1", a BlueLEVEL "2" and a BlueMETER it is recommended to group first the BlueLEVEL "1" with the BlueMETER and then the BlueLEVEL"2" also with the BlueMETER. The affiliation to the measuring group will be communicated between the members.



The **two instruments to be grouped** must be set to the **JOIN-mode**. The <**ON/MODE**> key must be pressed repeatedly until the mode [**JOIN**] appears in the display. Confirm with <**ENTER**>

Searching

1. Both instruments are "searching" each other. During the searching procedure the green LED on both instruments are lit continuously. The instruments remain in the "search" mode until they have detected each other.
   During the search process the following picture will be displayed:



   Remark: The searching process may go on for several minutes in bad communication conditions.

2. **Group connection**
   As soon as the two instruments have successfully detected each other the search process is stopped and this is visualised by a rapid blinking (4 to 5 times per second) of the green LED's on both instruments.. The joining can no be activated by
   - using the <**ENTER**> key on one of the instruments
     or
   - the whole process may be cancelled by pressing the <**ON/MODE**> key.

3. After establishing the group a **"REFRESH"** will be performed.

4. After the grouping the command **"SENSOR"** will be performed. As the measuring mode has been cancelled during the JOIN procedure this mode must be selected again. The message **"not-defined"** will be displayed

5. The measuring mode ("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 blue LED "LINK" will be lit continuously. The green LED "READY" will blink shortly as many times as instruments are joined in the measuring group (including the own address)

   Attention: If the LED "OFF" is blinking in red, a connection is not possible (see chapter 2.4.2 / special case)

2.4.3 SPECIAL CASES "JOIN"

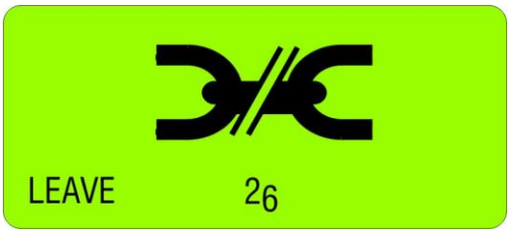
In case both instruments are already joined in different groups of instruments they do find each other but they can not communicate together. The red LED "OFF" is blinking. The search process may be cancelled by using the key <**ON/MODE**> or <**ENTER**>

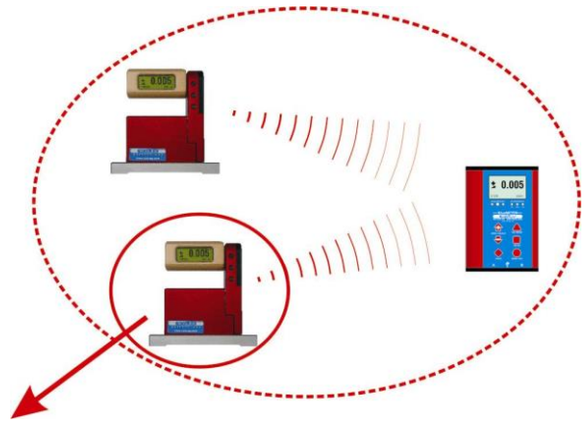
If it is required to use one of the instruments in the new measurement group it is necessary to use the mode "LEAVE" to cancel the existing connection.

2.5 UNHINGE AN INSTRUMENT IN THE RADIO MODE FROM A GROUP BY USING THE FUNCTION „LEAVE"

Each instrument may be unhinged from an existing group of connected instruments.

PROCEDURE „LEAVE"





1. If BlueLEVEL instruments are transmitting measuring values to a BlueMETER or a BlueTC, the keys on the BlueLEVELs are locked. To unlock a BlueLEVEL, the settings at the BlueMETER have to be changed in such a way it no longer communicates with this BlueLEVEL.
2. The instruments to be disconnected must be set to the mode LEAVE. The **<ON/MODE>** key must repeatedly be pressed until in the display shows the mode **[LEAVE]**. Confirm with **<ENTER>**
3. During the leaving mode the blue LED is blinking under "LINK", the green LED "READY" is not blinking respectively off.
4. After the successful procedure the green LED is blinking once for approx. 1 second. With this the unhinge process is finished.

2.6 RENEWED CONNECTION 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 OF THE KEYS AND FUNCTION OF THE BLUELEVEL WITH AND WITHOUT RADIO TRANSMISSION

Starting the BlueLEVEL

Press the **<ON/MODE>** and **<ZERO/SELECT±>** keys located opposite on the handle until all the LED's on top of the handle are illuminated and on the display "**SYSTEM CHECK**" is shown before the actual display appears.

3.1 THE BLUELEVEL

Large LCD display with actual measured value, instrument's address and measuring unit (m/m or Arcsec)

LED showing activities of radio transmission and infrared contact.

Rotating handle with LCD display

Functional keys on both sides of the handle column.

Antenna of radio modules covered and protected

Display of battery power

When the "🔋" symbol is blinking the batteries should be replaced.

Sensor cell with electronic modules in nitrogen filled, gastight housing.

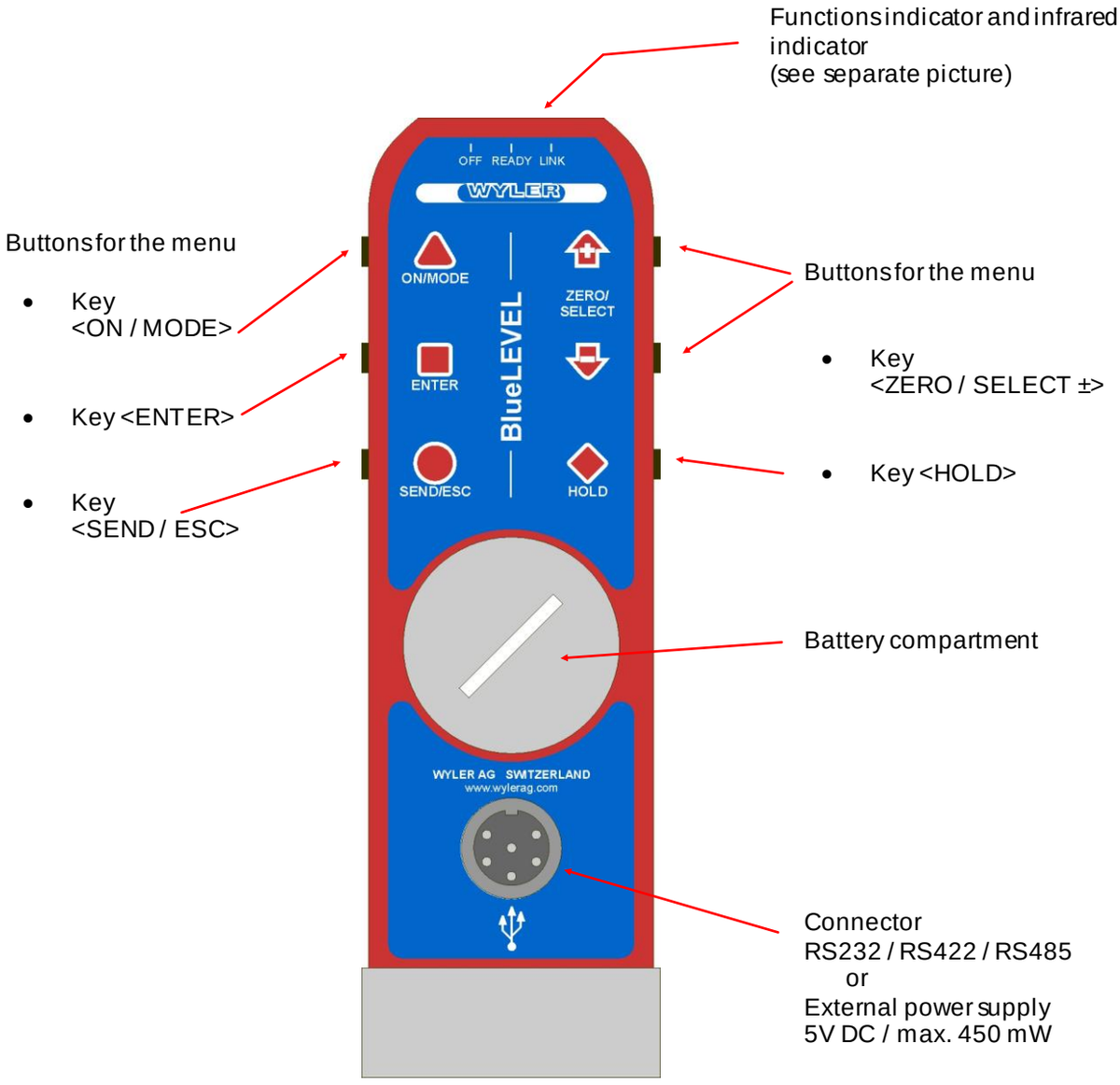
Measuring base

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

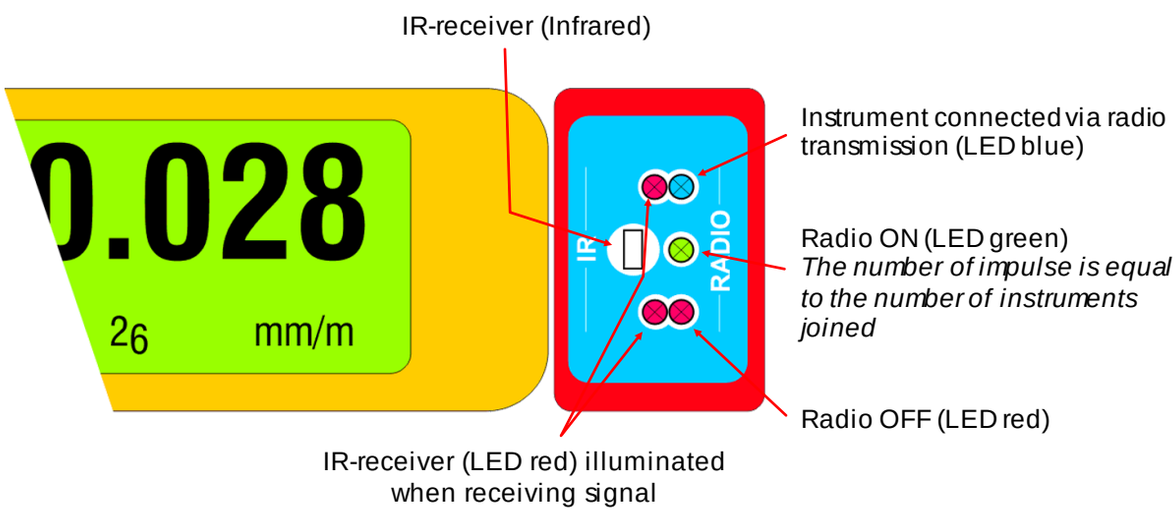
Attention: The housing is NOT rigidly fixed to the measuring base to avoid mechanical tensions.

3.2 VIEW OF FUNCTIONAL KEYS BLUELEVEL

3.2.1 REAR VIEW

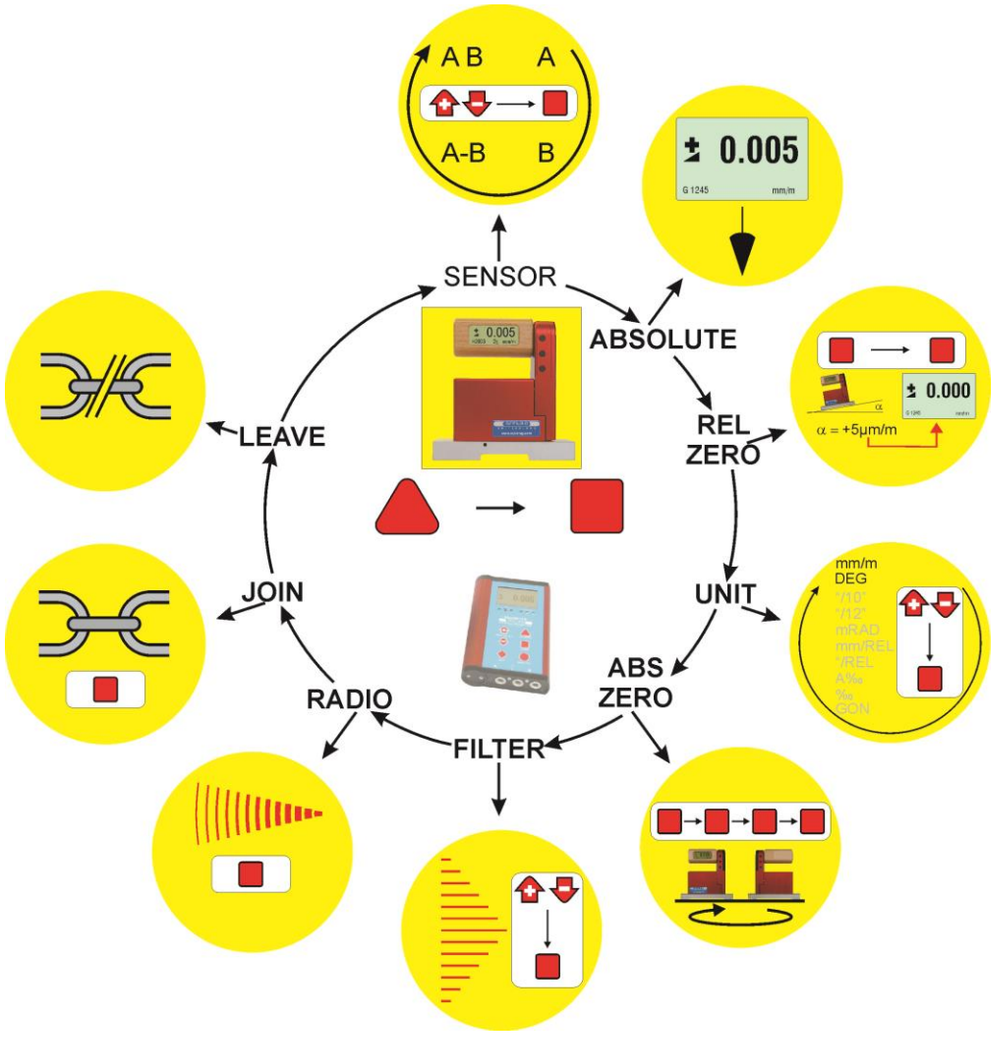


3.2.2 TOP VIEW



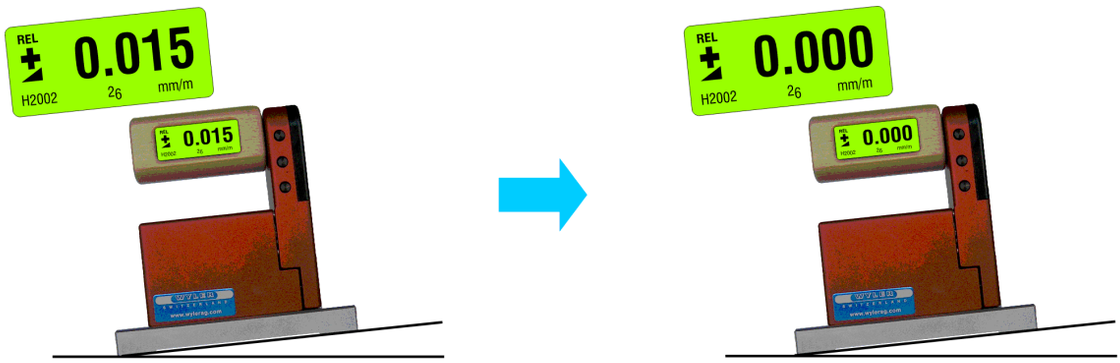
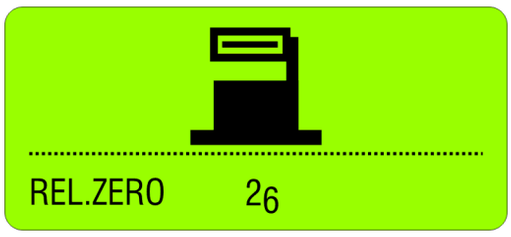
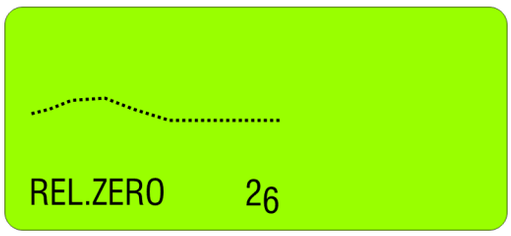
3.3 FUNCTIONAL MENU WITH BLUELEVEL USING THE FUNCTION KEY

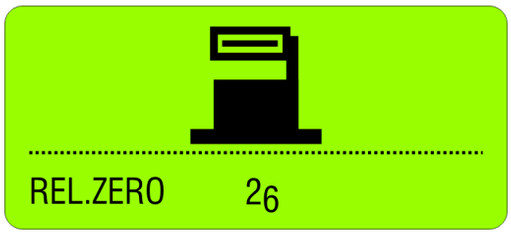
(same applies partially for BlueMETER and BlueTC) / according to G. Lasczyk
… using the key **<ON/MODE>**



FOR ADDITIONAL DETAILS PLEASE CONSULT THE FLOW CHARTS CHAPTER "L / FLOW CHARTS" PAGES 86.....97

Switching the instruments ON	- Starting the **BlueLEVEL. P**ress the **<ON/MODE>** and **<ZERO/SELECT±>** keys located opposite on the handle until all the LED's on top of the handle are illuminated and "**SYSTEM CHECK"** is shown on the display. After starting the actual measured value as well as the last used unit is displayed. - Starting the **BlueMETER.** Press the **<ON/MODE>** key until all the LED's are illuminated and "**SYSTEM CHECK**" is shown on the display. After starting the actual measured value as well as the last used unit and configuration is displayed.
SENSOR **(BlueMETER only)**	- Setting the active sensors/ports and selection of the single ore differential measurement display **BlueMETER only**.

ABSOLUTE	Standard measuring mode, absolute measured value (Zero-offset considered) The instrument displays the actual deviation from a horizontal plane.
REL ZERO	Relative measured value (In the relative mode a „ZERO-OFFSET“ determined e.g. by reversal measurement is superimposed by the value „REL **ZERO OFFSET**“) **<u>Option 1</u> / Automatic setup**  Before After Use the key **<ON/MODE>** select **[REL.ZERO]** and confirm with **<ENTER>.** First the following picture is shown in the display  Using **<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.	**<u>Option 2</u> / Manual setup**

REL ZERO	Use the key **<ON/MODE>** select **[REL.ZERO]** and confirm with **<ENTER>**. First the following picture is shown in the display  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 key **<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. 
UNIT	Selection of unit ([**mm/m**] or [**Arcsec**]) Using the key **<ON/MODE>** select the menu [**UNIT**] and confirm with **<ENTER>**. Using the keys **<ZERO/SELECT ±>** select the required unit and confirm with **<ENTER>**.

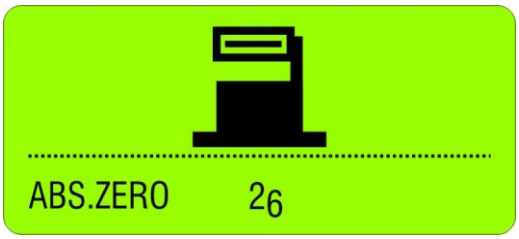
ABS. ZERO

Setting of absolute ZERO with a r**eversal 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 the instrument is placed on.

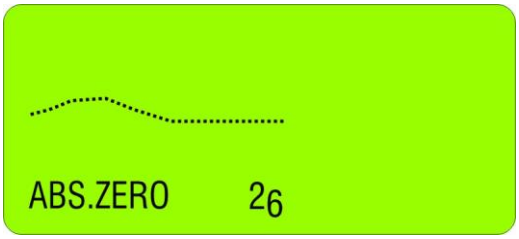
- Slide the instrument onto a flat, horizontally levelled surface (e.g. engineer's surface plate).

- 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>**
  The following display is seen:

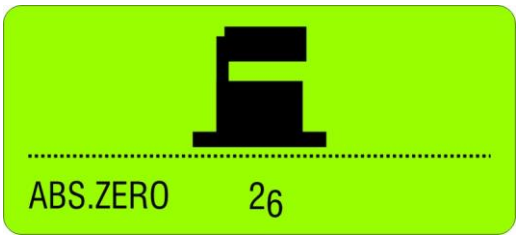


- Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are visible in graphic form.



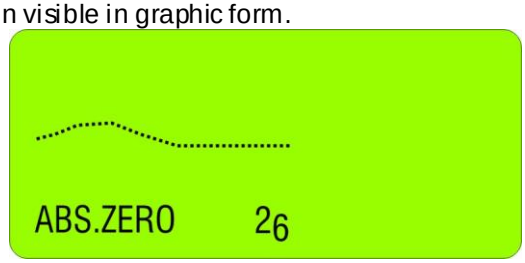
  When the curve is getting a straight line confirm the first value with the zapper or with **<ENTER>**

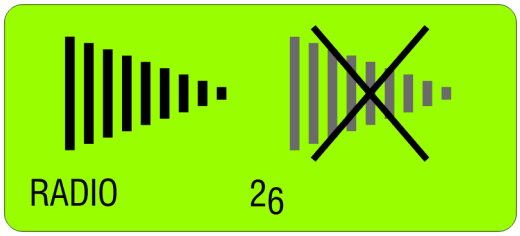
- After the first reading the following display is seen:



  This display means the first reading was successful. The instrument must be turned 180 degrees without lifting it 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	- 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.
FILTER	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>**.
RADIO	Switch radio mode ON or OFF (using cable transmission) Use the key **<ON/MODE>** select the menu [**RADIO**] and confirm with **<ENTER>**.  For definitely switching On or Off confirm again with **<ENTER>**. After switching the radio OFF the **red LED on the handle is on**. Returning to the radio mode follow the same procedure. When the radio mode is on, the **green LED on the handle is on**.
JOIN	Combine a group of instruments to a measurement group See detailed description in chapter 2.4: Combine a group of instruments to a measurement group using the function "JOIN" In radio transmission mode
LEAVE	Unhinge an instrument in the radio mode from a group See detailed description in chapter 2.5 Unhinge an instrument in the radio mode from a group by using the function "LEAVE"

FOR ADDITIONAL DETAILS PLEASE CONSULT THE FLOW CHARTS CHAPTER "L / FLOW CHARTS" PAGES 86.....97

ADDITIONAL FUNCTIONS

Function KEY-LOCK / key lock and unlock by using the push buttons

Using the following function the keys may be locked or unlocked

KEY-LOCK <ON> Keep the key **<ENTER>** pressed for a minimum of 2 seconds until in the display shows „LOCKED“
When the keys are locked the respective symbol is displayed as shown below

The KEY-LOCK function is meant to eliminate any unintended pressing of a key and starting an unplanned action, such as e.g. a <HOLD> function.
It is however possible to make all the required measurements without restrictions.

KEY-LOCK <OFF> Keep the key **<ESC>** pressed for a minimum of 2 seconds until after a short display of the sign "LOCKED" in the display the above mentioned symbol disappears and "UNLOCKED" is shown.

3.4 TEACH-IN of the IR-trigger (Zapper)

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 **<ZERO/SELECT ±>** on the measuring or display instrument pressed
- Point the trigger (IR Zapper) in the direction of the measuring or display instrument
- Press the **actuator key** on the IR Zapper until both red IR LEDs are lighting up.

This procedure must be done on all the measuring and display instruments using the same IR triggering. When the instruments are dispatched this procedure is already factory set standard.

3.5 OPERATING THE BLUELEVEL

3.5.1 DESCRIPTION OF THE VARIOUS KEYS

If the instrument is remotely controlled by a BlueMETER the key functions are blocked with very few exceptions. All functions have to be executed at the BlueMETER.

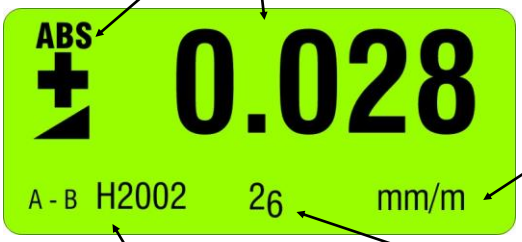
<ON/MODE> – key

Function - 1 –

Starting the **BlueLEVEL.** Press the <ON/MODE> key until all the 5 LED's are illuminated and on the display "**SYSTEM CHECK"** is shown.

After starting the actual measured value as well as the last used unit is displayed. e.g.:

Actual value and unit set
actual leading sign and showing the
measurement mode (in the example: ABS = ABSOLUTE mode)



Unit in
[**mm/m**], resp. [**µm/m**]
or in
[**Arcsec**]

Serial number of instrument used as identification. In the example the reference instrument "B" is active. The mode is differential measurement „A-B", the address of the instrument "B" is H2002 (Address shown beside "B")

Actual battery power

Deactivating the automatic instrument shut off of the BlueLEVEL:

When pressing the **<ON/MODE>** and **<ZERO/SELECT±>** keys at the **starting of the instrument** longer than 10 seconds all LED's start blinking and the automatic shut off is deactivated. Using the battery mode, the instrument is automatically shut off after 60 minutes.

Exception:

When the BlueLEVEL or the BlueMETER is connected to an external power supply the instrument never shuts off automatically.

Function - 2 -

The key **<ON/MODE>** is used for handling the internal **menu**. When pressing several times other menu points are displayed.

Function - 3 -

For **shutting off** the BlueLEVEL the key **<ON/MODE>** must be pressed continuously until all 5 LED's are on and the instrument's display is completely off.

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.

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 actions taken.
Function - 2 -	In connection with the software LEVELSOFT and MT-SOFT the key is used for collecting the actual measured value. It is not recommended to use this key due to unsettle the instrument when the key is pressed. It is recommended to use the infrared zapper or the **<ENTER>** key on the BlueMETER instead.

<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 not recommended to use this key due to unsettle the instrument when the key is pressed. It is recommended to use the infrared zapper or the **<SEND/ESC>** key on the BlueMETER instead.

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
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, 9600 Baud

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") / only **BlueMETER**
- Relative base settings
- Set "**Zero-Offset"**
- Set **"REL Zero-Offset"** etc.

Function - 2 -

In the operating mode "A B" the values of both instruments connected to the ports "A" and "B" are displayed on the **BlueMETER** simultaneously one above the other.

Upper display:
Measuring instrument port "A"

Lower display
reference instrument port "B"

<HOLD> - Key

Function - 1 -

With the **<HOLD>** key a measured value may "frozen". After pressing the key **<HOLD>** without further action by the user, the measured value is collected during 25 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 BlueLEVEL will return to the measuring mode. If in the "on hold" mode a BlueMETER takes over the control the instrument automatically returns to the measuring mode

Function - 2 -

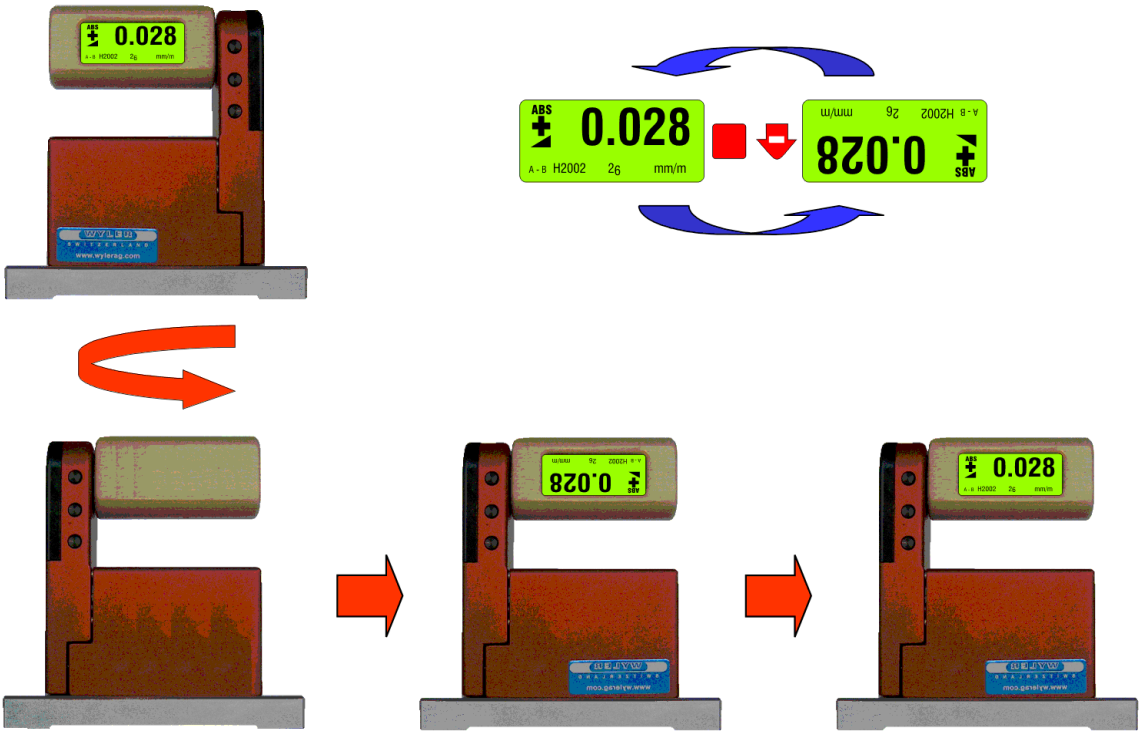
When using the mode **REL ZERO** and **ZERO** the actual measuring value can be accepted by pressing the **<HOLD>** key.

Mirroring the display

With the two middle keys **<ENTER>** and **ZERO/SELECT** the display can be mirrored diagonally. With this function in combination with the rotary handle bar the values displayed can be perfectly seen from all possible angles. This function can be executed at all times, even when the instrument is remotely controlled by a BlueMETER.

Left:
Display "standard"

Right:
Display mirrored diagonally



3.5.2 DESCRIPTION OF VARIOUS DISPLAY FORMS ON THE BLUELEVEL

Main display

Display of the actual measured value

Display in [mm/m]
The instrument is as single unit in a group active

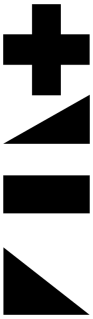
Port "A": Address of the instrument: H2080

Display in [mm/m]
The instrument is as reference unit in a group active

Port "B": Address of the instrument: H2002. The address of the second instrument "A" is only shown on the BlueMETER.

Display of the inclination

The picture shows the direction of the value's inclination



Inclined to the right: positive

Declined to the right: negative

Menu

ABSOLUTE	Standard measuring mode
REL ZERO	Relative measurement
UNIT	Setting the required units
ABS.ZERO	Setting absolute zero
FILTER	Setting a filter type
RADIO	Switch radio mode ON or OFF
JOIN	Joining a group of instruments
LEAVE	Leaving a group of instruments

Status of battery power "BATT"

Usually the actual battery power is displayed, e.g. 2_6 **(2.6 Volt)**

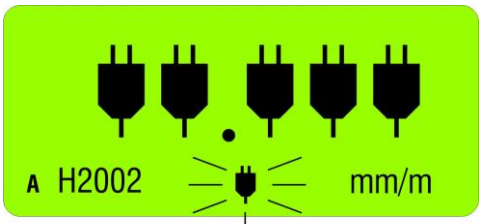
Regarding the status indication of the internal power the following options are possible:

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}

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

Supply voltage U_{INT} <4.75V

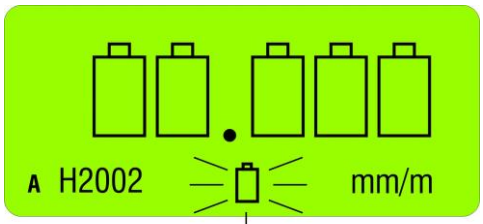


Supply voltage U_{INT} <4.5V
Measuring no longer possible

Battery supply U_{BATT}

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

Supply voltage U_{INT} <4.75V



Supply voltage U_{INT} <4.5V
Measuring no longer possible

Measuring unit

Display of the actual unit set.
2 basic units are available in the BlueLEVEL [**mm/m**] and [**Arcsec**]

Sensor-Address

Function – 1

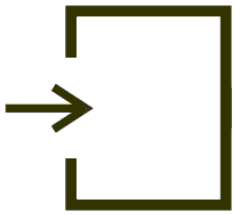
Display of active port address
- of the instrument showing the measured value
- connected instrument/sensor used for calibration

Function - 2

Display of the measuring mode, e.g. individual instrument or differential measurement (Sensor A - Sensor B)

Note: If this symbol appears in the display, this means that the instrument is performing any function.

During this time the measuring instruments should not be touched and the process should not be cancelled.



4 DESCRIPTION OF THE BLUEMETER WITH OR WITHOUT RADIO MODULE

The BlueMETER is an intelligent digital display unit developed by WYLER AG for the inclination measuring instrument BlueLEVEL. 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 is
- a display unit
- an interface between instrument and PC/Laptop

On the BlueMETER 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

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

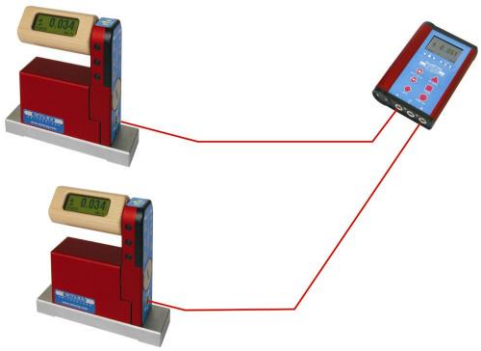
Starting the BlueMETER
Press the key **<ON/MODE>** continuously until all 5 LED’s are illuminated. Then release the key and the display shows "**SYSTEM TEST"**. When started, the display shows the measured value of the connected measuring instruments as well as the last saved configuration inclusive the last set measuring unit.

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

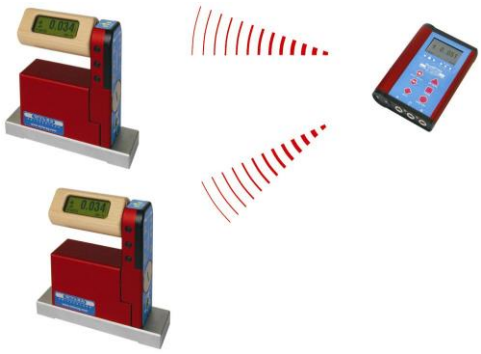
In case the key **<ON/MODE>** is pressed for more than 10 seconds when the BlueMETER is started all LED’s start blinking and the **automatic shut off** is **deactivated**.

4.2 TYPICAL CONFIGURATIONS WITH BLUEMETER

Configurations using BlueLEVEL instruments and BlueMETER

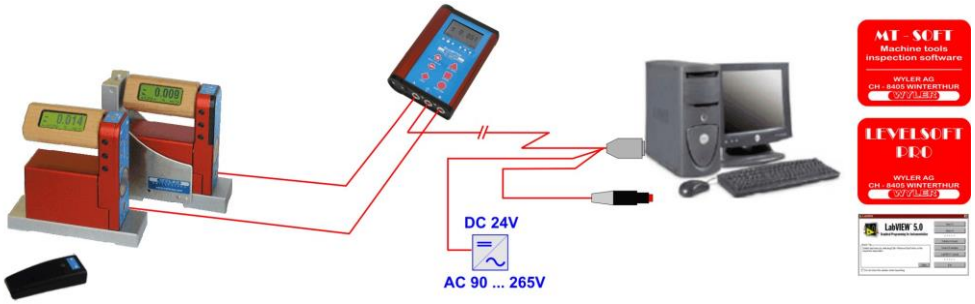


Data transmission via cables

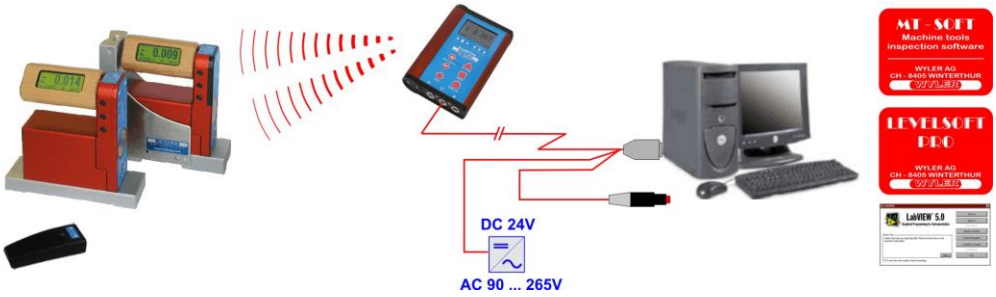


Data transmission via radio module (Bluetooth™ wireless technology)

Configurations using BlueLEVEL instruments and BlueMETER
connected to PC/Laptop



Data transmission via cables to PC/Laptop



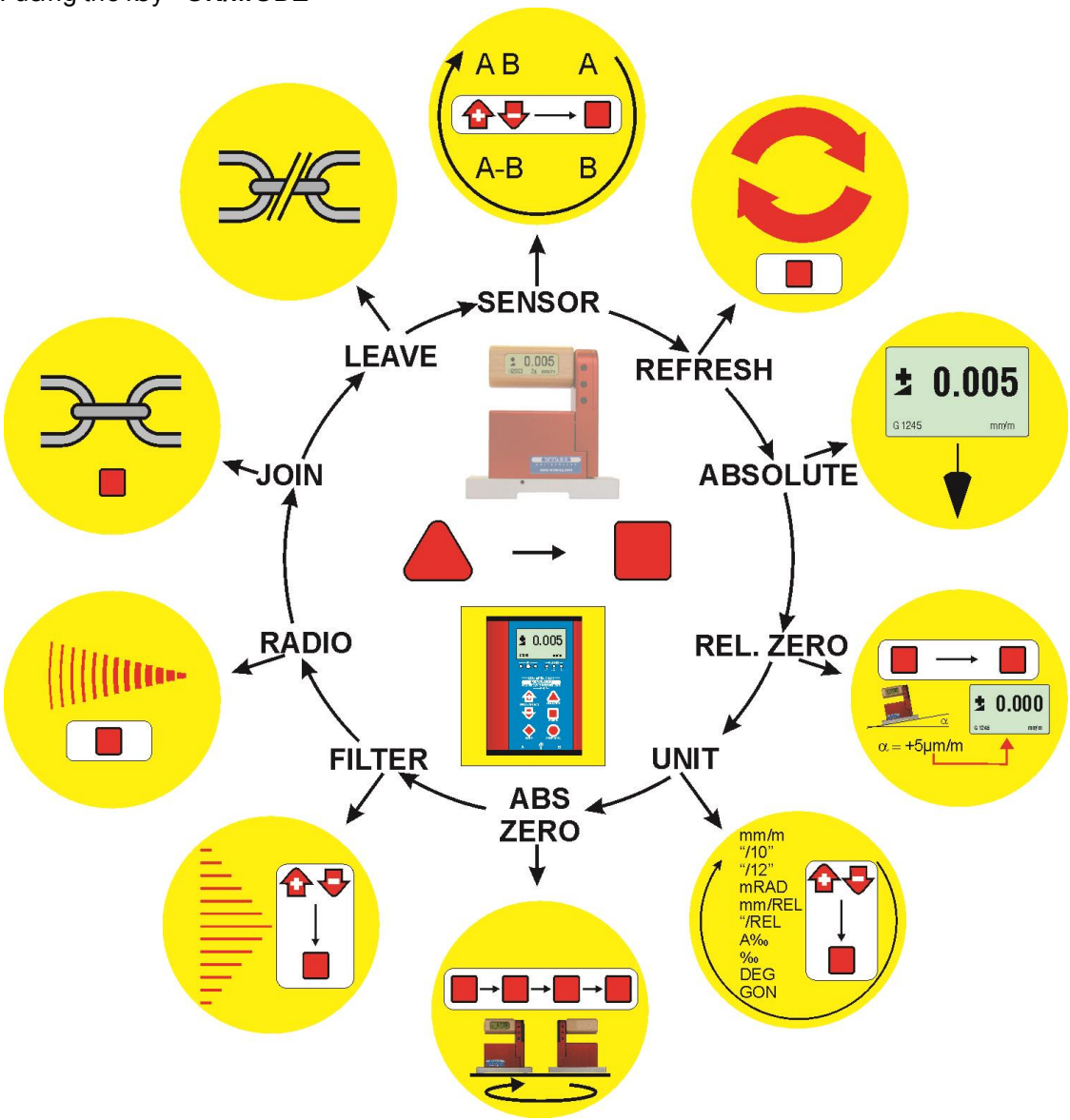
Wireless data transmission (Bluetooth™ wireless technology) and connection to PC / Laptop by cable

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:

4.4 FUNCTIONAL MENU WITH BLUEMETER USING THE FUNCTION KEY

(same applies for BlueLEVEL and partially for BlueTC) / according to G. Lasczyk
… using the key **<ON/MODE>**



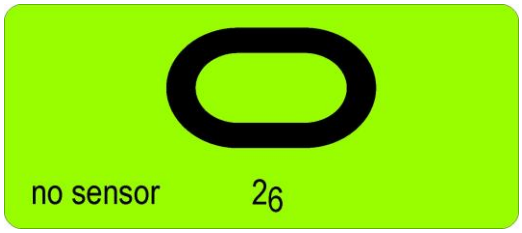
FOR ADDITIONAL DETAILS PLEASE CONSULT THE FLOW CHARTS CHAPTER "L / FLOW CHARTS" PAGES 86.....97

Switching the instrument on	- Press the **<ON/MODE>** and **<ZERO/SELECT±>** keys located side by side until all the LED's are illuminated then release the keys 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 keys **<ON/MODE>** and **<ZERO/SELECT±>** continuously for more than 10 seconds all the LEDs start flashing and the **automatic shut off** is disabled.
SENSOR **(BlueMETER 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 only)

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



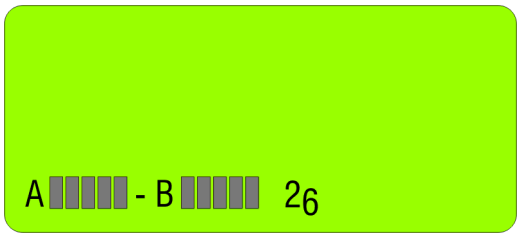
- "no sensor": no sensors found yet. NO sensors are connected via cables and no instruments with wireless data transmission are registered.
  In case the sensors should have been connected through cables, a REFRESH must be performed after these have been connected. Press the key <**ON/MODE**> repeatedly until **[REFRRESH]** appears on the display. Confirm with <**ENTER**>.

  In case the sensors should have been connected via wireless data transmission these must be added to the measuring group using the function JOIN. Press the key <**ON/MODE**> repeatedly until **[JOIN]** appears on the display. Confirm with <**ENTER**>. Do the same on the BlueLEVEL. As soon as the greed LED starts blinking confirm with <**ENTER**>. Detailed description of the JOIN function see chapter 2.4.

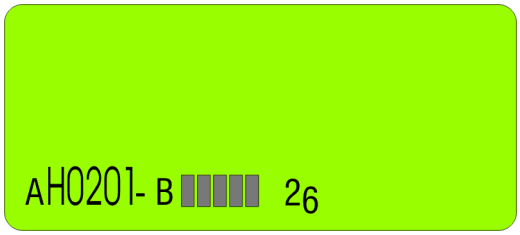
- Now the measuring mode and the sensors can be selected. Confirm with <**ENTER**> and select the required configuration using the <**ZERO/SELECT±**> key.

  - 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)

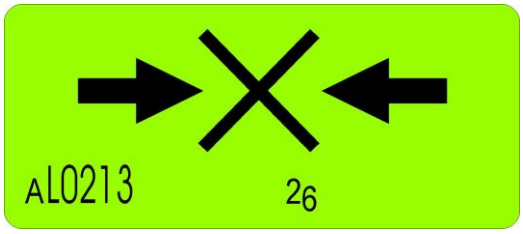


  Confirm the configuration selected with **<ENTER>**. The address of the sensor "A" can now be selected with the keys **<ZERO/SELECT±>**. Confirm the selection with **<ENTER>**.
  Select the address of the first sensor (measuring instrument) using the keys **<ZERO/SELECT ±>** and confirm with **<ENTER>**.



  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.

Cont. SENSOR (BlueMETER only)	- Possible error messages in the **display**:
	 
	
	• 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:
	  ○ The measuring instrument is not switched on
	  ○ The distance between the BlueMETER and the Blue LEVEL is to long
	  ○ The wireless communication element on the measuring instrument is not switched on

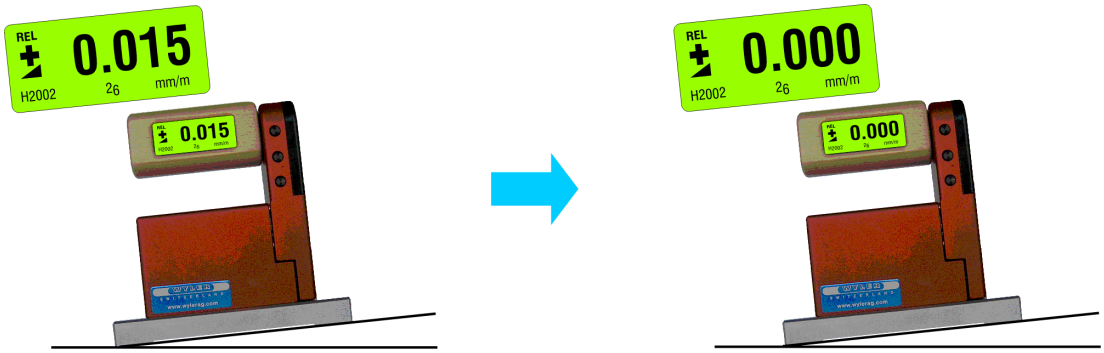
REFRESH **(BlueMETER only)**	Starts the search for instruments connected and registers them in the internal list of instruments. Instruments not connected any more are marked in the list of instruments as "not present". To make a later search easier these remain, however, in the list. The function "REFRESH" 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. If BlueLEVEL 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. **<u>For BlueMETER only</u>**
ABSOLUTE	Standard measuring mode, absolute measured value (Zero-offset considered) The instrument displays the actual deviation from a horizontal plane.

REL ZERO

With <u>one</u> instrument

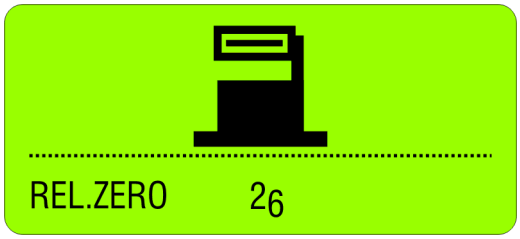
Relative measured value (In the relative mode a "ZERO-OFFSET" determined e.g. by reversal measurement is superimposed by the value "REL ZERO OFFSET")

<u>Option 1</u> / Automatic setup

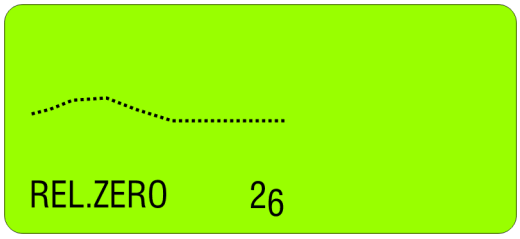


Before After

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



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



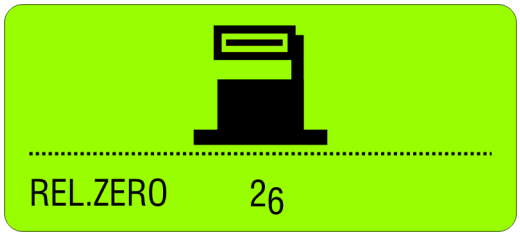
When the values have stabilized the relative ZERO can be confirmed with <ENTER> or with the IR-zapper.

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

Option 2 / Manual setup

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



Use <ON/MODE> for cancelling the procedure

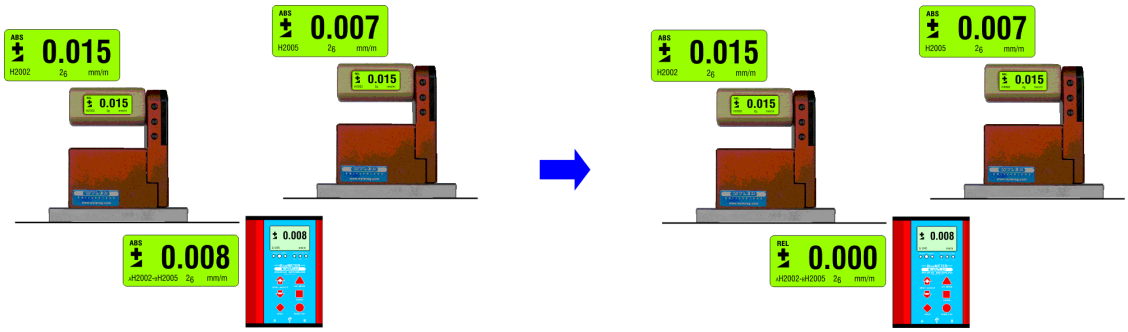
The following picture is seen. It shows an earlier value for a REL.ZERO OFFSET.

This value may now be changed manually with the key <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.

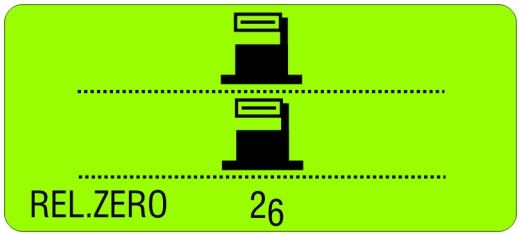
Two instruments connected, differential measurement
Instrument "A" minus instrument "B"

The procedure is similar with the exception that now two instruments are considered.

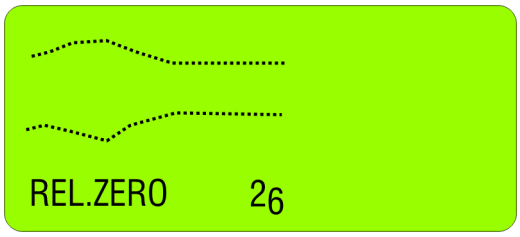


Use the key **<ON/MODE>** select **[REL.ZERO]** and confirm with **<ENTER>** First the following picture is shown in the display

CONT.
REL ZERO



Using **<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.

Important:
On the instrument's (BlueLEVEL) display still the actual measured values in the **absolute mode** are seen.

UNIT

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 possible formats may now be chosen by pressing the key **ZERO/SELECT "+/-"** until the desired unit is displayed. This selection must be confirmed by pressing **<ENTER>**.

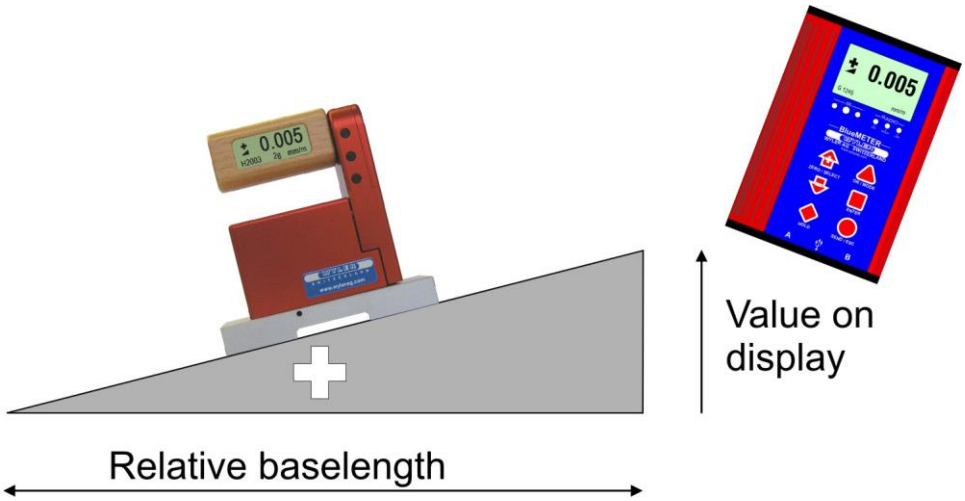
The following **measuring units** can be chosen at the BlueMETER:

CONT. UNIT

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. 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

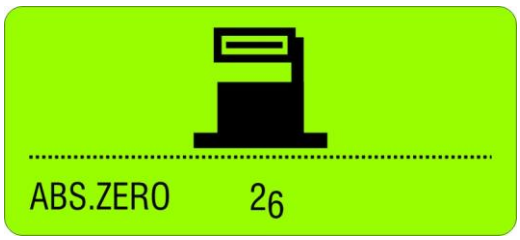
ABS.ZERO

Setting of absolute ZERO with a r**eversal 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 the instrument is placed.

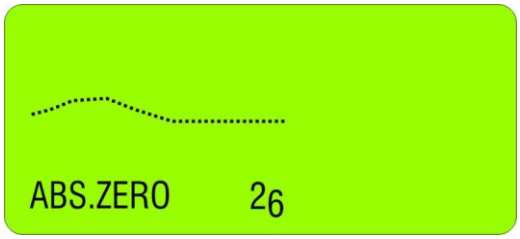
- Slide the instrument onto a flat, horizontally levelled surface (e.g. engineer's surface plate).

- 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>**
  The following display is seen:

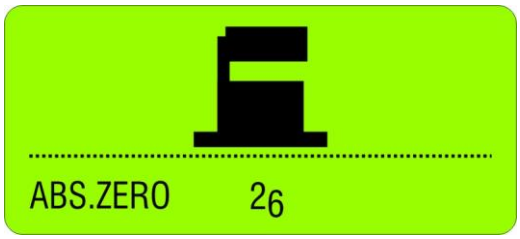


- Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are visible in graphic form.



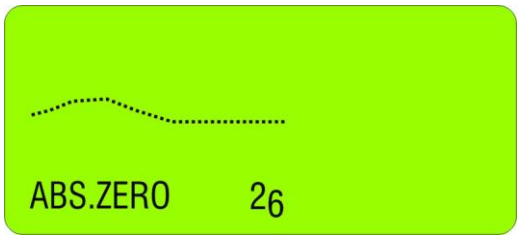
  When the curve is getting a straight line confirm the first value with the zapper or with **<ENTER>**

- 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.

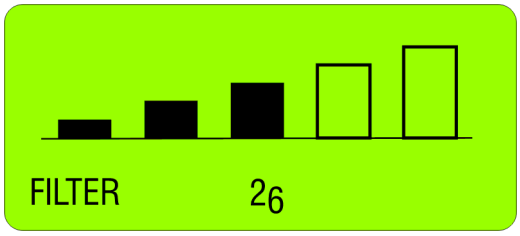


Cont. ABS.ZERO

- 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.

FILTER



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>**.

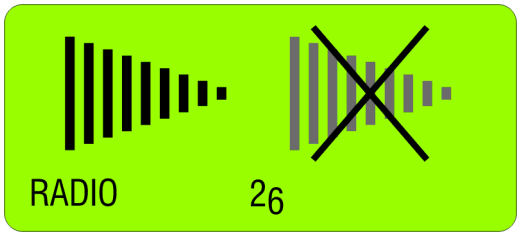
Filter description:

- 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	Switch radio mode ON or OFF (using cable transmission) Use the key **<ON/MODE>** select the menu [**RADIO**] and confirm with **<ENTER>**.  For definitely switching On or Off confirm again with **<ENTER>**. After switching the radio OFF the **red LED on the handle is on**. Returning to the radio mode follow the same procedure. When the radio mode is on, the **green LED on the handle is on**.
JOIN	Combine a group of instruments to a measurement group See detailed description in chapter 2.4: Combine a group of instruments to a measurement group using the function „JOIN“ In radio transmission mode
LEAVE	Unhinge an instrument in the radio mode from a group See detailed description in chapter 2.5 Unhinge an instrument in the radio mode from a group by using the function „LEAVE“

FOR ADDITIONAL DETAILS PLEASE CONSULT THE FLOW CHARTS CHAPTER "L / FLOW CHARTS" PAGES 86.....97

ADDITIONAL FUNCTIONS

Adjusting the display contrast

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

4.5 TEACH-IN of the IR-trigger (Zapper)

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 **< ZERO/SELECT ±>** on the measuring or display instrument pressed
- Point the trigger (IR Zapper) in the direction of the measuring or display instrument
- Press the **actuator key** on the IR Zapper until both red IR LED's are lighting up.

This procedure must be done on all the measuring and display instruments using the same IR triggering. When the instruments are dispatched this procedure is already factory set standard.

4.6 OPERATING THE BLUEMETER
4.6.1 DESCRIPTION OF THE VARIOUS KEYS

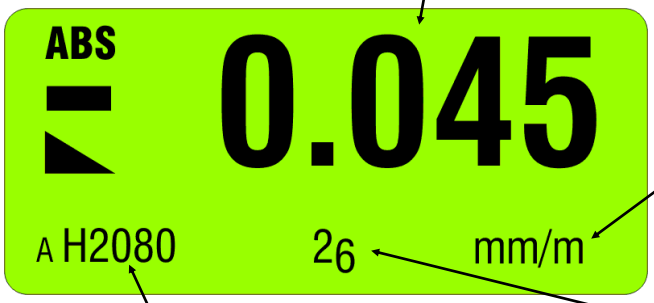
<ON/MODE> - Key

Function - 1 –

Starting the **BlueMETER.** Press the <ON/MODE> key until all the 5 LED's are illuminated and on the display shows "**SYSTEM CHECK**".

After starting, the actual measured value as well as the last used unit is displayed. e.g.:

Actual value and unit set
actual leading sign and showing the
measurement mode (in the example: ABS = ABSOLUTE mode)



Unit in
[**mm/m**], resp. [**µm/m**]
or in
[**Arcsec**]

Serial number of instrument used as identification.

Actual battery power

Deactivating the automatic instrument shut-off of the BlueMETER:
When pressing the **<ON/MODE>** key at the **starting of the instrument** for longer than 10 seconds all LED's start blinking and the automatic shut off is deactivated.
Exception:
When the BlueMETER is connected to an external power supply the instrument never shuts off automatically.

Function - 2 -

The key **<ON/MODE>** is used for handling the internal **menu**. When pressing several times other menu points are displayed.

Function - 3 -

For **shutting off** the BlueMETER the key **<ON/MODE>** must be pressed continuously until all 5 LED's are on and the instrument's display is completely off.

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.

Function - 4 -

Setting the displayed values (memory values) of the functions "**REL ZERO"** and **"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 and MT-SOFT the key is used for collecting the actual measured value.
Function – 3	The key **<ENTER>** is used to turn on resp. turn 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.

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
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, 9600 Baud

Function - 2 - Delete the "**<HOLD>"** function and return to the mode **MEASURE**.

Function - 3 - **Cancel** the functions of the various menus

ZERO/SELECT "+/-" - Key

Function - 1 -	The keys **ZERO/SELECT "+/-"** are used for selecting different settings, such as: - Measuring unit - Ports ("A" / "B" / "A - B" / "A B") / only **BlueMETER** - Relative base settings - Set "**Zero-Offset"** - Set **"REL Zero-Offset"** etc.

<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 25 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 BlueLEVEL will return to the measuring mode.
Function - 2 -	When using the mode **REL ZERO** and **ZERO** the actual measuring value can be accepted by pressing the **<HOLD>** key.

4.6.2 DESCRIPTION OF VARIOUS DISPLAY FORMS ON THE BLUEMETER

Main display

Display of the actual measured value

Display in [mm/m]

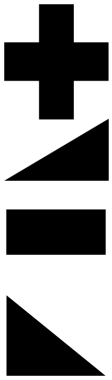
The display of the BlueMETER shows the difference value between instrument "A" (H2002) and instrument "B" (H2005)

Display in [mm/m]

The display of the BlueMETER shows the measured values of the instrument "A" (H2002) as well as the instrument "B" (H2005)

Display of the inclination

The picture shows the direction of the value's inclination



Inclined to the right: positive

Declined to the right: negative

Menu

SENSOR	Setting the active sensors/ports and selection of the single or differential measurement display. BlueMETER only
ABSOLUTE	Standard measuring mode
REFRESH	Update of the list of instruments
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

Status of battery power "BATT"

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}!

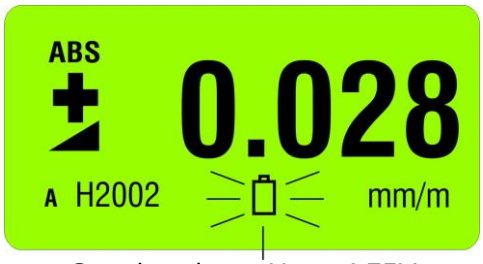
External Power Supply U_{EXT}

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

Supply voltage U_{INT} <4.75V

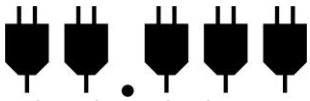
Battery supply U_{BATT}

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

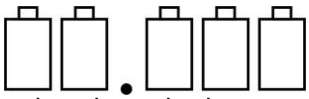


Supply voltage U_{INT} <4.75V

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

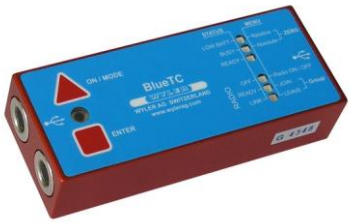
Display of active port address
- of the instrument showing the measured value
- connected instrument/sensor used for calibration

Function - 2

Display of the measuring mode, e.g. individual instrument or differential measurement (Sensor A - Sensor B)

5 BLUETC (TRANSCEIVER/CONVERTER) WITH OR WITHOUT RADIO MODULE

The BlueTC with or without radio transmission was developed as an alternative interface to the BlueMETER for using the inclination measuring instruments BlueLEVEL.



Functions in connection with BlueLEVEL

The BlueTC can be used with the BlueLEVEL instruments. As all the relevant data such as

- Calibration data
- Instrument's address

are stored in the instrument's memory.

It is possible to send measured data via a RS 232 port to a printer, a PC/Laptop or the WYLER software **LEVELSOFT PRO** and **MT-SOFT** or to other software such as e.g. LabVIEW™

Advantage compared to the BlueMETER connected to BlueLEVEL instruments are:

- Simple configuration BlueTC is only an interface between instruments and PC / Laptop
- Cost effectiveness

Disadvantage compared to the BlueMETER connected to BlueLEVEL instruments are:

- No display of the connected instruments [A] and [B] measured values
- Menu less extensive and less comfortable due to no display

5.1 INITIAL STARTUP OF THE BLUETC

Please read the manual carefully before working with the BlueTC for the first time.

Starting the BlueTC
Press the key **<ON/MODE>** continuously until all 6 LED's are illuminated then release the key

- The LED "READY" in **STATUS** is flashing rapidly
- The green LED "READY" in **RADIO** is blinking as many times as instruments are connected in the radio mode (inclusive own address)
- In case instruments e.g. BlueLEVEL are already connected by radio the blue LED under **RADIO** is on

Deactivating the automatic instrument shut-off of the BlueTC:

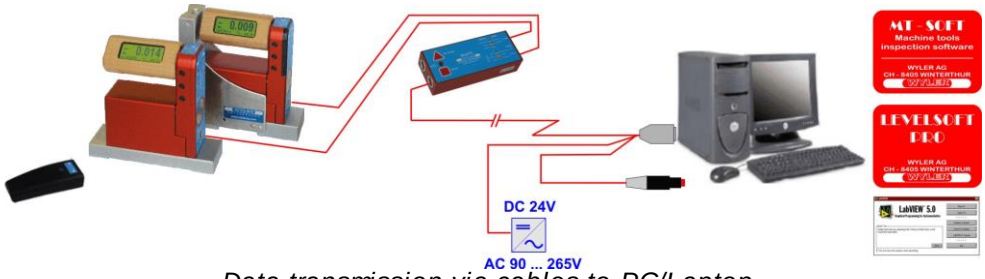
When pressing the **<ON/MODE>** key at the **start of the instrument** longer than 10 seconds all LED's start blinking and the **automatic shut-off** is **deactivated**. In the battery mode, the instrument is automatically shut off after 60 minutes.

Exception:

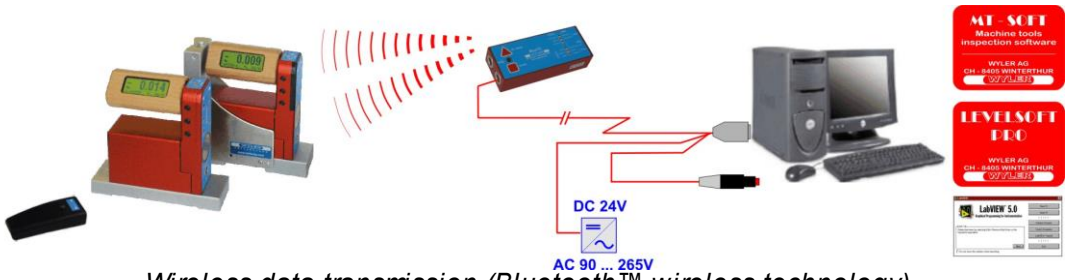
When the BlueTC is connected to an external power supply the instrument never shuts off automatically (continuous operation).

5.2 TYPICAL CONFIGURATIONS WITH BLUETC

Configurations using BlueLEVEL instruments and BlueTC connected to PC/Laptop



Data transmission via cables to PC/Laptop
BlueTC as Interface



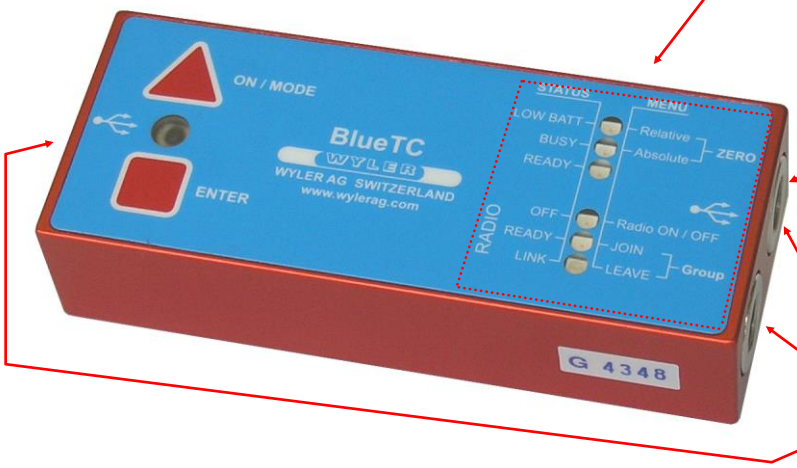
Wireless data transmission (Bluetooth™ wireless technology) and connection to PC / Laptop ***BlueTC as Interface***

5.3 Overview of the BLUETC

Panel with functional keys
- ON / MODE
  and
- <ENTER>

LED showing activities of radio transmission, menu structure and infrared contact.

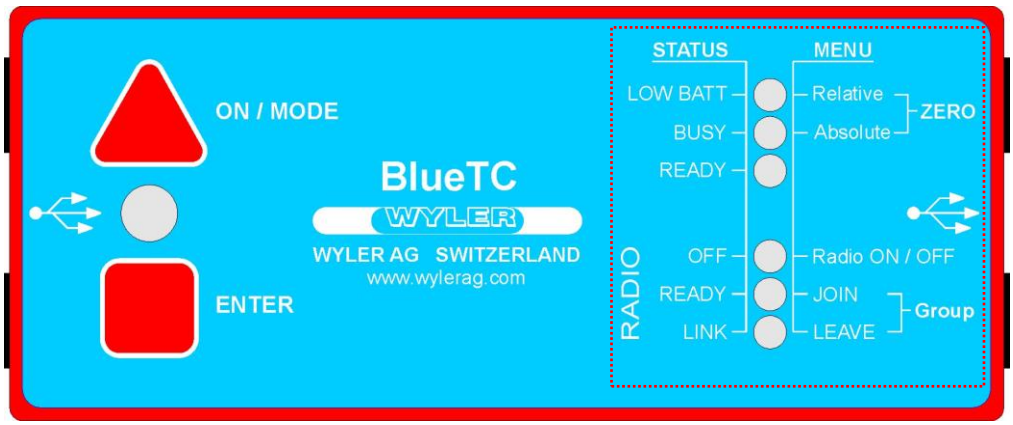
Aluminium housing anodised



Connectors for instruments/sensors/power supply and output to PC/Laptop

The BlueTC is supplied with or without piggy-back mounted power supply

5.4 FUNCTIONAL MENU WITH BLUETC / STRUCTURE



MENU STRUCTURE USING THE KEY <ON/MODE>

NOTE:
THE FUNCTIONS DESCRIBED HERE AFTER CAN ONLY BE PERFORMED AFTER THE INSTRUMENT HAS BEEN RELEASED BY THE FOLLOWING PROCEDURE:

Press and hold down the <**ENTER**> key. After 3 seconds press additionally the <**ON/MODE**> key and hold both down for another 3 seconds. The release both keys at the same time.

With the key <ON/MODE> the corresponding menu can be selected. By means of the key <ENTER> the menu point can be chosen.

MENÜ	**Relative ZERO LED red**	deactivated
	Absolute ZERO LED yellow	deactivated
	Radio ON / OFF LED red	ON / OFF RADIO (wireless data transmission)
	JOIN GROUP LED green	Joining a measuring group
	LEAVE LED blue	Leaving a measuring group

STATUS	**LOW BATT LED red**	In case of low battery power the LED glows red
	BUSY LED yellow	Flashing yellow when instrument is busy
	READY LED green	Flashing green when the instrument is ready
	OFF LED red	Red when the radio is OFF
	READY LED green	Flashing green when the radio is ON. The number of impulse indicate the number of instruments joined in the measuring group
	LINK LED blue	Blue when the wireless data transmission is active

5.5 OPERATING THE BLUETC
DESCRIPTION OF THE VARIOUS KEYS

<ON/MODE> - Key

Function - 1 – 	Starting the **BlueTC.** Press the **<ON/MODE>** key until all the 6 LED's are illuminated, release key • The LED "READY" in **STATUS** is flashing rapidly • The green LED "READY" in **RADIO** is blinking as many times as instruments are connected in the radio mode (inclusive own address) • In case instruments e.g. BlueLEVEL are already connected by radio the blue LED under **RADIO** is on **Deactivating the automatic instrument shut-off of the BlueTC:** When pressing the <**ON/MODE>** key at the **start of the instrument** for more than 10 seconds all LED's start blinking and the automatic shut-off is deactivated. Normally the instrument is automatically shut off after 60 minutes. **Exception:** When the BlueTC is connected to an external power supply the instrument never shuts off automatically.
Function - 2 –	The key <**ON/MODE>** is used for choosing the corresponding menu point
Function - 3 -	For **shutting off** the BlueTC the key <**ON/MODE>** must be pressed continuously until all 6 LED's are on.

<ENTER> – Key

Function – 1 –	By means of the key **<ENTER>** the menu point can be chosen
Function - 2 -	In connection with the software LEVELSOFT and MT-SOFT the key is used for collecting the actual measured value.

APPENDIX
A BASICS AND GENERAL REMARKS ABOUT BLUESYSTEM AND INCLINATION MEASUREMENT

A1 INTRODUCTION TO THE BLUESYSTEM

The new **BlueSYSTEM** is a continuous further enhancement of the well known and well established measuring instruments MINILEVEL NT + LEVELTRONIC NT with or without wireless data transmission. A BlueSYSTEM normally consists of one or two measuring instruments BlueLEVEL and an indication unit BlueMETER. Depending on the application The BlueMETER can also be connected to a PC with evaluation software allowing the online evaluation and presentation of the values.

The BlueSYSTEM is available **with or without radio transmission**. When using the system with cable connections it is possible to upgrade to wireless transmission at a later stage

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 enhanced as well, to allow precise measurements even under critical environmental conditions.

The key features of these new series of instruments are:

- Compact and pleasant design which is functionally optimized for precision measurement
- Wireless data transmission based on the internationally approved Bluetooth™ -standard
- 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
- Display can be read from both sides since the handle can be rotated
- Each instrument has its own specific address allowing the use of several independent systems in the same room without interfering with each other
- Since each instrument has a built in IR receiver, the measurement can be initiated at any instrument
- Compatible to existing measuring bases
- One range only in every instrument
- There are three different BlueLEVEL types available
    - BlueLEVEL 1 µm/m: Range ±20mm/m
    - BlueLEVEL 5 µm/m: Range ±100mm/m
    - BlueLEVEL 10 µm/m: Range ±200mm/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 and other applicable EMC regulations

The new measuring instruments of the BlueSYSTEM family can be used as individual instruments as well as combined in a set. Instead of using a BlueMETER it is also possible to use a BlueTC as an interface to the PC/Laptop. The functions are all the same with the exception of the LCD display which is only available with the BlueMETER.

A set of instruments, also called ENGINEER SET, normally consists of one or two BlueLEVEL and one BlueMETER, forming the ideal tool for measuring flatness and machines under workshop 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 DIFFERENCE BETWEEN THE CONFIGURATION WITH BLUEMETER AND BLUETC

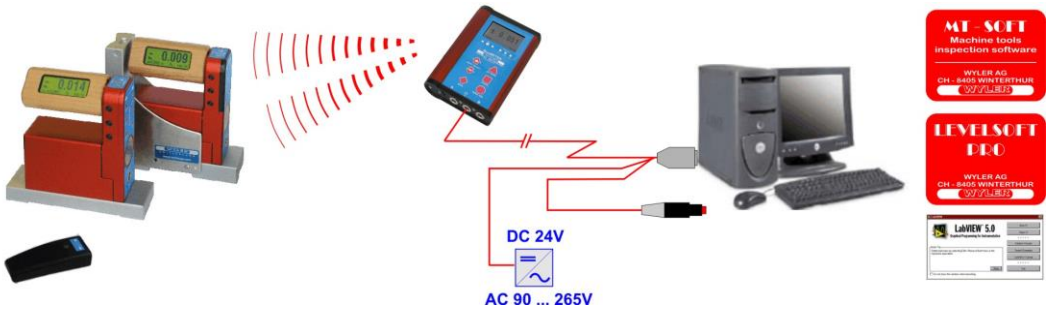
Basically two configurations are possible. The instruments as well as the display (BlueMETER) or interface (BlueTC) components are available **with or without radio transmission**.

I. **Communication from instrument to external display via cable.**
This conventional type of communication uses cables between the various components (BlueMETER, respectively BlueTC).

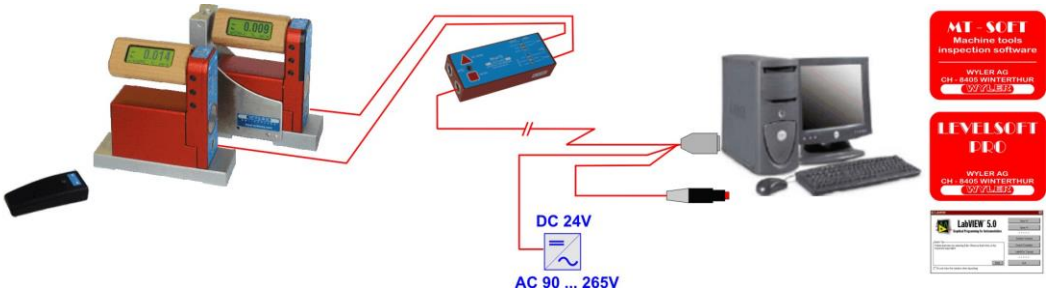
II. **Communication from the instruments to the external display or to the interface via radio transmission.**
Using this type of configuration the data transmission is by radio module between the instruments and the BlueMETER or BlueTC. As a back-up system additional cables are also supplied.

Remarks:
For a surcharge it is possible to upgrade a set delivered with cables at a later stage to the radio transmission module.

Difference between **BlueMETER** and **BlueTC**:



Configuration with **BlueMETER**



Configuration with **BlueTC**

The functions of BlueMETER and BlueTC are all the same with the exception of the LCD display which is only available with the BlueMETER. When working without PC/Laptop it is not possible to display the difference between two instruments on the BlueTC. When working with a PC/Laptop and the software LEVELSOFT PRO or MT-SOFT the BlueTC is used as interface. The use of a BlueTC makes therefore only sense in combination with a PC/Laptop or when the difference between two instruments is not important to measure.

A3 INSTRUMENT'S OVERVIEW

THE INSTRUMENTS OF THE BLUESYSTEM - FAMILY IN DETAIL

The following instruments are part of the BlueSYSTEM family

BlueLEVEL
The measuring instrument with different available sensitivities and integrated display of the values, the instrument's address and the measuring unit. The BlueLEVEL is available with or without radio module.

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

BlueTC (Transceiver/Converter)
Interface with various functions used for element between instruments and PC/Laptop. The BlueTC is available with or without radio module. The BlueTC can also be used as a wireless transmission interface for other WYLER sensors.

Common features of all the BlueSYSTEM 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 WyBus (RS485)
- All instruments working equivalently on the same level of communication

Features of the interfaces BlueMETER and BlueTC:

- Both instruments can be used as interface between instruments and PC/Laptop
- Both instruments use identical functions for grouping instruments via radio module
- Both instruments use battery power
- All instruments are equipped with cable connections as alternative to radio transmission

Additional features available in the BlueMETER:

- 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 used
  - Set various filter types

BlueLEVEL
with flat horizontal base

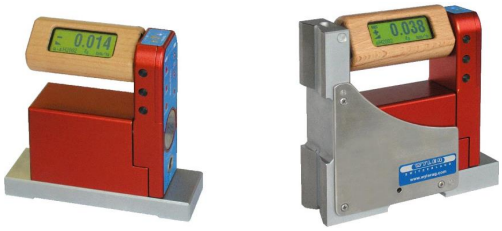
BlueLEVEL
with prismatic angular base

BlueMETER

BlueTC (Transceiver / Converter)

A4 MEASURING PROCEDURE / GENERAL HANDLING

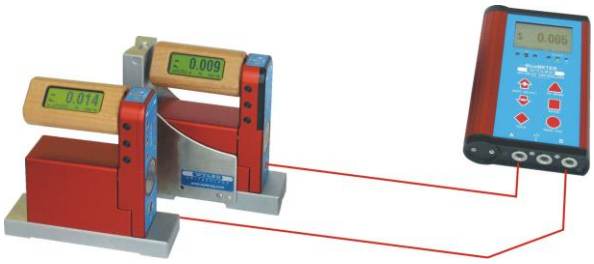
TYPICAL CONFIGURATIONS WITH / WITHOUT RADIO TRANSMISSION



Used as stand alone instruments

Available sensitivities:

- 1µm/m (0.2 ArcSec)
- 5µm/m (1 ArcSec)
- 10µm/m (2 ArcSec)

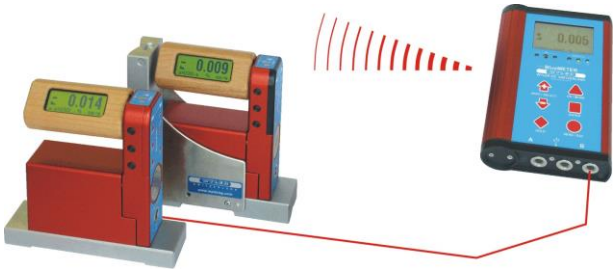


Data transmission via cables

Two BlueLEVEL with BlueMETER

Data transmission via radio module (Bluetooth™ wireless technology)

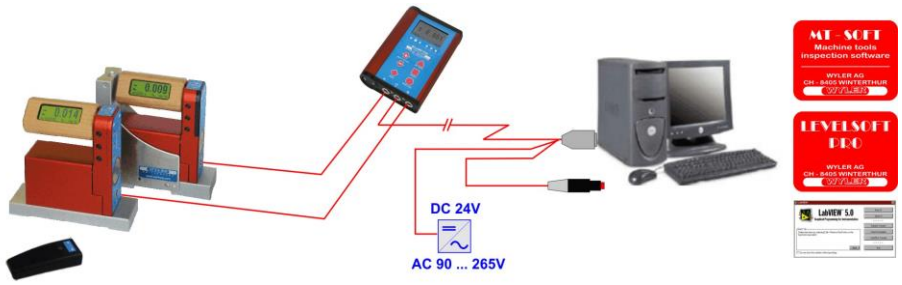
Two BlueLEVEL with BlueMETER and infrared-zapper for triggering the data transmission



Basically it is possible to **combine instruments with radio transmission and instruments with cable** data transmission.

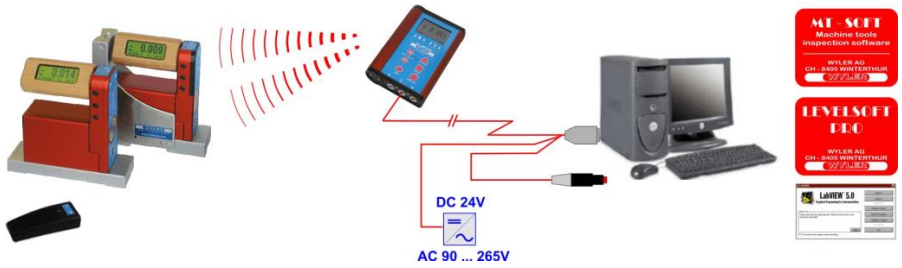
Combination of radio transmission (Bluetooth™ wireless technology) and cable connection

Two BlueLEVEL with BlueMETER



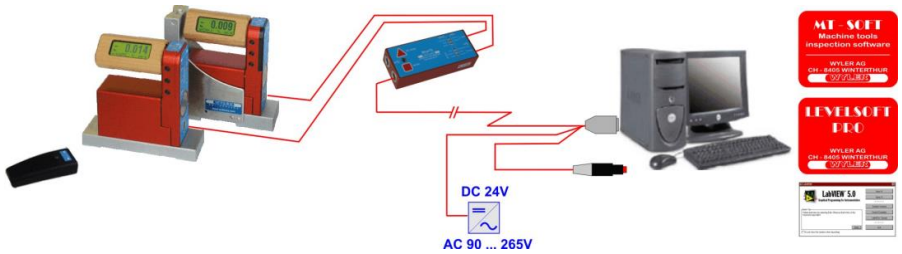
Data transmission via cables to PC/Laptop

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



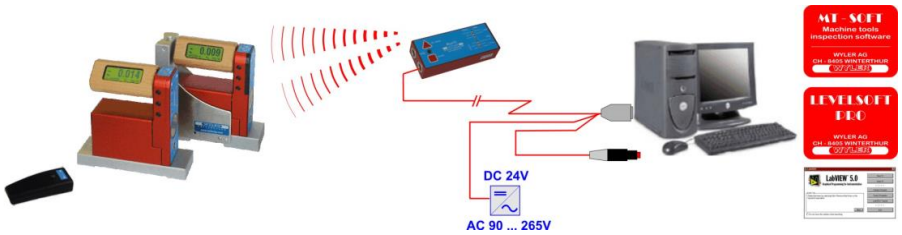
Wireless data transmission (Bluetooth™ wireless technology) and connection to PC / Laptop

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



Data transmission via cables to PC/Laptop

Two BlueLEVEL with **BlueTC** and infrared-zapper for triggering the data transmission



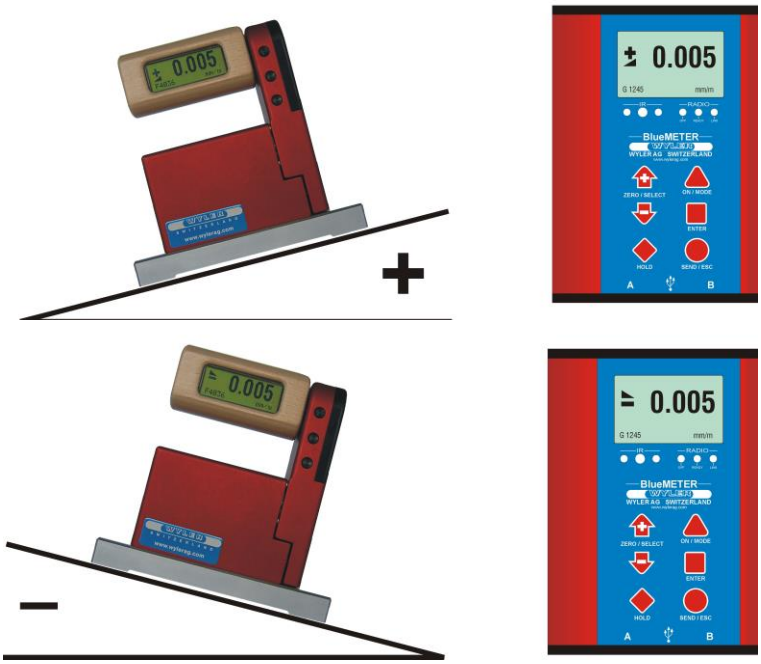
Wireless data transmission (Bluetooth™ wireless technology) and connection to PC / Laptop

Two BlueLEVEL with **BlueTC** and infrared-zapper for triggering the data transmission

According to the WyBus compatibility scheme even more than 2 sensors can be connected to a BlueMETER respectively to a BlueTC. 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.

A5 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**.



Inclined to the right: positive

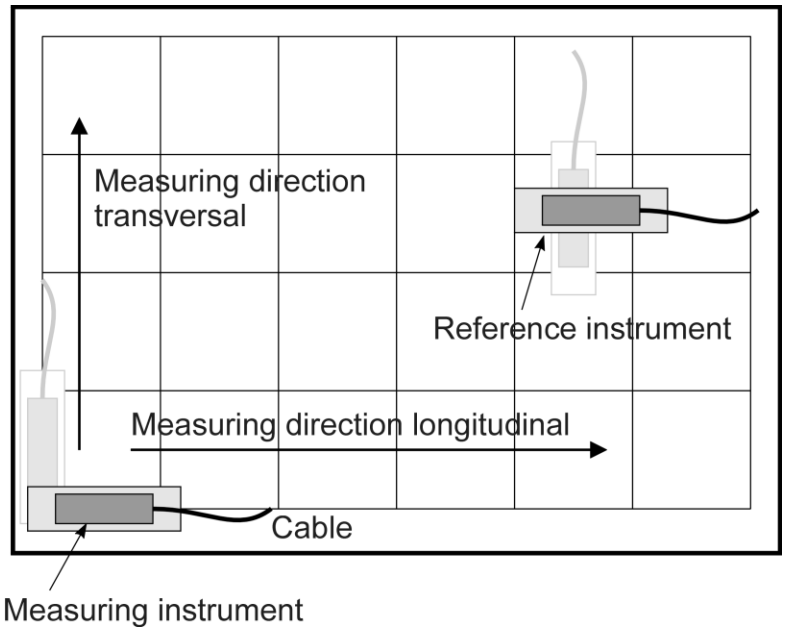
Declined to the right: negative

(Practical remark: positive values indicate that some material may be removed on the measured piece)

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 or on the integrated display of the BlueLEVEL.
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

A6 ABSOLUTE MEASUREMENT / RELATIVE MEASUREMENT / DIFFERENTIAL MEASUREMENT

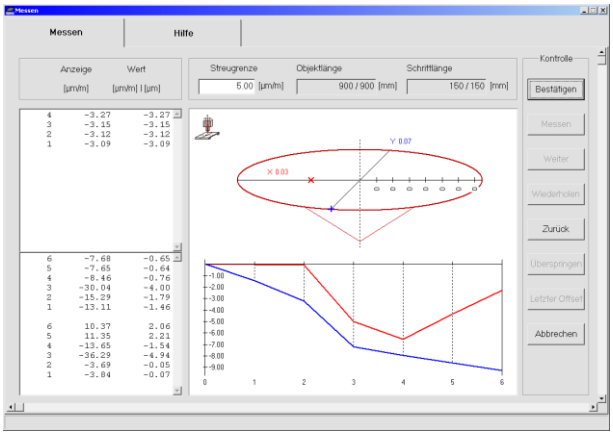
Absolute measurement
(Absolute ZERO)

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**

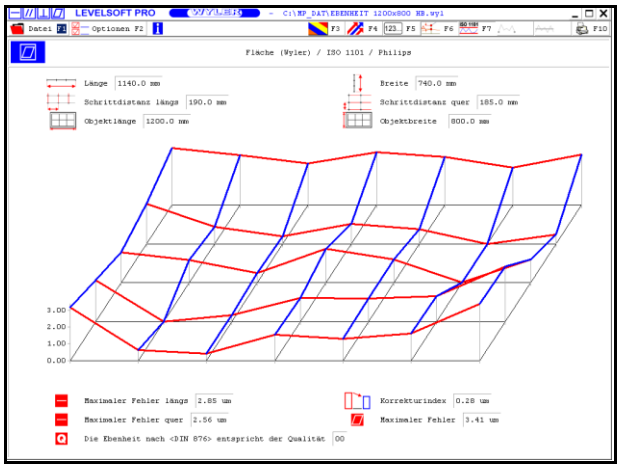
Relative measurement
(Relative ZERO)

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.

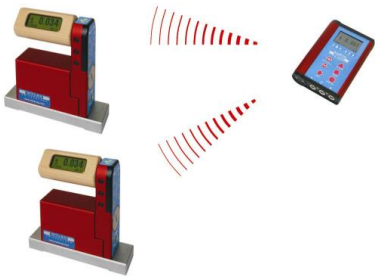
Most important is that always the instrument is placed on both positions in the same direction.

Practical example



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

Differential measurement



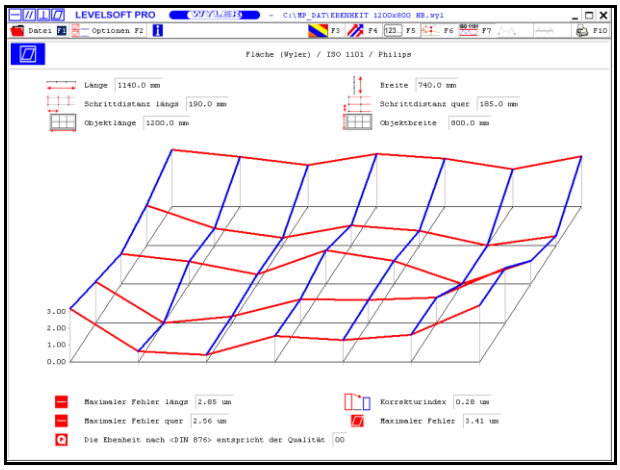
A differential measurement is a measurement with two instruments **Measuring instrument** (A) and **Reference instrument** (B), measuring the angular difference between the two. This means e.g. if the angular change in both instruments is the same the displayed value (Difference A - B) does not change.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

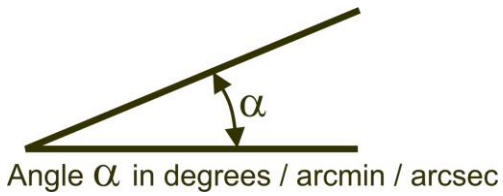
Practical example



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

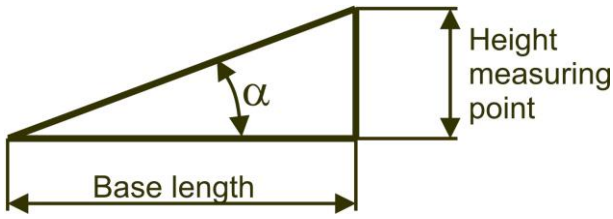
A7 GENERAL REMARKS ABOUT "ANGLES" AND "INCLINATION"

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.

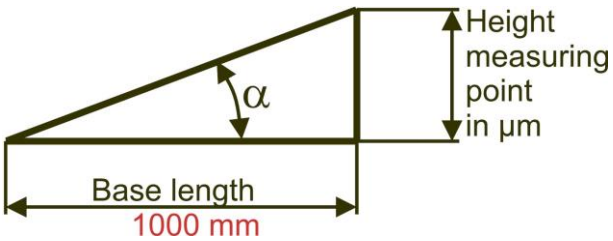


Angle α = Height of the measuring point related to a defined base.

Height of the measuring point = tan α x length of base

Example:

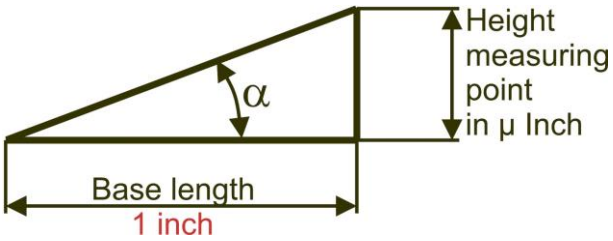
Angle = Height related to a defined base.
e.g. **22 µm/m**



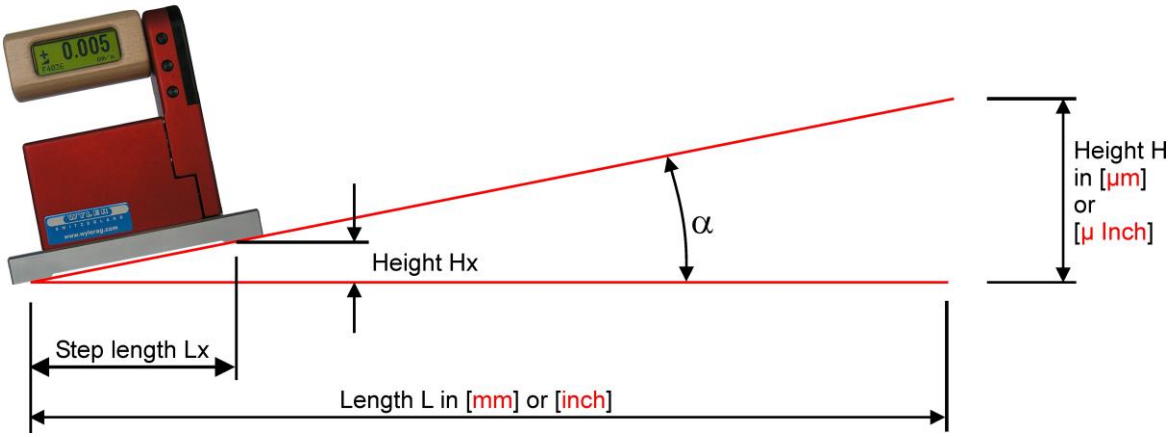
Example:

Because the relation µm/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 µm/m are equal to 22 micro inch/inch or 22 µInch / Inch



A8 HEIGHT RELATED TO THE STEP LENGTH



Height Hx in **[µm]** related to step length

$$\text{Height Hx [µm]} = \frac{\text{Height H[µm]} \times \text{Steplength Lx[mm]}}{\text{Length L[mm]}}$$

Height Hx in **[micro Inch]** related to step length

Height Hx [micro Inch] = Height H [micro Inch] x Step length Lx in [Inch]

1 micro Inch = 0,000001 Inch

Height Hx in **[µm]** related to step length

$$\text{Height Hx [mm]} = \tan\frac{\alpha\,[\text{arc sec}]}{3600} \times \text{Length Lx[mm]}$$

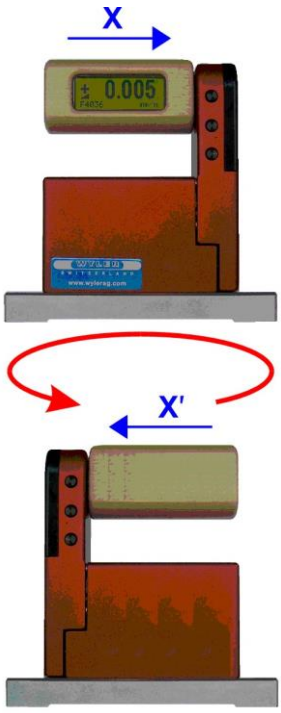
Height Hx in **[micro Inch]** related to step length

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

1 micro Inch = 0,000001 Inch

A9 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



<u>Reversal measurement</u> 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

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

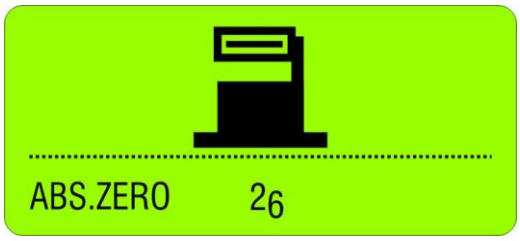
Practical procedure:
Prior to adjusting the zero point, the BlueLEVEL instrument should be allowed time to acquire the ambient, respectively the work-piece temperature. In addition the measuring system should be switched on for at least 1 minute (at least 3 minutes for instruments with sensitivity 1 µm/m

The reversal measurement can be done with the help of the BlueMETER or directly using the BlueLEVEL.

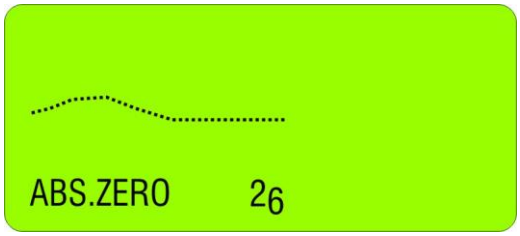
- Slide the instrument onto a flat, horizontally levelled surface (e.g. engineer's surface plate).

- 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>**
  The following display is seen:

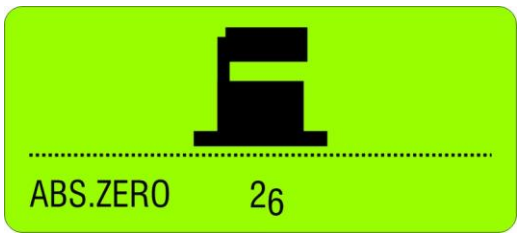


- Use the zapper or confirm with **<ENTER>**. On the display the progress of the collected values are visible in graphic form.



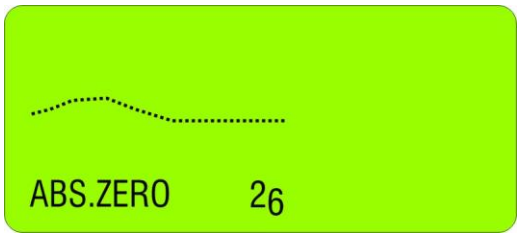
When the curve is getting a straight line confirm the first value with the zapper or with **<ENTER>**

- 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 it 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/BlueMETER will read deviations from absolute horizontal position.

Using BlueLEVEL with a BlueMETER the value of the display is shown in [Arcsec] or in [mm/m].

B2 RELATIVE MEASUREMENT

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

The same applies when lines, parallels, flatness is measured with the **WYLER LEVELSOFT 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.

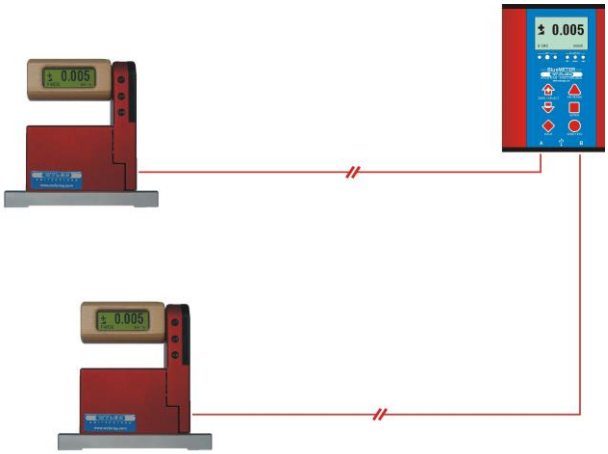
B3 DIFFERENTIAL RESPECTIVELY REFERENCE MEASUREMENT USING AN ENGINEER SET

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

- Measurement on objects 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

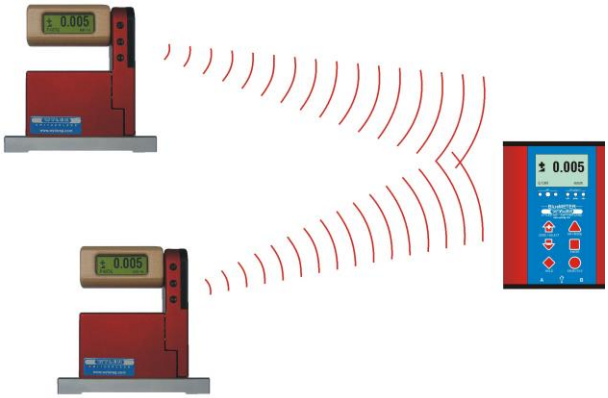
The **Engineer set** usually consists of:

Two BlueLEVEL and one BlueMETER;
Data transmission via cables



Picture:
Two BlueLEVEL and one BlueMETER

Two BlueLEVEL and one BlueMETER;
Data transmission via radio module



Picture:
Two BlueLEVEL and one BlueMETER

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 in the same direction.

Examples for differential / reference measurement:
M = Measuring instrument, connected to port "A"
R = Reference instrument, connected to port "B"

Rectangularity resp. parallelism of machine spindle in resp. 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 stabilization only.

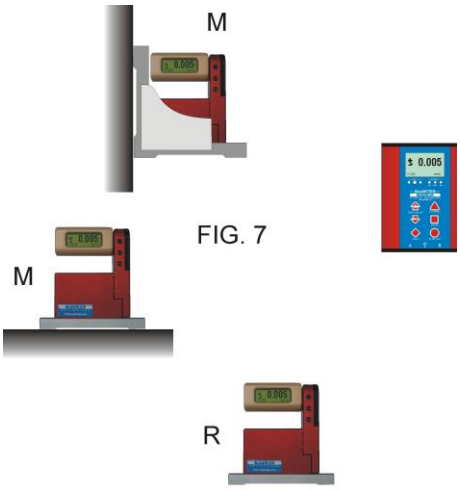


FIG. 7

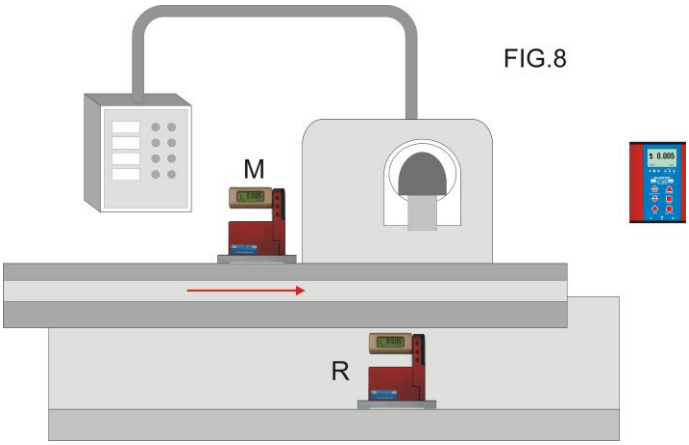
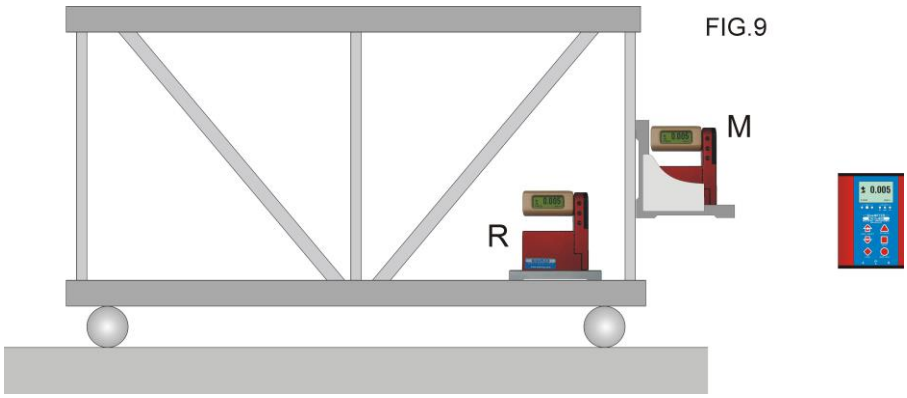
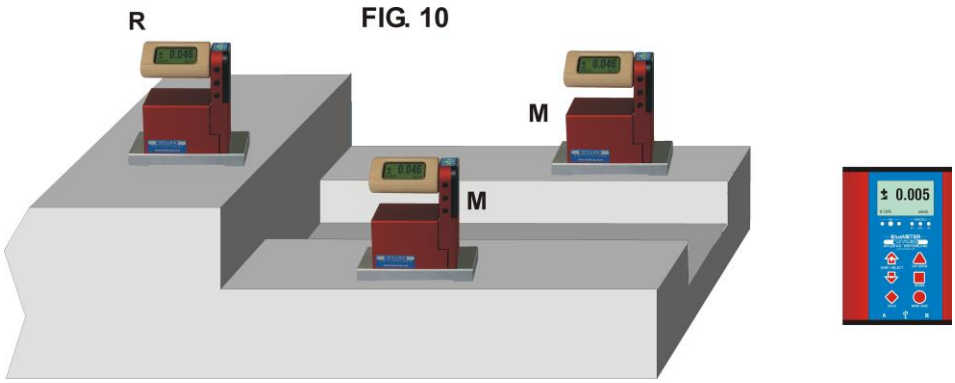


FIG.8

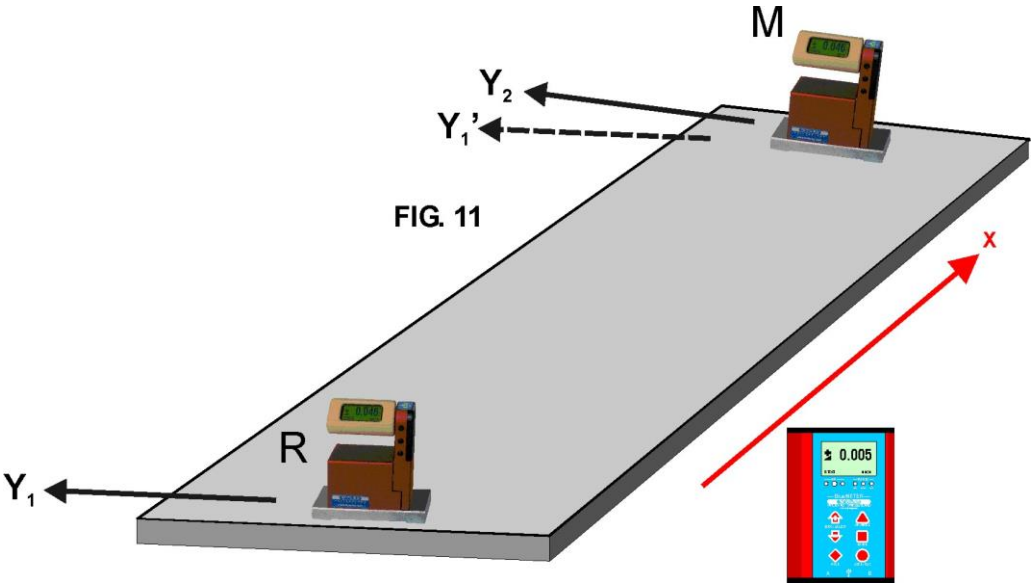
Inspection of perpendicularity and parallelism on large structures (Fig. 9). Suitable instrument for outdoor applications.



To conduct **high precision measurements of parallelism** (Fig 10) (e.g. two or more guide ways)
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 µm/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 axis have to be parallel!)
This procedure is also applied when fastening workpieces in order to see possible tensions.



B4 ANGULAR MEASUREMENTS

a) Small angles

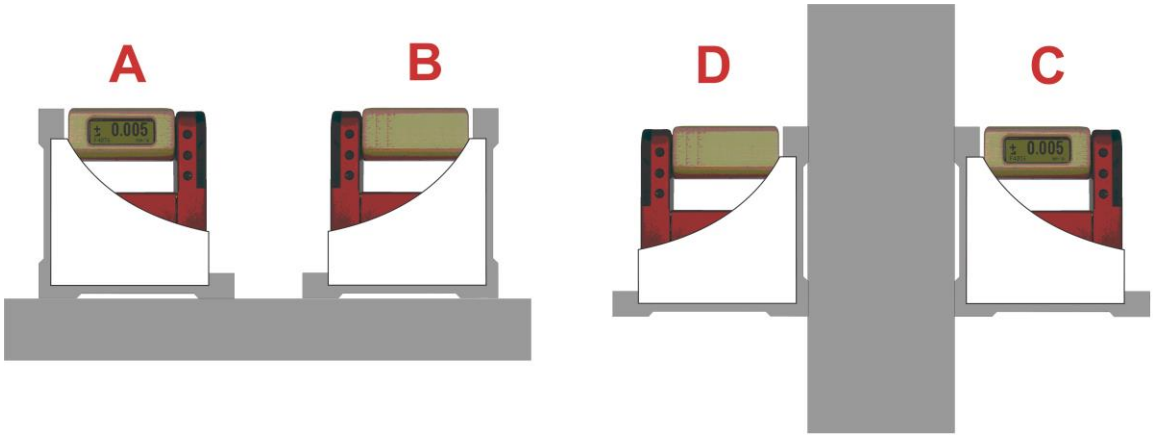
The measuring instruments BlueLEVEL are especially well suited for measuring small angles. It is however to be considered that the larger the angle is getting, the larger the linearity error of the instrument is. It is therefore important to level the object to be measured (e.g. surface plate) as well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

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 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:



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

In the **WYLER LEVELSOFT PRO** a new set-up allows the easy measurement of squareness of rectangular objects. This software offers a menu point "ANGLES / Measurement of perpendicular 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)

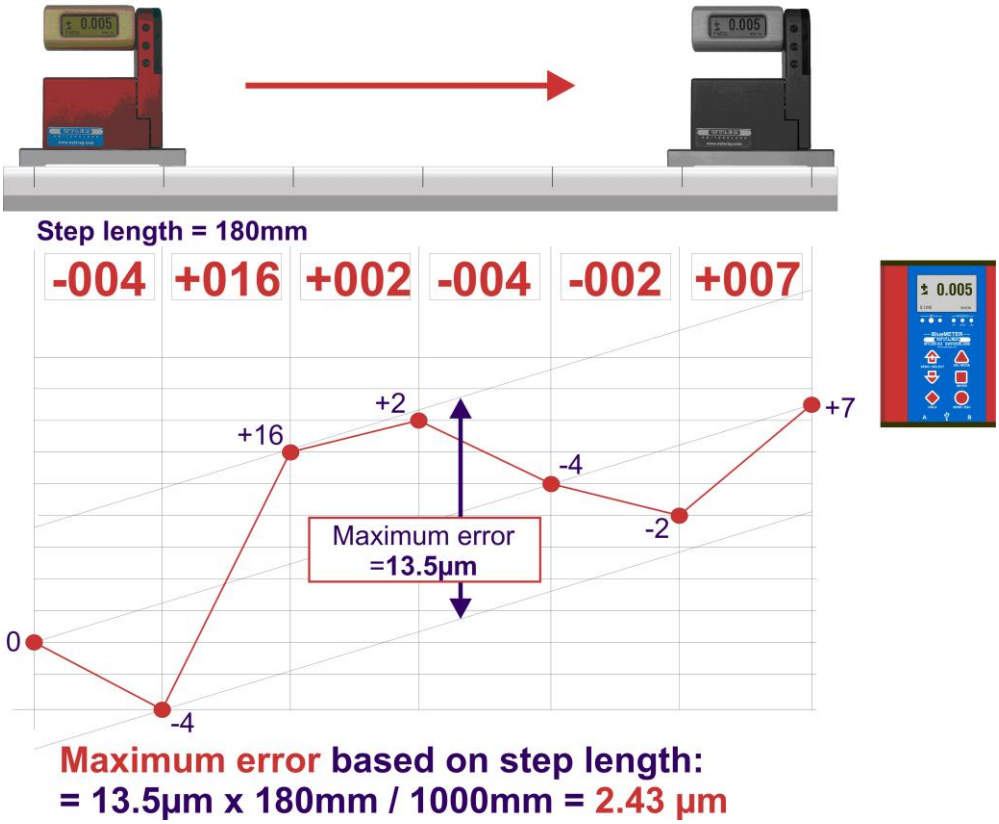
Ask your local WYLER representative for further information of the software LEVELSOFT PRO

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 µm/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 combined with a BlueMETER with integrated radio module for wireless data transmission

Measurements on granite surface plates are done with instruments equipped with hardened steel bases with dust groves. 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 large. Such a task is best done with the **WYLER LEVELSOFT PRO.**

C WYLER SOFTWARE LEVELSOFT PRO

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

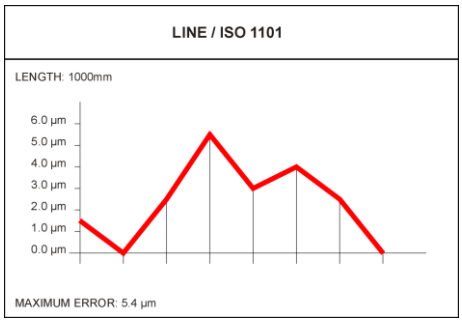
The following measurements can be done with the WYLER LEVELSOFT PRO in combination with the correct measuring instruments:

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

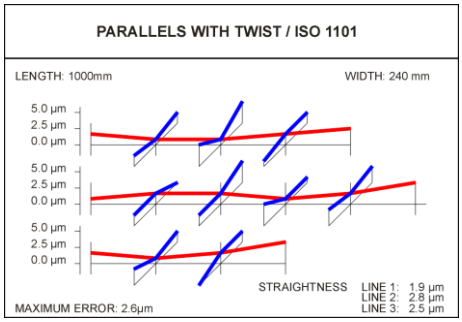
LEVELSOFT PRO

WYLER AG
CH - 8405 WINTERTHUR
WYLER

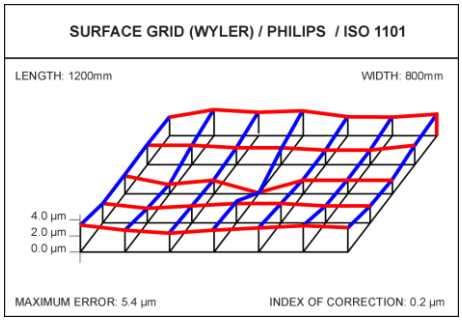
Measurement of line according to ISO1101 with and without twist (torsion)



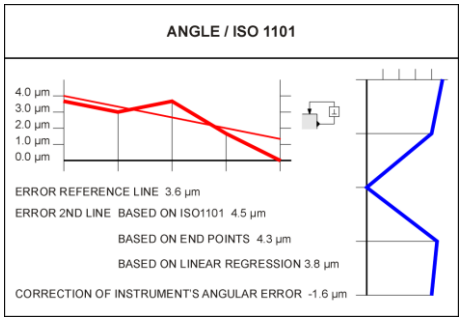
Measurement of parallel lines according to ISO1101 with and without twist (torsion)



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



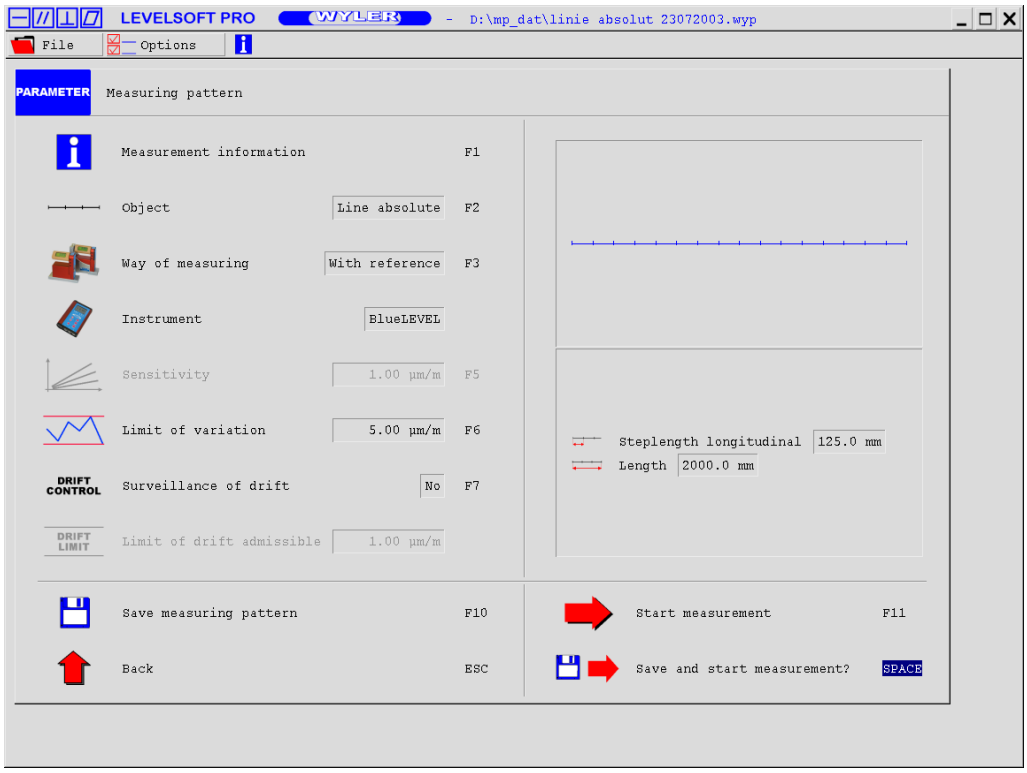
Rectangularity according to ISO1101



In order to connect the instruments to a PC/Laptop a cable connection between the BlueMETER and the PC/Laptop is required. It is possible to use a BlueTC instead of a BlueMETER as interface. However the BlueTC has no display where the measured values are shown.

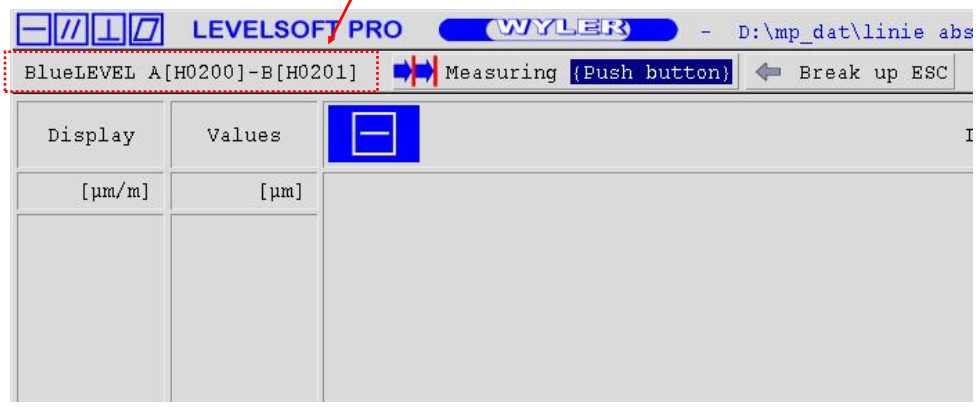
Remarks:

With the Software LEVELSOFT PRO the instruments of the BlueSYSTEM are automatically recognized



Address, respectively serial number of the instruments

The type of the interface instrument and the serial numbers of the measuring instruments are displayed.



D SOFTWARE FOR THE DEFINITION OF MACHINE TOOL GEOMETRY MACHINE TOOL INSPECTION SOFTWARE MT-SOFT

MT-SOFT 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.

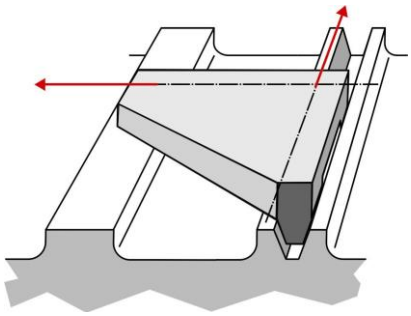
The following measurement tasks can be done by using suitable instruments and the WYLER MT-SOFT:

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

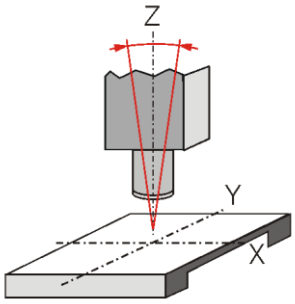
MT SOFT

WYLER AG
CH - 8405 WINTERTHUR
WYLER

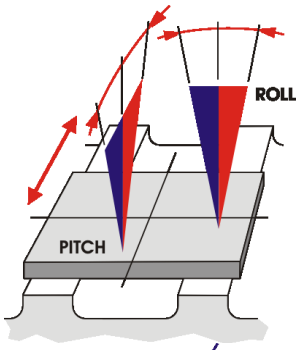
GUIDE WAYS
Measurement of guide ways using inclination measuring instruments



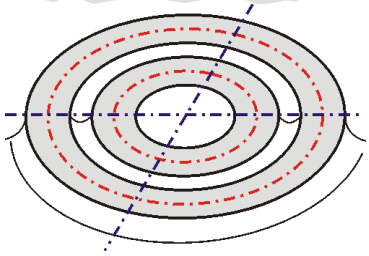
ROTATING AXIS
Definition of rectangularity between the surface of the table and the vertical rotating spindle



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.



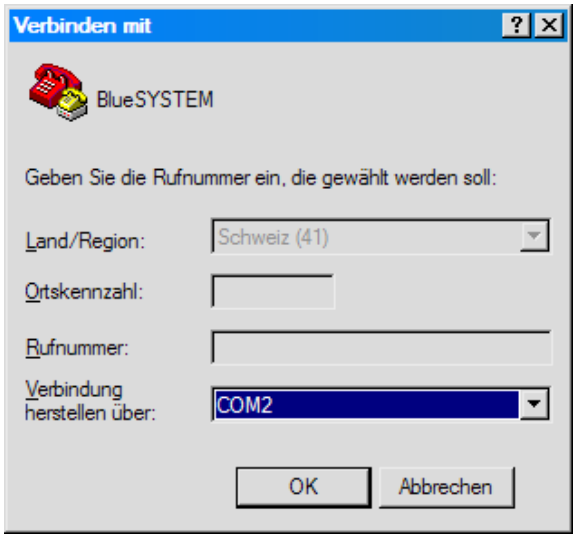
E EXAMPLE USING THE HYPER TERMINAL OF WINDOWS OR WINDOWS TERMINAL PROGRAM (EXAMPLE IS WIN XP)

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.

   Confirm with **<OK>**



3. Enter the parameters

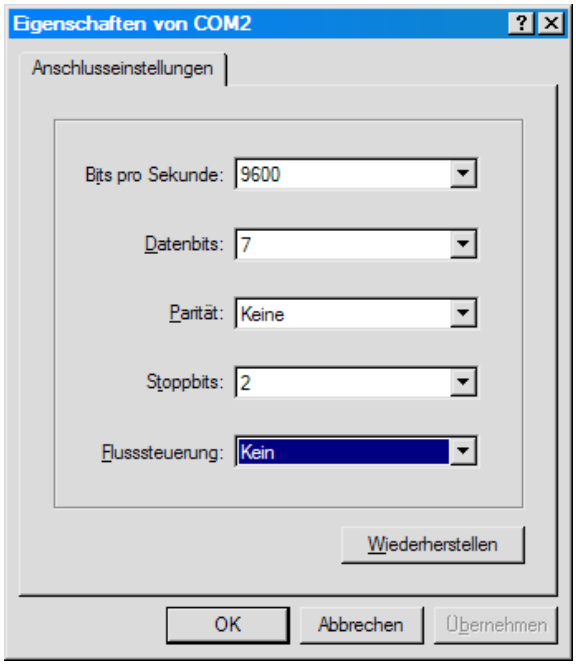
Bits per Second:	9600
Data bits:	7
Parity:	no
Stop bits:	2
Protocol:	no

   Confirm with **<OK>**

   The HyperTerminal-Windows appear.

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

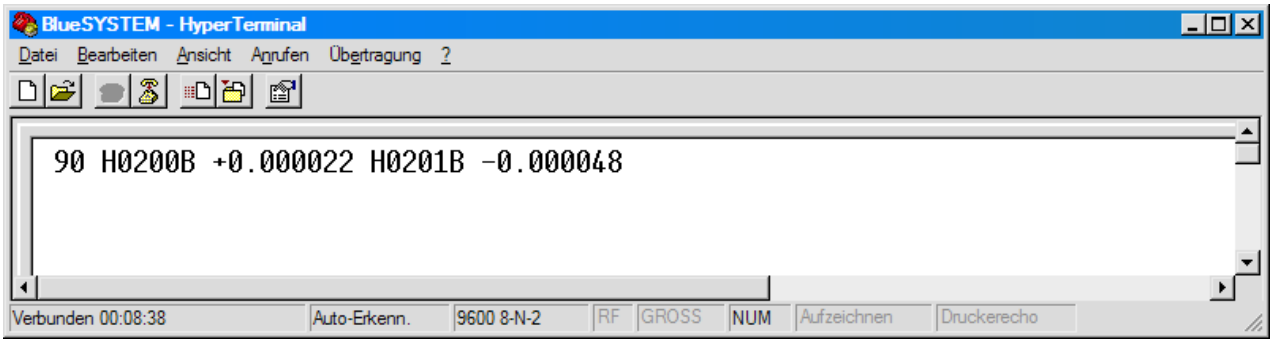
   Alternatively the value can be called by pressing the key "P" on the PC keyboard.



Example: Two BlueLEVELs and a BlueMETER are connected

Remark:
The configuration has to be done first on the BlueMETER

- 1 BlueLEVEL with the address H0200 is connected to Port “A”
- 1 BlueLEVEL 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 with the address H0200 is connected to Port “A”
+0.000022	+0.000022 Rad respectively +22 µRad
H0201B	BlueLEVEL with the address H0201 is connected to Port “A”
-0.000048	-0.000048 Rad respectively -48 µRad

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.

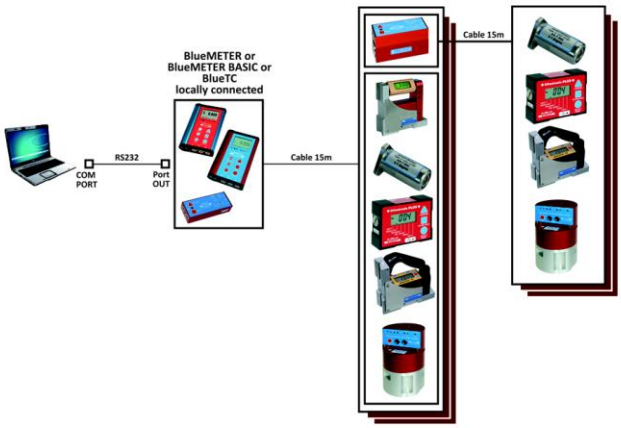
F1 CONNECTION THROUGH A SHORT CABLE

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



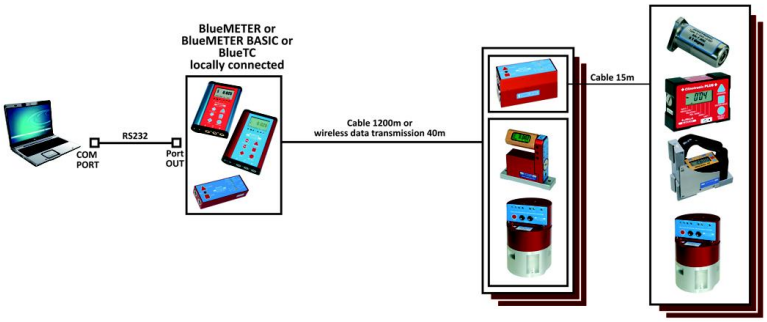
F2 CONNECTION THROUGH A LONG CABLE OR THROUGH WIRELESS TRANSMISSION

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:

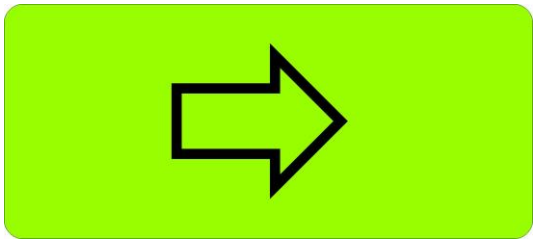
- Zerotronic
- Clinotronic
- Minilevel NT
- Zeromatic2/1
- Zeromatic2/2



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

BlueTC

- 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
  - 1µ instrument: mm/m, 3 decimals
  - 5µ instrument: mm/m, 3 decimals, rounded to 5µm/m
  - 10µ 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.

G3 ACTIVATE THE FUNCTION KEY ON THE BLUETC

In the basic state the function keys of the BlueTC are locked. Using the following key combination you can enable the function keys:

- Hold the key <ENTER> down
- After approx. 3 seconds press additionally the key <ON/MODE>
- Hold both keys down for another 3 seconds
- Release both keys at the same time

With repeated action of the key <ON/MODE> you can select the menu required.
Confirmation with the key <ENTER> will execute the respective menu.

The key lock function is disabled until a function has been completed or until the BlueTC has been restarted. After that the key lock is active again.

H TECHNICAL DATA BLUESYSTEM

H1 TECHNICAL DATA OF THE RADIO MODULES

SENDER / RECEIVER **SENDER / EMPFÄNGER** **BlueSYSTEM with** **Bluetooth™ wireless technology**	**Frequency**	**ISM-Band / 2,4000 - 2,4835 GHz**
	Modulation	FHSS (Frequency Hopping Spread Spectrum)
	Used Net-structure	Point to point / Point to multi-point
	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 OF THE BLUELEVEL

Sensitivity / Empfindlichkeit	1 µm/m 0.2 Arcsec	5 µm/m 1 Arcsec	10 µm/m 2 Arcsec
Display range / Anzeigebereich	**± 20 mm/m**	**± 100 mm/m**	**± 200 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 / °C (Ø10°C) / DIN 2276 Temperaturkoeffizient / °C (Ø10°C) / DIN 2276	up to / bis 2000 µm/m: max. 2 µm/m up to bis 20000 µm/m: max 20 µm/m	up to / bis 10000 µm/m: max. 10 µm/m up to bis 100000 µm/m: max 100 µm/m	up to / bis 20000 µm/m: max. 20 µm/m up to bis 200000 µm/m: max 200 µm/m
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	BlueLEVEL: + 5 V DC, max. 450 mW		
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: 1200g		

H3 TECHNICAL DATA OF THE BLUEMETER

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 : + 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, including batteries Netto-Gewicht, inklusive Batterien	BlueMETER: 775g

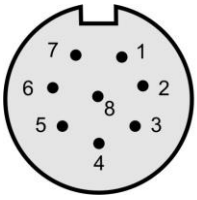
H4 TECHNICAL DATA OF THE INTERFACE BLUETC

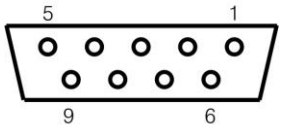
Sensitivity / Empfindlichkeit	----------	----------	----------
Digital output / Digitalausgang	RS232 / RS422 / RS485, asynchron, 7 DataBits, 2 StopBits, no parity, 9600 bps		
External power supply Externe Stromversorgung	BlueTC: + 5V DC, max. 450 mW or/oder 8…28 V DC		
Operating temperature range / Betriebstemperatur Storage temperature range / Lagertemperatur	0 … +40°C -20 … +70°C		
Net weight without battery pack Net weight, incl. battery-pack and incl. batteries Netto-Gewicht ohne Batterie-Pack Netto-Gewicht, inkl. Batterie-Pack und inkl. Batterien	150g 550g 150g 550g		

H5 PIN-DEFINITION FOR BLUELEVEL + BLUEMETER, BLUELEVEL + BLUEMETER BASIC AND BLUETC

RS485

Binder Series 712 / 8 pol. (female)





RS232

Sub-D / 9 pol. (female)

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.

WYLER AG
Im Hölderli
CH-8405 WINTERTHUR
Switzerland

Tel. 0041 (0) 52 233 66 66
Fax. 0041 (0) 52 233 20 53

Homepage: http://www.wylerag.com
E-Mail: wyler@wylerag.com

I2 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.

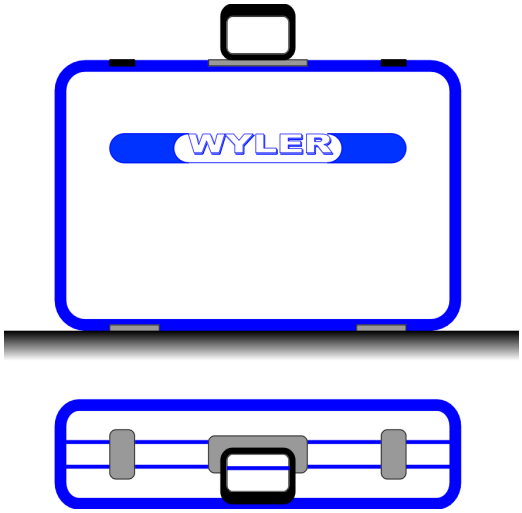
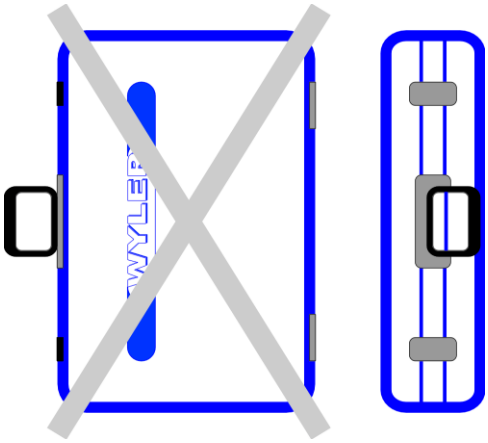


FIG. 14



J2 CARE AND HANDLING OF THE BATTERIES

BATTERY REPLACEMENT

BlueLEVEL:	2 pieces	1.5V, Size “C” ALKALINE
BlueMETER:	3 pieces	1.5V, Size “C” ALKALINE
BlueTC:	2pieces	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, 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 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

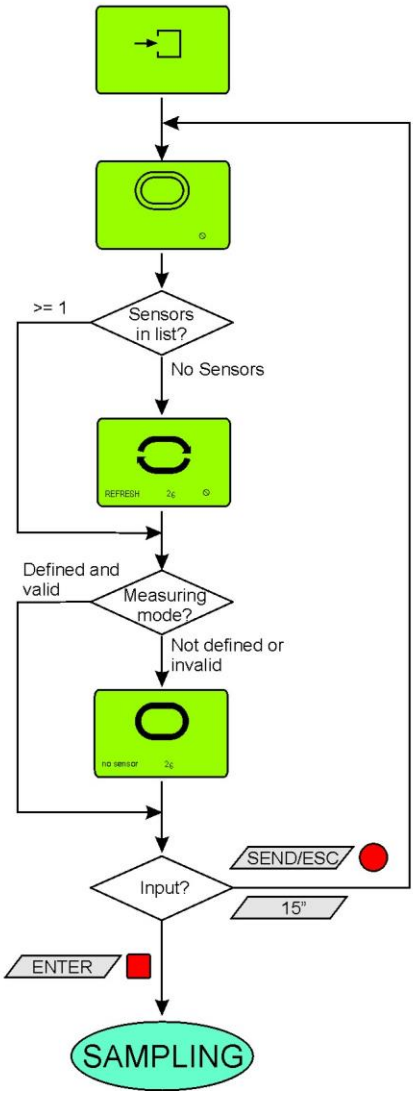
- Declaration of Conformity “DoC”
- FCC Compliance, Statement for cB-0946
- IC Compliance
- Japan Radio Equipment Compliance (TELEC)
- Batteries / WEEE

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

L FLOWCHARTS

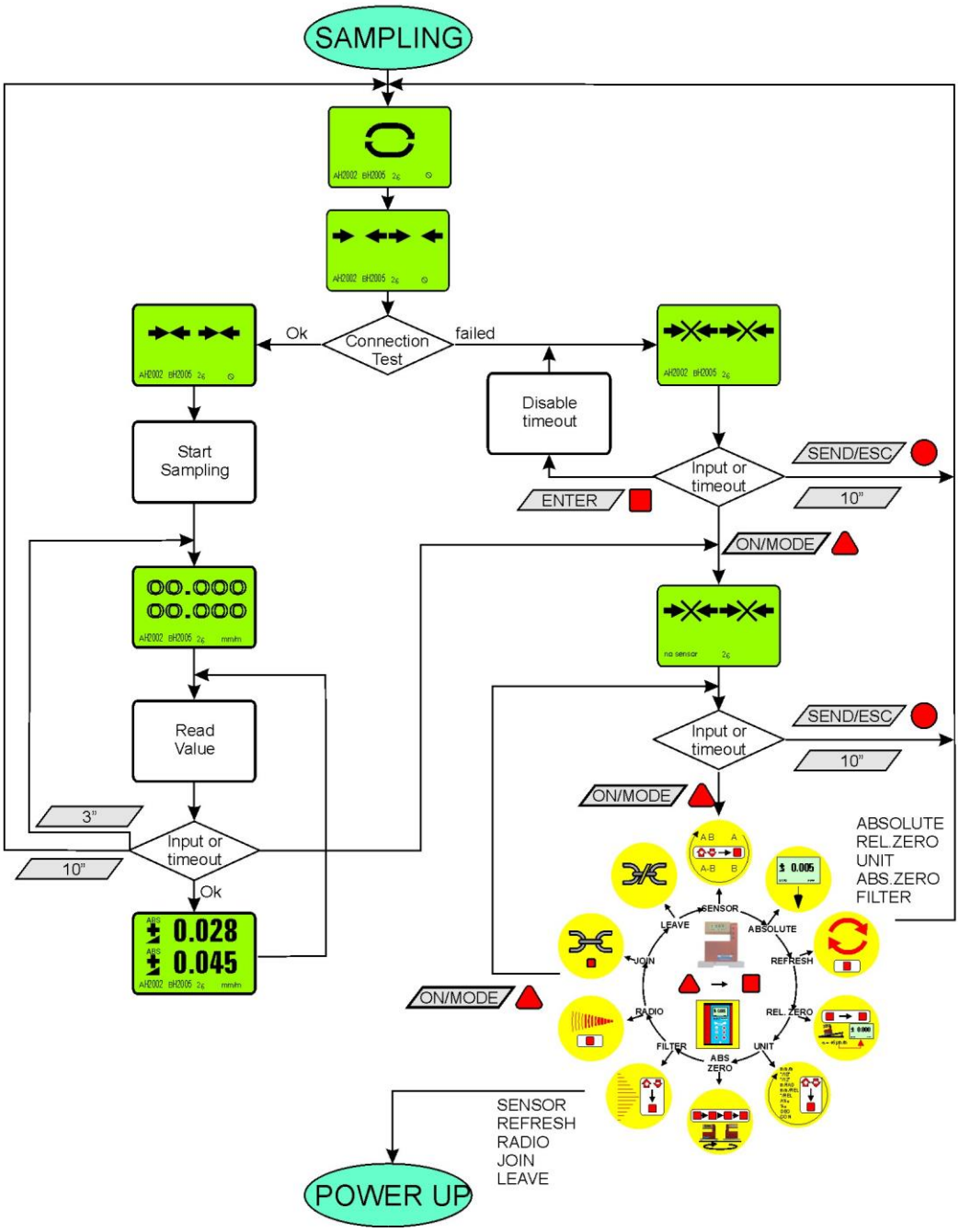
L1 POWER UP (BLUEMETER ONLY)

POWER UP (BlueMETER)

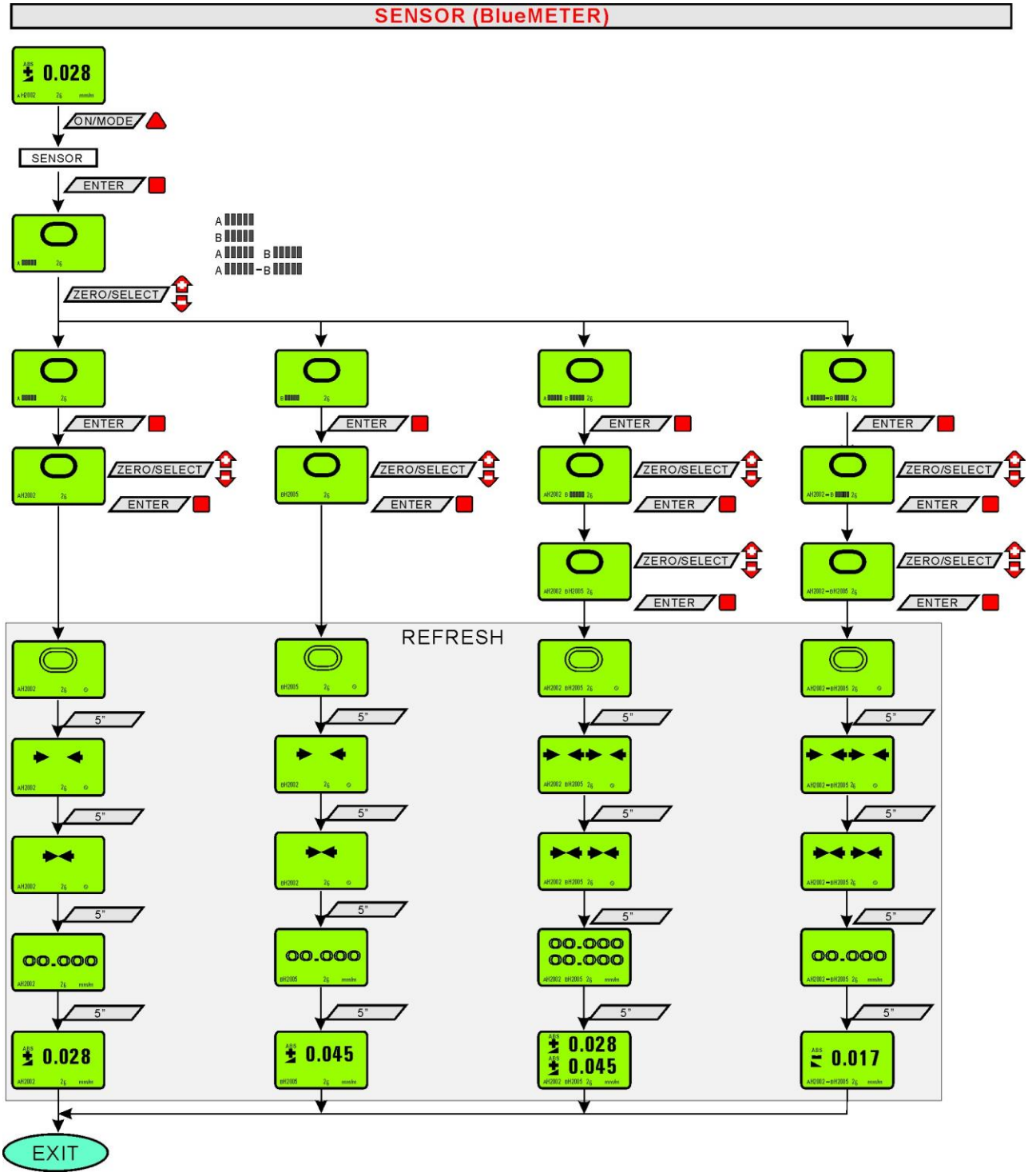


L2 SAMPLING (BLUEMETER ONLY)

SAMPLING (BlueMETER)

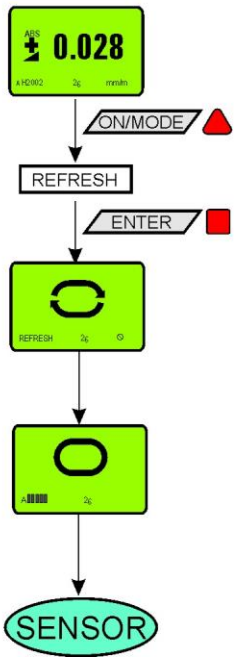


L3 SENSOR (BLUEMETER ONLY)



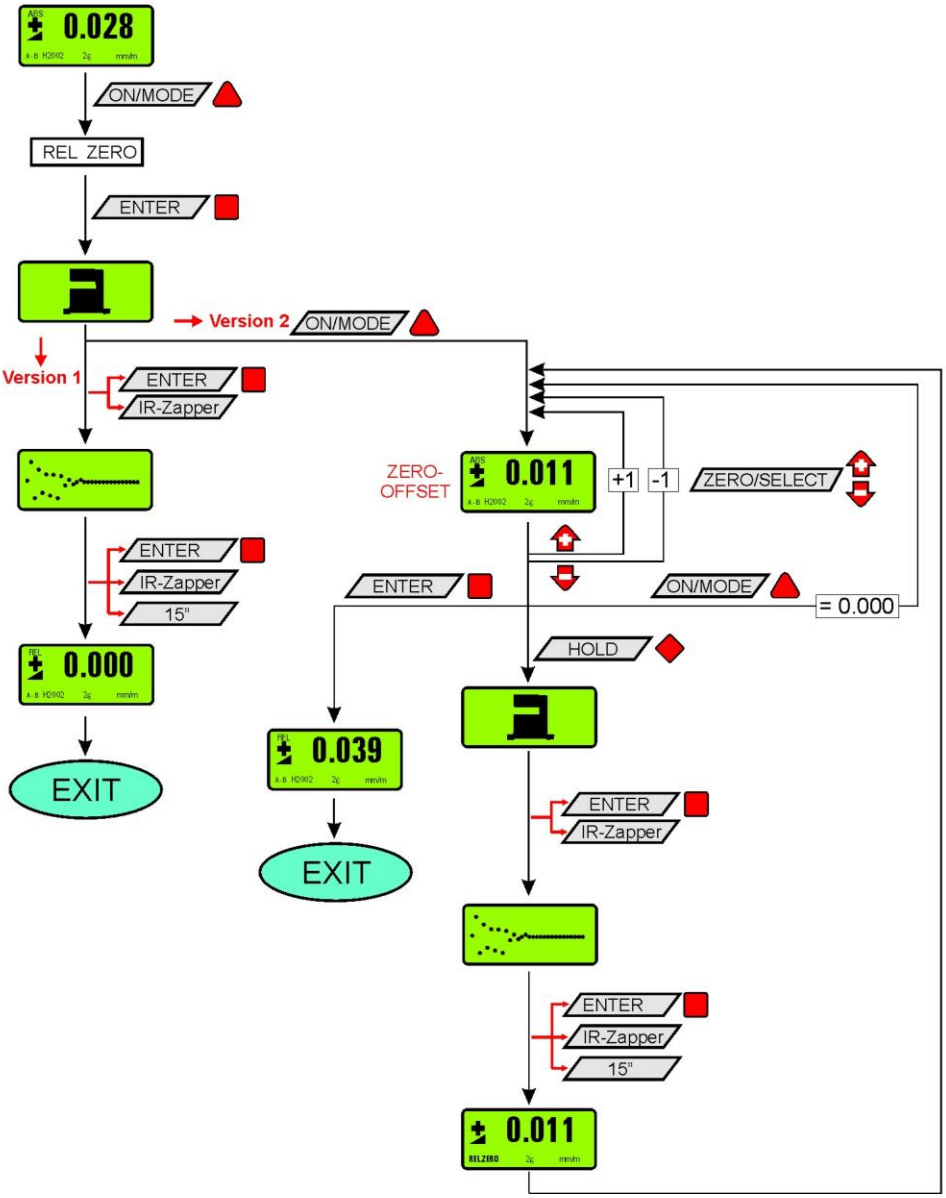
L4 REFRESH

REFRESH

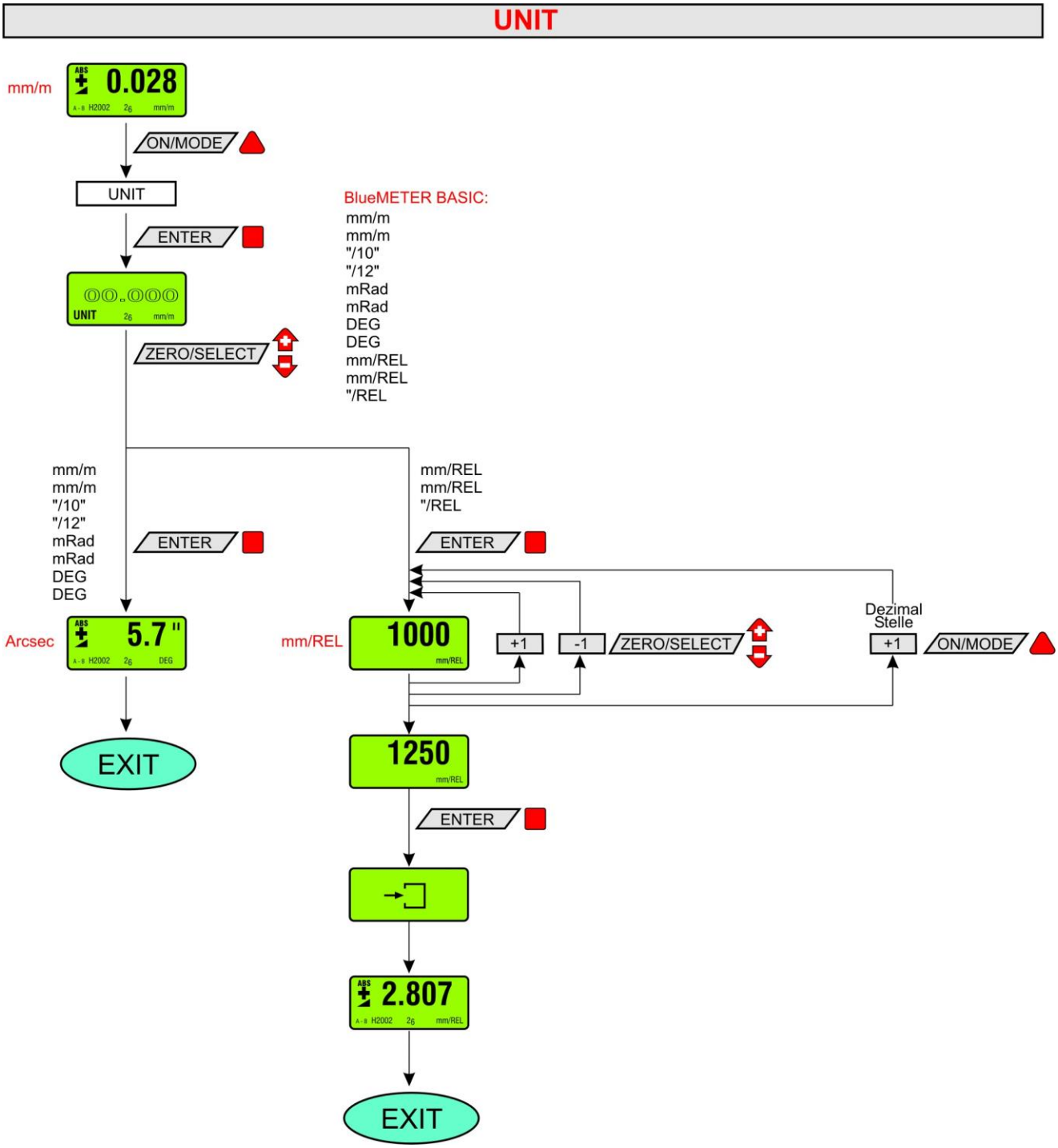


L5 RELATIVE ZERO / REL.ZERO

REL ZERO

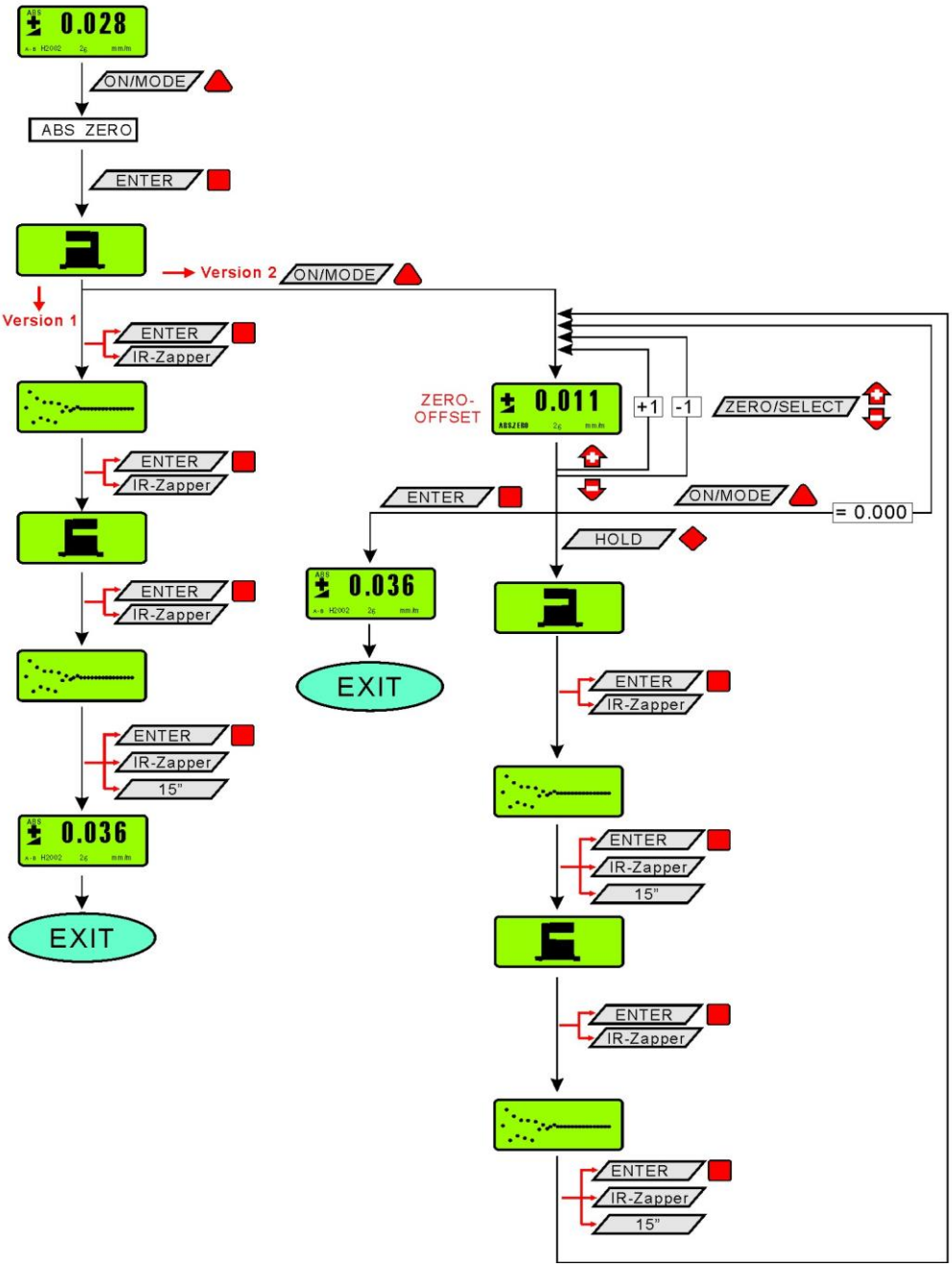


L6 UNITS


UNIT
mm/m
0.028
ON/MODE
UNIT
ENTER
00.000
UNIT
ZERO/SELECT
BlueMETER BASIC:
mm/m
mm/m
"/10"
"/12"
mRad
mRad
DEG
DEG
mm/REL
mm/REL
"/REL
mm/m
mm/m
"/10"
"/12"
mRad
mRad
DEG
DEG
ENTER
mm/REL
mm/REL
"/REL
ENTER
Arcsec
5.7"
mm/REL
1000
+1
-1
ZERO/SELECT
Dezimal Stelle
+1
ON/MODE
EXIT
1250
ENTER
2.807
EXIT

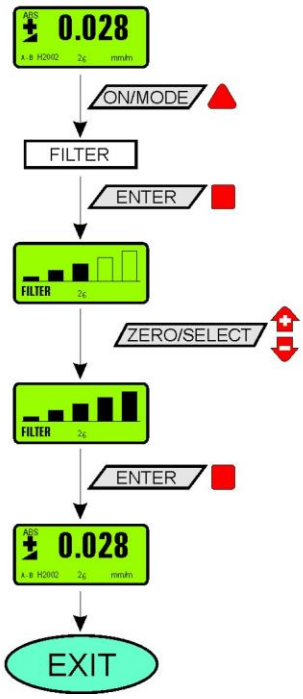
L7 ZERO ABSOLUTE / ABS ZERO

ABS ZERO



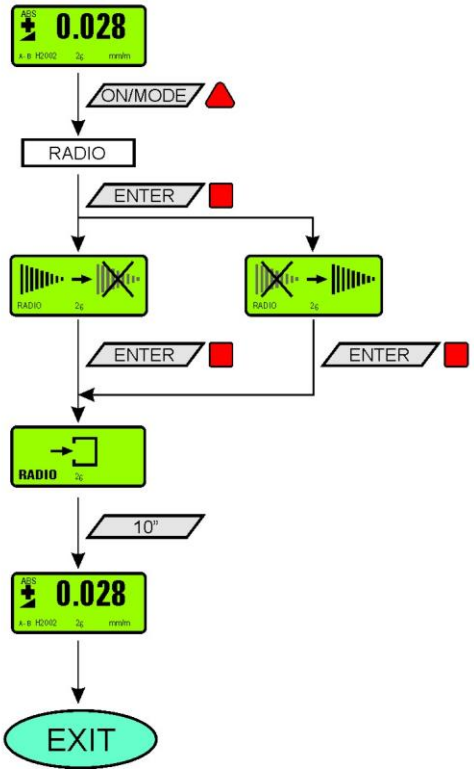
L8 FILTERS

FILTER

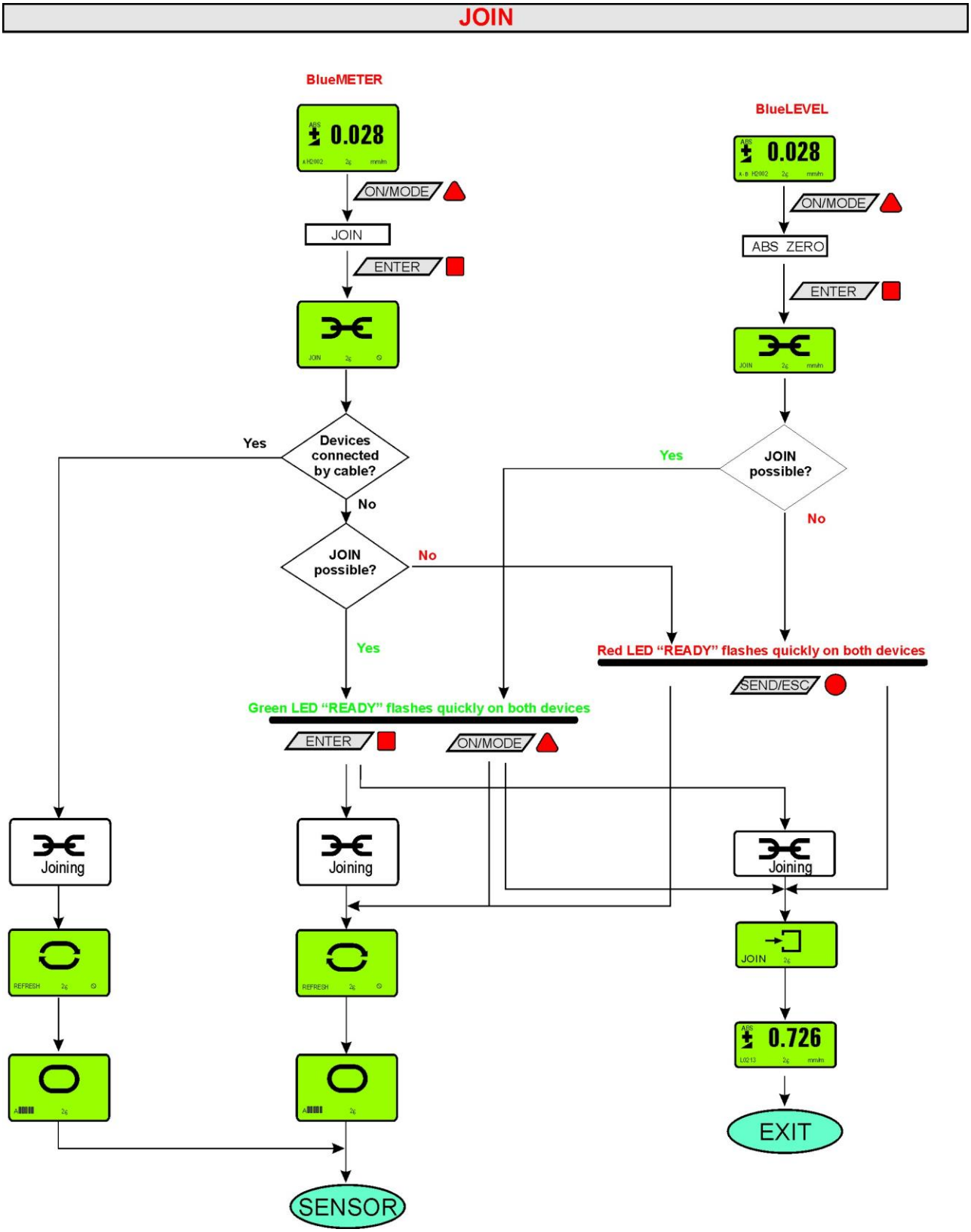


L9 RADIO (WIRELESS DATA TRANSMISSION)

RADIO

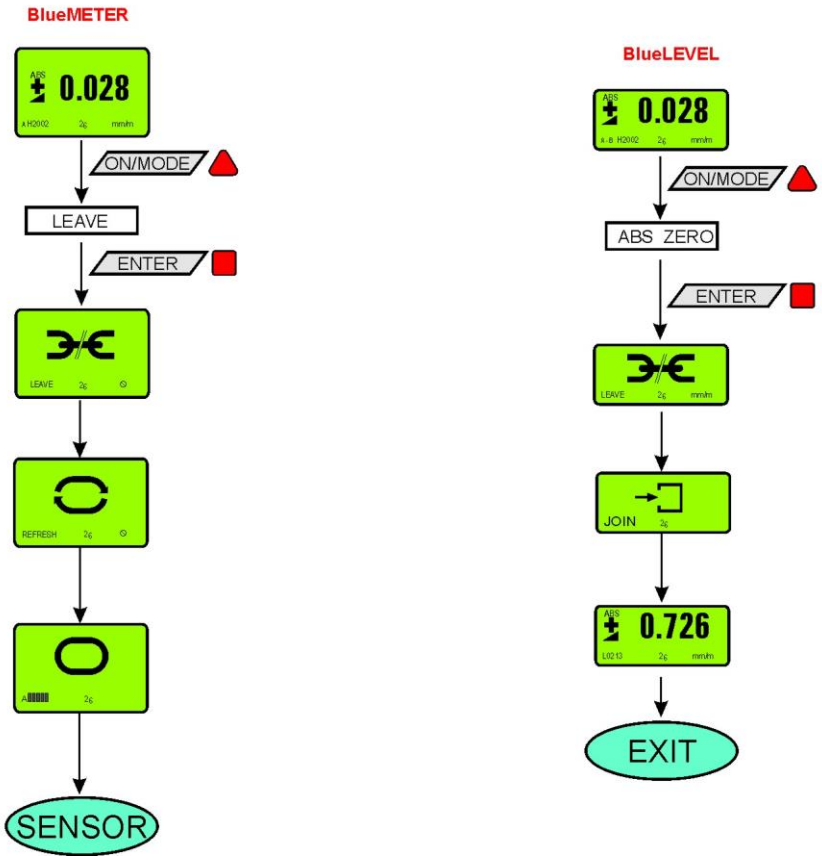


L10 JOIN

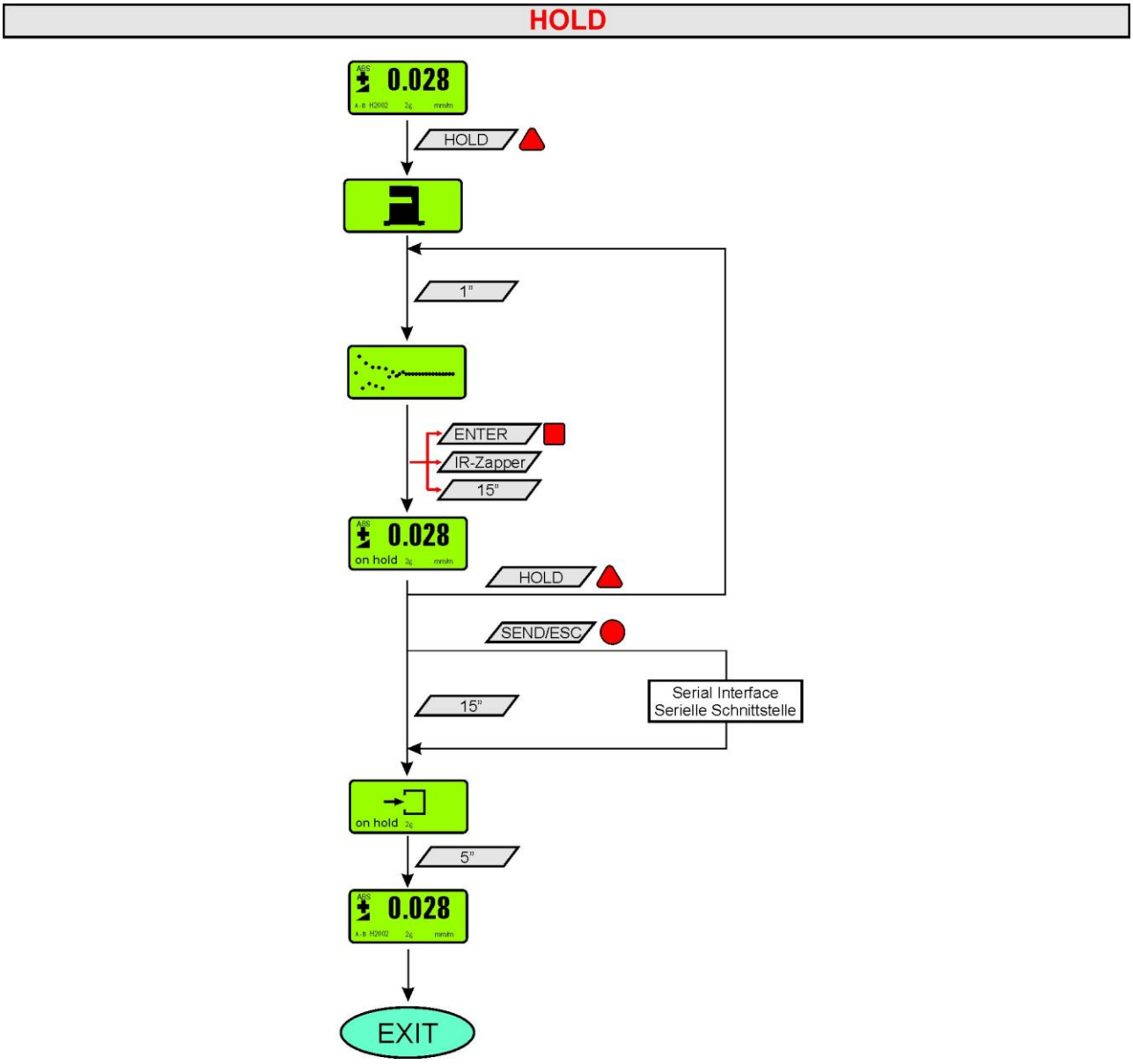

JOIN
BlueMETER
0.028
ON/MODE
JOIN
ENTER
Devices connected by cable?
Yes
No
JOIN possible?
No
Yes
Green LED "READY" flashes quickly on both devices
ENTER
ON/MODE
Joining
Joining
REFRESH
SENSOR
BlueLEVEL
0.028
ON/MODE
ABS ZERO
ENTER
JOIN possible?
Yes
No
Red LED "READY" flashes quickly on both devices
SEND/ESC
Joining
JOIN
0.726
EXIT

L11 LEAVE

LEAVE



L12 HOLD


HOLD
0.028
HOLD
1"
ENTER
IR-Zapper
15"
0.028
on hold
HOLD
SEND/ESC
Serial Interface
Serielle Schnittstelle
15"
on hold
5"
0.028
EXIT

M INDEX

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