

# WYLER

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## MANUAL

# BlueLEVEL-2D





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### Modifications / Änderungen:

Datum / Date	Geändert durch / Modified by	Beschreibung der Änderung / Description of the modification
1.3.2014	HEH	Initial release
12.3.2014	MG	Some corrections
8.1.2015	HEH	New: CONFORMITY DECLARATIONS AND APPROVALS

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

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

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# 1 INTRODUCTION

## 1.1 DESCRIPTION OF BLUELEVEL-2D

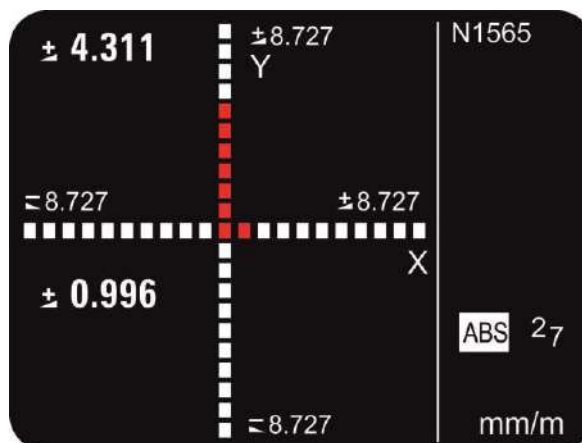
The BlueLEVEL-2D is a high precision and compact inclination measuring instrument for 2 axes. In spite of its small outer dimensions the instrument contains 2 inclination sensors one in X- and one in Y-direction together with a full graphical and color 2D-display.

Thanks to its precision and its size the BlueLEVEL-2D is perfectly suited for the alignment of machines and machine parts. It can be used as stand-alone unit but can also be used in combination with a WYLER measuring software.

The Blue Level-2D is designed as a high-precision measuring instrument

The following parameters (among others) can be set and changed at the BlueLEVEL-2D:

- Units
- Display of measuring range
- Type of display
- Filter settings



It is possible to send the measured data via an RS232 port to a PC/laptop and therewith to the WYLER software LEVELSOFT PRO, MT-SOFT and LabEXCEL software.

The BlueLEVEL-2D contains two sensors based on the analog measuring principle. The analog measuring principle is optimized for the measurement of straightness, flatness, etc. with handheld instruments because this measurement principle provides a stable value very quickly, which is very important for precise measurements and an efficient measurement process. Furthermore it is very insensitive to low-frequency interference, as can sometimes occur in machine tools.

## 1.2 PREPARATION AND START-UP


### PRIOR TO STARTING

Please read this manual prior to working with the BlueLEVEL-2D. You will get an overview on all the functions and possibilities of this instrument. At the same time you get familiar with the handling of the instrument and wrong handling and specifically the unintentional erasing of the calibration data can be avoided.

### 1.2.1 BATTERIES

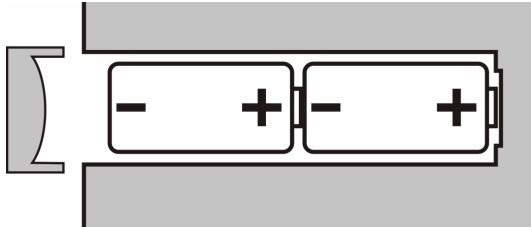
The batteries are not inserted in the instrument during shipment. It is strongly recommended to remove the batteries during transport.

The battery voltage is shown in the display e.g. 27 (**2.7 Volt**)

Lowest possible battery voltage is **1.7 Volt**. If the voltage drops below this value a blinking battery symbol is  shown: The batteries should then be exchanged rather soon.

2 pieces 1.5V, Size "C" ALKALINE





As an end user you are forced by law to return all used batteries and accumulators, a disposal through household waste is prohibited.

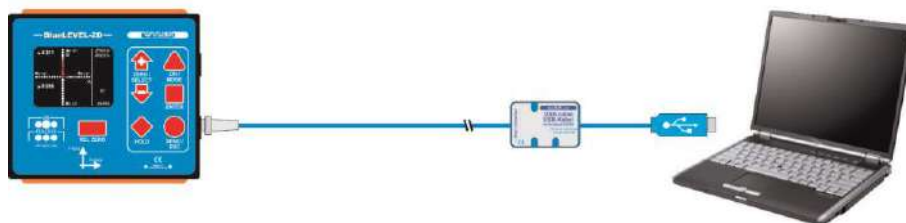
Batteries/accumulators containing contaminants are marked with the symbol shown, which clearly indicates the prohibition of disposal through household waste.

You can dispose of your used batteries/accumulators free of charge at the collecting points of your community, our distribution partners or at each location selling batteries/accumulators. You thus fulfil your legal obligation and contribute to the protection of the environment.

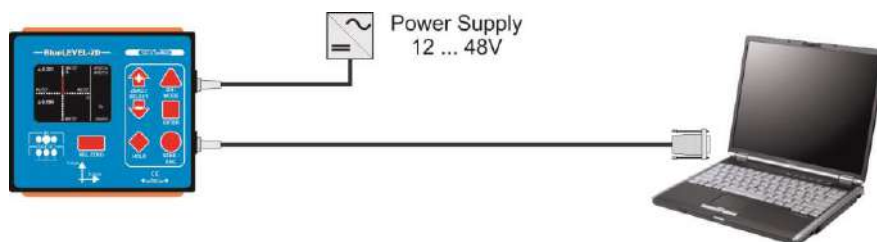
### 1.2.2 POSSIBLE CONFIGURATIONS



Stand-alone instrument

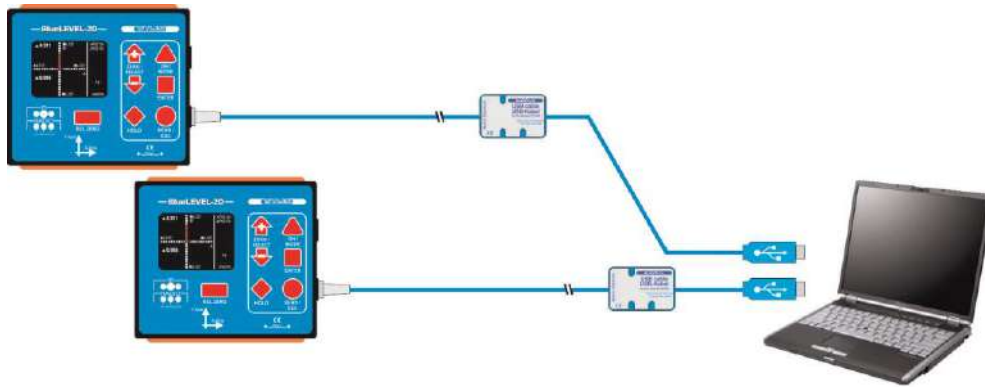


BlueLEVEL-2D connected via an USB cable to a PC/Laptop

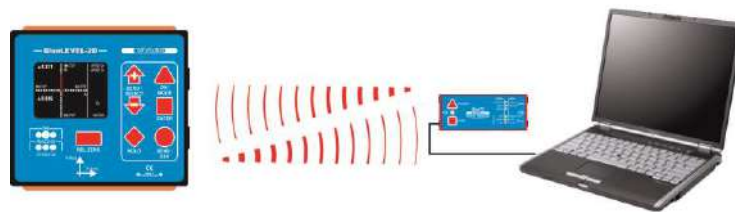


A BlueLEVEL-2D connected to a laptop with the RS232 cable. The instrument is powered from an external power supply

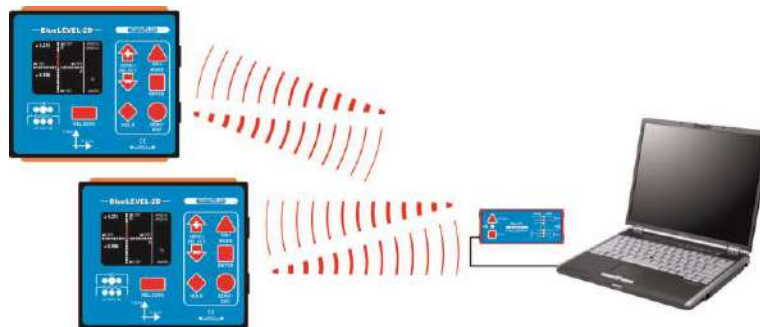




Two BlueLEVEL-2D connected to a laptop with USB cables allowing simultaneous differential measurement in 2 directions. The instruments are powered from the USB-ports.



A BlueLEVEL-2D connected via Bluetooth to a BlueTC and to a laptop.



Two BlueLEVEL-2D connected via Bluetooth to a BlueTC and to a laptop.



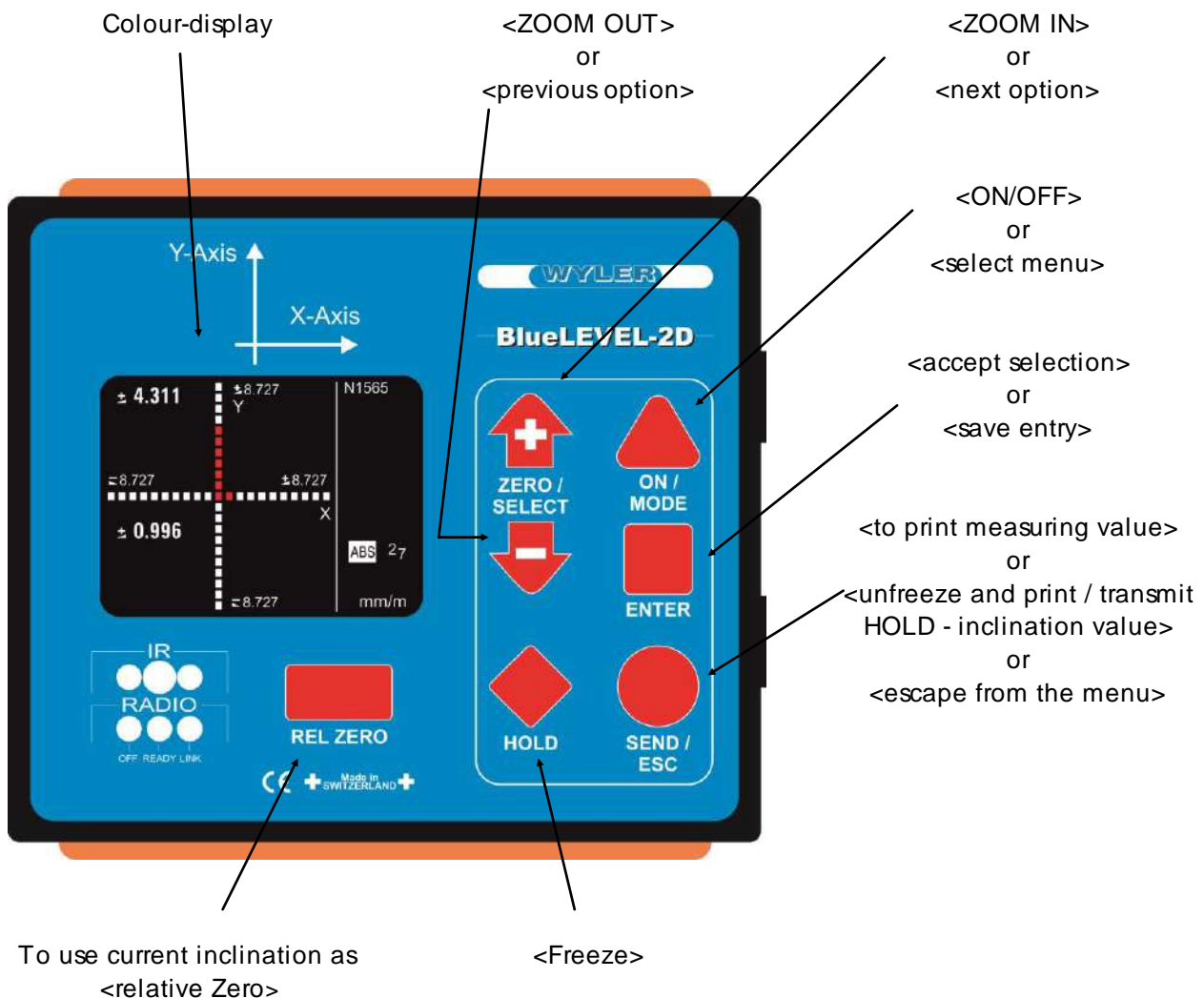
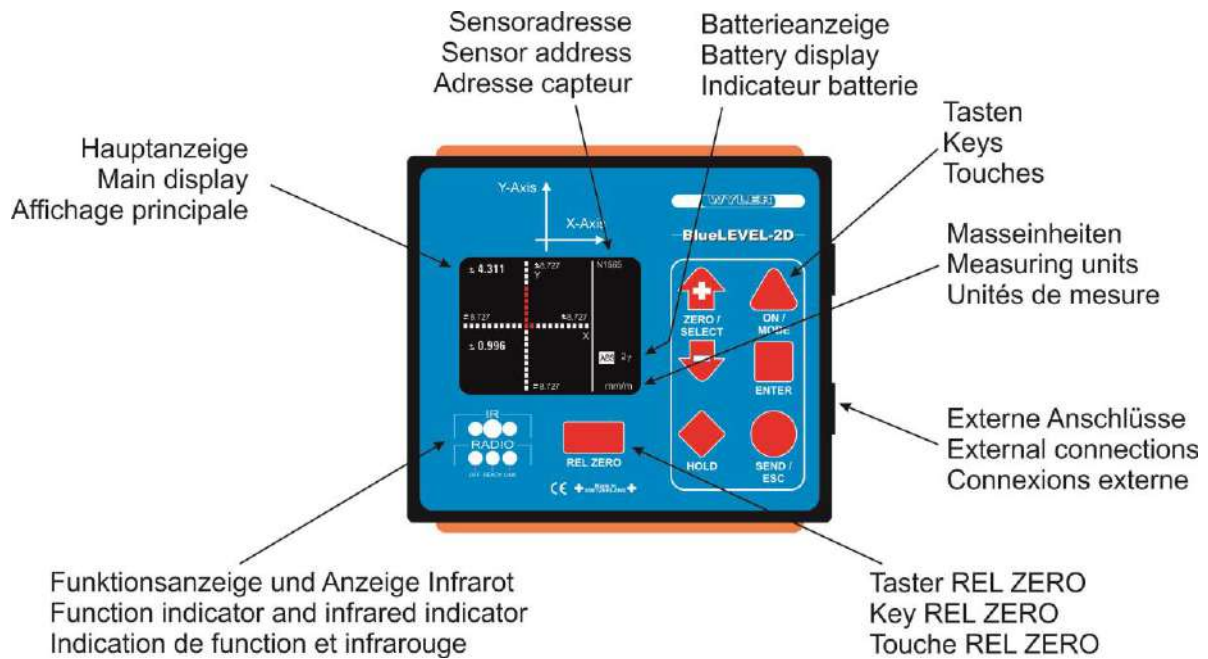
Two BlueLEVEL-2D connected via Bluetooth to a BlueMETER SIGMA and to a laptop.

Please check the respective manuals and data sheets for details on the other products shown above.

## 2 STARTING

### 2.1 OPERATION/ SHORT DESCRIPTION


#### 2.1.1 OVERVIEW KEYBOARD AND DISPLAY




### 2.1.2 HOW TO SWITCH THE INSTRUMENT ON AND OFF

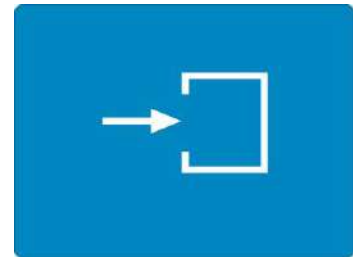
The BlueLEVEL-2D features an automatic shut off. In normal mode the instrument is automatically switched off 60 minutes after the last key operation. This automatic shut OFF function can be deactivated with a special ON sequence or when using an external power supply

To switch ON

Keep the key  pressed until the display and all LEDs are lit and release the key. The instrument will automatically shut off 60 minutes after the last key operation.


If you keep the key  pressed for **more than 10 seconds** the automatic OFF function is deactivated. This is indicated by blinking LEDs.

The instrument carries out a short function test and establishes connections to other instruments, if any had been available before switching off the instrument.


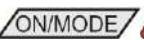





The instrument changes into measuring mode. The settings, which were used prior to switching the instrument off, are reloaded.

To switch OFF


Keep the key  pressed until the display disappears (about 3 seconds). All settings are kept and will be reloaded again next time the instrument is switched on.

### 2.1.3 KEYS / FUNCTIONS / SHORT DESCRIPTIONS OF EACH SINGLE KEY

	ON/MODE - Key
<b>Function - 1 -</b>	<p>To switch the BlueLEVEL-2D ON. When for starting the key  is pressed, a grey picture will appear on the screen and all LEDs will be illuminated. After releasing the key the BlueLEVEL-2D is switching to the measuring mode. The current inclination is displayed in the mode and unit which was used before switching the instrument OFF. In case of an error the respective error message is shown in the display. The instrument will automatically shut of 60 minutes after the last key operation.</p> <p>If the key  is pressed <b>for more than 10 seconds</b> the LEDs start blinking and the <b>automatic OFF function is deactivated</b>.</p> <p><b>Exception:</b> If the BlueLEVEL-2D is powered from an external power supply, the automatic OFF function is deactivated and the instrument will remain ON.</p>
<b>Function - 2 -</b>	<p>To switch OFF, press the key  <b>more than 3 seconds</b>, until the display disappears.</p>
<b>Function - 3 -</b>	<p>With the key  you open the menu. Pressing the key repeatedly will move you through the menu which is indicated by the cursor moving down to the required function.</p>





### ON/MODE - Key

**Function - 4 -** While setting a value with the key  the default value can be recalled.




### ENTER – key

**Function - 1 -** The key  is used to confirm a chosen function or to save a value entered

**Function - 2 -** While in the function "REL ZERO" or "ABS ZERO" the measuring can be started or an ongoing measuring can be finished by pressing the key 



### SEND/ESC- key

**Function - 1 -** The key  is used to send / transmit a measuring value to a PC or to a printer or similar output device through the RS485 port

#### Data format OUT port:

[sss xxxxtt sn.nnnnnn xxxxtt sn.nnnnnn <cr>]

sss = 0 .. 255 – sequence number

e.g. xxxxtt = Sensor Serial Number and Type  
 N2473Dx BlueLEVEL-2D X-Axis  
 N2473Dy BlueLEVEL-2D Y-Axis

sn.nnnnnn = inclination in rad, e.g. +0.226349  
 +9.999999 -> Positive Overrange  
 -9.999999 -> Negative Overrange

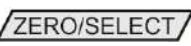


Example: 112 N2473Dx -0.021033 N2473Dy +0.002289



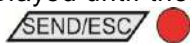

#### Format of transmission:



asynchron, 7Bit, 2 Stopbits, no parity, 9600 Baud

**Function - 2 -** Unfreeze of the "HOLD"- function to return to the measuring mode.  
 At the same time the "frozen" value is sent to the RS 485 port to any connected device

**Function - 3 -** **Escape** function from the menu

	ZERO/SELECT "+/-" - key
<b>Function - 1 -</b>	<p>The key  is used to</p> <ul style="list-style-type: none"> <li>• changing the scale in the display</li> <li>• increase / decrease the display range</li> </ul> <p>This function can, however, be disabled in the instrument settings.</p>
<b>Function - 2 -</b>	<p>The key  is used to select possible adjustments, such as</p> <ul style="list-style-type: none"> <li>• menu selection</li> <li>• modification of a number</li> </ul>

	HOLD - key
<b>Function - 1 -</b>	<p>The key  serves for "freezing" a measuring value. The value is displayed until the BlueLEVEL-2D returns to the measuring mode by pressing the  key.</p>
<b>Function - 2 -</b>	<p>In the functions "REL.ZERO" and "ABS.ZERO" the key  is used for reading in the actual measuring value again during the manual entering.</p>

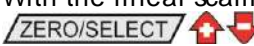
	REL ZERO - key
<b>Function - 1 -</b>	<p>The key  serves for setting the actual inclination as the relative Zero.</p>

## 2.2 DISPLAY

The BlueLEVEL-2D features various graphic displays which can be scaled according to the requirements of the measuring task. Also the background colour and the brightness of the display can be adjusted.


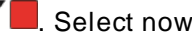

### 2.2.1 SCALING OF THE DISPLAY




For an optimal use of the graphic display, you have various options for scaling.

With the linear scaling the display precision remains constant over the full range. With the keys  the resolution can be changed. Thus also the range being displayed will be changed.

With the logarithmic scaling the display precision around Zero is the highest and it is reduced continuously with higher inclination values. Around Zero the resolution corresponds to the unit selected.

In the adjustments of the instrument you can switch between linear and logarithmic scaling.

Using the key  select the menu point [Options] and confirm with . Select now [Logscale] and confirm with .

Switch the logarithmic scaling ON or OFF using the keys **ZERO/SELECT**  . The display will show the requested state of the instrument. Confirm with the key **ENTER** .






The instrument will return to the measuring mode. If the logarithmic scaling is enabled, the symbol "LOG" will appear below the graph.

## 2.2.2 DISPLAY TYPES

The display type can be selected in the menu "display".

Using the key **ON/MODE**  select the menu point [Display] and confirm this selection with **ENTER** .

Select the required display type using the keys **ZERO/SELECT**   and confirm your selection with the key **ENTER** .



The instrument will return to the measuring mode.

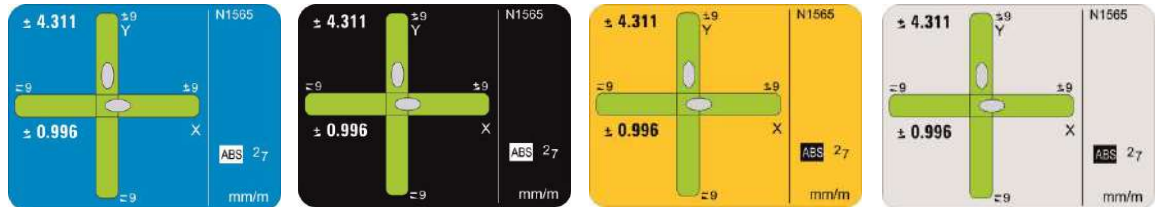


The following display types are available in the BlueLEVEL-2D:

Numeric display



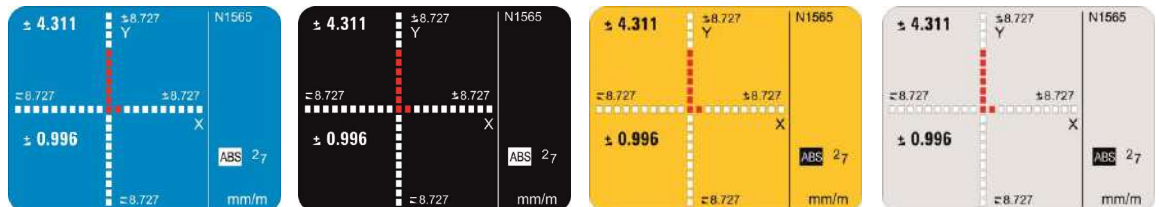
Display with cross vial



Display target



Display LED-cross

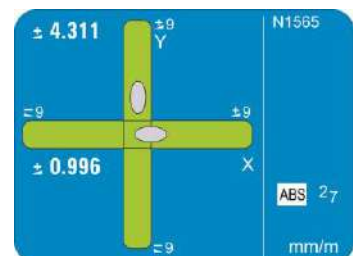


## 2.2.3 BACKGROUND COLOUR

In the adjustments of the instrument the background colour can be selected. Depending on the brightness of the colour selected the colour of the fonts and the symbols will change between black and white.

Using the key **ON/MODE** select the menu point [Options] and confirm with **ENTER** . Select now [Display Settings] and confirm with **ENTER** .

With the keys **ZERO/SELECT** select the display colour and confirm the selection with the key **ENTER** .



The instrument will return to the measuring mode.






## 2.2.4 BRIGHTNESS

Adjustment of the brightness of the display. Difference between battery operation and the use of an external power supply.

In the adjustments of the instrument the brightness of the display can be adjusted in order to adapt it to the environmental conditions and to optimise the battery life time. Thus two different values can be set for the battery operation and the operation with an external power supply

Using the key **ON/MODE**  on mode select the menu point [Options] and confirm with **ENTER** . Select now [Display Settings] and confirm with **ENTER** .

Using the keys **ZERO/SELECT**   select [Brightness] for the adjustment when using an external power supply and [Brightness Powersave] for the adjustment in battery operation. Confirm this selection with **ENTER** .

With the keys **ZERO/SELECT**   you can adjust the brightness required. The display will show the power consumption in a range from 10% to 100% of the maximum brightness. Only steps of 10% are possible. Confirm the adjustment with the key **ENTER** .

With the key **ON/MODE**  the default value of 50% will be recalled.







The instrument will return to the measuring mode.






## 2.3 SHORT DESCRIPTION OF THE INDIVIDUAL DISPLAY AREAS

### Main display

In the main display the actual measuring value will be displayed.

<b>Display of the direction of the inclination</b>	<p>A symbol indicates the direction of the inclination of the value displayed.</p> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 10px;">inclined to the right (positive inclination)</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;">  <div style="margin-left: 10px;">declined to the right (negative inclination)</div> </div>
<b>on hold</b>	The HOLD function is activated, i.e. the measuring value is "frozen".
<b>ABS</b>	Absolute measurement is activated.
<b>REL</b>	Relative measurement is activated, i.e. the measuring value is the difference between the current and the reference plane, i.e. the relative base.
<b>displaying range 60°</b>	Shows the selected displaying range. The displaying range can be adjusted using the keys <b>ZERO/SELECT</b>   provided that this function is enabled in the options.
<b>scale division 5°</b>	Angle between two tick marks.
<b>Scale division LOG</b>	Indicates that the logarithmic scale is in use. If this sign is missing, the linear scale is in use.
<b>Serial number</b>	<p>Shows the serial number of the instrument.</p> <ul style="list-style-type: none"> <li>• X-Axis: A+Serial number+X</li> <li>• Y-Axis: B+Serial number+Y</li> </ul>
<b>Battery voltage 2<sub>6</sub></b>	Display of the current battery voltage (example 2.6 V). The lowest possible voltage is 1.7 Volt. After a further voltage drop a blinking battery symbol will appear. The batteries must then be exchanged immediately. A plug symbol will appear when the instrument is powered by an external source.
<b>Measuring unit</b>	Display of the measuring unit in use. There are 10 basic units available, whereas for each setting various options can be selected.

### 3 OPERATING INSTRUCTIONS BLUELEVEL-2D

The BlueLEVEL-2D offers a wide range of functions and adjustment possibilities. The list of functions appears when the key **ON/MODE**  is pressed. With the keys **ZERO/SELECT**   the desired function can be selected and with **ENTER**  it will be started. If during 10 seconds no further key is operated, the function list will be left. With the key **SEND/ESC**  a function selected can be abandoned. Already entered changes of parameters will be rejected and the BlueLEVEL-2D will return to the previously used display mode.

Here after the single functions will be described.

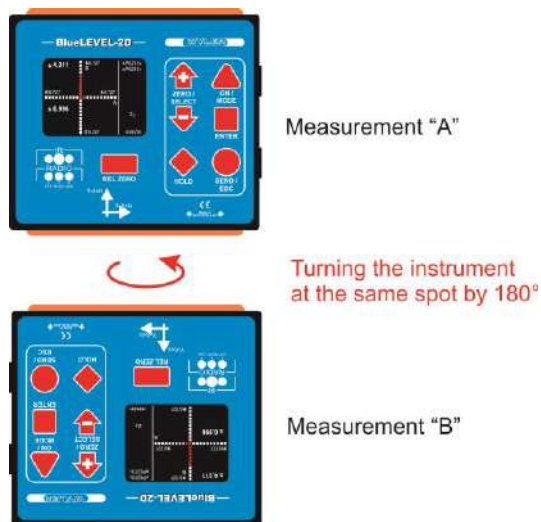
#### 3.1 "ZERO-SETTING" / ABSOLUTE ZERO

Absolute ZERO means that the instrument shows the measuring value "0" if the measuring surface of the instrument is aligned exactly according to gravity (true horizontal or true vertical).

##### 3.1.1 SET ABSOLUTE ZERO (WITH A REVERSAL MEASUREMENT)

The absolute zero is used as the base for absolute inclination measurements. In order to achieve the best possible precision please observe that the measuring object (support) and the BlueLEVEL-2D have the same temperature and that the instrument is in operation for several minutes before starting a measurement. The surface needs to have a very good flatness.

Mark the precise position and particularly the direction of the BlueLEVEL-2D in order to be able to turn the instrument by 180 degrees and to put it in opposite direction at the very same spot.





The absolute zero will be determined from a **reversal measurement** (two measurements in opposite direction but at the same spot). Use for this procedure an adequate surface (rigid and stable support, as flat as possible and as horizontal as possible), where you put the BlueLEVEL-2D. Mark the position and the direction of the BlueLEVEL-2D precisely and turn it on the same spot by 180 degrees.


$$\text{ZERO OFFSET} = \frac{\text{Measurement "A"} + \text{Measurement "B"}}{2}$$

**The "ZERO-OFFSET" will be stored in the BlueLEVEL-2D**

#### EXAMPLE:


With the key **ON/MODE**  select the menu item [Abs ZERO] and confirm this selection with **ENTER** .

In the display the position of the instrument for the first measurement will be shown.


Put the BlueLEVEL-2D to the first position and press the key **ENTER**  for reading the first measuring value. Alternatively the first measuring value can also be entered with the zapper.




During the measurement the display will graphically show the current measurement.

Confirm the first measurement with the key  or with the zapper. After 15 seconds the value will automatically be read.

After a successful reading of the first measuring value the position of the instrument for the second measurement will appear in the display.

Put the BlueLEVEL-2D now to the second position (turn the instrument by 180 degrees in the horizontal) and press the key  again for reading the second measuring value. Alternatively the second measuring value can also be entered with the zapper.

During the measurement the display will graphically show the current measurement.

Confirm the second measurement with the key  or with the zapper. After 15 seconds the value will automatically be read.

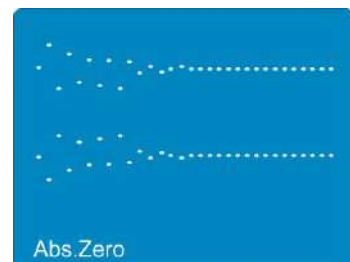
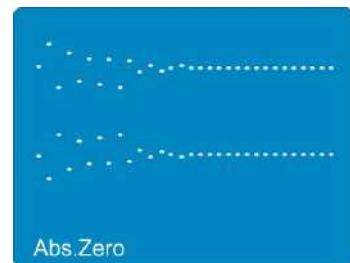
After termination of the reversal measurement the display for the actual measurement under consideration of the ZERO OFFSET will appear on the screen.

Notice:

The value of the "ZERO OFFSET" determined by a reversal measurement corresponds to the deviation of the zero point of the BlueLEVEL-2D compared to the absolute Zero (gravity). The displayed measuring value corresponds to




**VALUE displayed =**  
**Value of the BlueLEVEL-2D minus "ZERO OFFSET"**

The reversal measurement described above should be repeated periodically in order to achieve a high measuring precision, particularly when the BlueLEVEL-2D has not been in use for a longer period.



### 3.2 SELECTION OF THE MEASURING UNIT / UNIT

#### 3.2.1 STANDARD-UNITS

You can change the measuring unit of the inclination values displayed. If you start the function [UNIT] the list of the available measuring units will appear. With the keys **ZERO/SELECT**   you can now select the measuring unit preferred. For memorizing the measuring unit selected you press now the key **ENTER** . The measuring unit will remain active until you change it again according to the above procedure.

The following **measuring units** can be chosen.

xxxx.xx	mm/m	mm per m / 2 decimals
xxx.xxx	mm/m	mm per m / 3 decimals *
xx.xxxx	"/10"	inch per 10 inches / 4 decimals
xx.xxxx	"/12"	inch per 12 inches / 4 decimals
xxxx.xx	mRad	Milliradian / 2 decimals
xxx.xxx	mRad	Milliradian / 3 decimals
xxxx.xx	mm/REL	mm in relation to the relative base / 2 decimals
xxx.xxx	mm/REL	mm in relation to the relative base / 3 decimals *
xx.xxxx	"/REL	inches in relation to the relative base / 4 decimals
xxxx.xx	A ‰	artillerie-permille
xxxx.xx	‰	permille
xxx.xxx°	DEG	degrees / 3 decimals
xxx° xx'	DEG	degrees / minutes
xx° xx' xx"	DEG	degrees / minutes / seconds
xxxx' xx"	DEG	minutes / seconds
xxxxxx"	DEG	seconds
xxxxx.x"	DEG	seconds *
xxx.xxx	GON	gon / 3 decimals
xx.xxxx	GON	gon / 4 decimals

Depending on the unit selected the last digit will be rounded to 5" or to the nearest lower integer (e.g.20 µmm/m).




#### 3.2.2 UNITS WITH RELATIVE BASE LENGTH


The units mm/REL and "/REL are related to a relative, this means selectable, base length. After selecting one of these units, the relative base length must be entered.

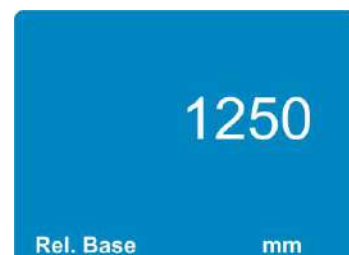
Example: **mm/REL** / mm in relation to a relative base / 2 decimals.

After the selection of the measuring unit in our example the stored base length of 1000 mm will appear.



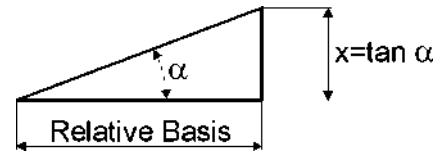
With the keys **ZERO/SELECT**   the proposed base length can be modified. The newly entered value can finally be confirmed with the **ENTER**  key.

With the key **ON/MODE**  the default value 1000 mm will be recalled.







The following measurements are now related to a base length of 1250 mm.

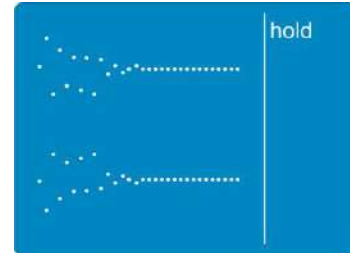
When measuring in the "relative mode" the height "X" will be displayed as linear measure in the selected unit and in relation to the set base length (in **mm** or **inches**).







### 3.3 FUNCTION HOLD

The key function   can be applied in all measuring modes.



Put the BlueLEVEL-2D on a stable support. Press now the key  . While the BlueLEVEL-2D is waiting for a valid measuring value the display will show graphically the measuring values read in the form of a shoal of points. As it is practically impossible to obtain a valid measuring value during manipulation, the instrument can be set to the final position even after activating the key.



Complete the measurement with the   key or with the zapper. After 15 seconds the measuring value will automatically be read.

By pressing the key   again a new valid measuring value will be read.



With the key   the "frozen" measuring value will be transmitted via the "RS485" port to a connected PC/Laptop with an RS232 interface. At the same time the instrument will return to the measuring mode.



The function SEND can also be initiated from the PC/Laptop connected by sending "P" (as a letter) via the RS 232 port.

### 3.4 SELECTION OF THE FILTER UNDER DIFFERENT MEASURING CONDITIONS / **FILTER**

A number of different predefined filters can be selected.

Description of the different filter types:

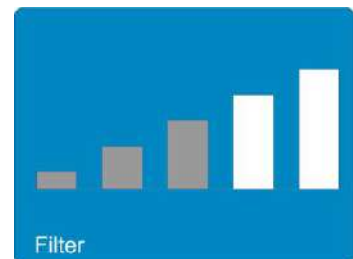
- FILTER 1: No filtering, no integration of the measuring values (T const. = 0.33 sec.)
- FILTER 2: Floating average of 3 measuring values (T const. = 1 sec.)
- FILTER 3: Floating average of 15 measuring values (T variable = 0.33 ... 5 sec.)
- FILTER 4: Floating average of 6 measuring values (T const. = 2 sec.)
- FILTER 5: Floating average of 15 measuring values (T const. = 5 sec.)

T: Response time when changing the position. For filter 3 the actual change of the measuring value will define the number of values to be used for calculating the floating average. With a considerable change the number of values will be reduced with minute fluctuations the number will be increased.

Filter type 3 is the factory setting when leaving WYLER AG.

With the key **ON/MODE**  select the menu item [FILTER] and confirm this selection with **ENTER** .

Using the keys **ZERO/SELECT**   you can now select the filter type desired and then confirm it with **ENTER** .




The measuring instrument will return to the measuring mode.

### 3.5 ABSOLUTE MEASUREMENT / RELATIVE MEASUREMENT

#### 3.5.1 ABSOLUTE MEASUREMENT

As a factory setting the BlueLEVEL-2D will be programmed for absolute measurement (default setting).

If this is not the case select the function [Absolute]. After confirming this function with the key **ENTER**  the instrument is ready for measurements in the mode "ABSOLUTE".

The measuring value corresponds to the

**value of the BlueLEVEL-2D minus "ZERO - OFFSET"**



Inclination X: 0.996mm/m  
Inclination Y: 4.311mm/m





### 3.5.2 RELATIVE MEASUREMENT / REL ZERO

#### Important preliminary remark:

The "REL ZERO OFFSET" determined for a relative measurement will be superposed to the "ZERO OFFSET", e.g. determined by a reversal measurement.

The "REL ZERO OFFSET" will be stored in the BlueLEVEL-2D and can be re-called again and again. When starting the next relative measurement the "REL ZERO OFFSET" entered or determined the last time will be displayed. The value can either be confirmed, newly entered or set to zero.



$$\text{Value displayed} = \text{Value of the BlueLEVEL-2D - "ZERO-OFFSET" - "REL ZERO OFFSET"}$$

Abbreviated procedure with the key  :

Put the measuring instrument on the reference surface.  
The display shows the values X +0.996mm/m and Y +2.311mm/m. This corresponds to the absolute inclination of the reference surface.



Inclination X: 0.996mm/m  
Inclination Y: 2.311mm/m

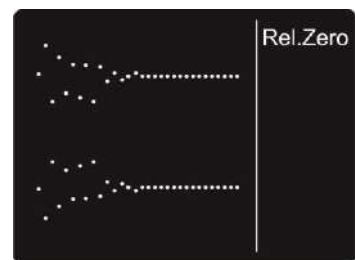


Set the BlueLEVEL-2D to the correct position and press the key  .

After 15 seconds the value will automatically be read.

During the measurement the display will graphically show the current measurement.

Complete the measurement with the   key or with the zapper. After 15 seconds the measuring value will automatically be read.



On the screen now the display for the actual measurement will appear under consideration of the ZERO OFFSET.

Inclination X: 0.000mm/m  
Inclination Y: 0.000mm/m



The **value** displayed is "0" and represents the position of the reference defined.



### 3.6 MEASURING WITH LIMITS / LIMITS

If you intend to set off an "Alarm" when a defined limit is exceeded this can be realised using the function "LIMITS".





The function "LIMITS" allows defining an upper and a lower **limit**. If this set limit is exceeded respectively under-run, a horizontal bar in the display will start blinking. A blinking bar above the displayed value means that the upper limit has been exceeded. If the blinking bar is below the lower limit has been under-passed. Through the RS485 port a message will be sent.

Using the key **ON/MODE**  select the menu item [LIMITS] and confirm this selection with **ENTER** .







Switch the function [LIMITS] on or off using the **ZERO/SELECT**   keys and confirm with the key **ENTER** .



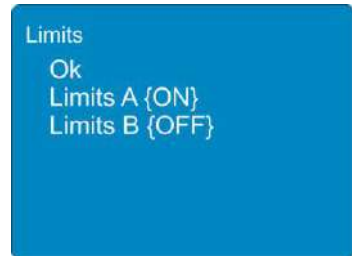
You can now enter the lower limit. The value is adjusted using the **ZERO/SELECT**   keys. Confirm the value with the key **ENTER** . With the key **ON/MODE**  the default value will be recalled.



Now you can enter the upper limit. The value is adjusted using the **ZERO/SELECT**   keys. Confirm the value with the key **ENTER** . With the key **ON/MODE**  the default value will be recalled.



The measuring instrument will return to the measuring mode.



If during the measurement the lower respectively the upper limit is exceeded a blinking horizontal bar will appear above respectively below the inclination value. Via the RS485 port a respective message will be sent.



It is possible to set the lower limit above the upper limit. In this case a respective message will be sent via the RS485 port continuously.

#### Data format at the RS 485 interface

Upper Limit	[sss xxxxtt	UL	sn.nnnnnn sm.mmmmmm<cr>]
Lower Limit	[sss xxxxtt	LL	sn.nnnnnn sm.mmmmmm<cr>]

sss = 0 .. 255 - Laufnummer

xxxxtt = Sensor Serial Number and Type

N2673Dx BlueLEVEL-2D X-Axis

N2673Dy BlueLEVEL-2D Y-Axis

sn.nnnnnn = +9.999999 - Positive Overrange




-9.999999 - Negative Overrange

other value - angular value in rad e.g. +0.226349

sm.mmmmmm = limit defined



### 3.7 GROUPING OF INSTRUMENTS TO A MEASURING GROUP IN THE WIRELESS MODE

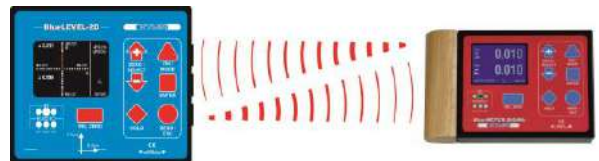
#### 3.7.1 GROUPING VIA CABLE CONNECTION / JOIN

1. Connect all instruments to be grouped (BlueLEVEL-2D and e.g. a BlueMETER SIGMA or BlueTC) using the cables provided and switch all instruments on.
- 
2. Select on the BlueMETER the menu "**JOIN**" using the **ON/MODE**  key. Confirm with the key **ENTER** . All instruments connected are now searched and joined to a group.
  3. After establishing the group a "**REFRESH**" will be performed.
  4. 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).
  5. 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.
  6. After successful connection the blue LED "LINK" will be lighting on all the instruments connected.

#### 3.7.2 GROUPING IN THE WIRELESS MODE / JOIN

With the function "JOIN" an instrument can be added to an existing group. During this procedure no instrument must be connected by cables as otherwise the "JOIN" procedure for cables will be performed. To make sure that the instrument does not belong to another group, it is advisable to perform the function "LEAVE" first.

1. On the BlueLEVEL-2D select the menu "**JOIN**" using the **ON/MODE**  key. Confirm with **ENTER** . Set the second instrument also to the JOIN mode.



#### 2. Searching

The two instruments are "searching" each other. During the searching procedure the green LED on both instruments is 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.

### 3. Group connection

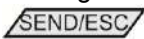

As soon as the two instruments have successfully detected each other the search process is stopped and this is visualised by a rapid blinking (4 to 5 times per second) of the green LEDs on both instruments. The joining can now

- be activated by using the   key on one of the instruments  
or
- the whole process may be cancelled by pressing the   key.

If the LED "OFF" is blinking in red, a grouping is not possible (see chapter 3.7.3 / special case)

4. The green LED "READY" will blink shortly as many times as instruments are joined in the measuring group (including the own address).

### 3.7.3 SPECIAL CASE "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  .

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.

### 3.7.4 UNHINGE AN INSTRUMENT FROM A GROUP USING THE FUNCTION "LEAVE" / LEAVE

Each instrument may be unhinged individually from an existing measuring group.






#### PROCEDURE "LEAVE"

1. On the BlueLEVEL-2D select the menu "LEVAE" using the   key.  
Confirm with  .
2. The BlueLEVEL-2D is now unhinged from the group and is no longer accessible via wireless data transmission.

### 3.8 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 one of the keys      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 OPTIONS

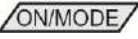





The options serve for entering the basic adjustments of the measuring instrument. The access to the options can be protected with a PIN code in order to avoid unauthorised modifications.

The following options are available:








- **Option "Set PIN-Code"**  
With this option it is possible to block the entering of options with a PIN code.
- **Option "Display Settings"**  
With this option basic settings of the display, such as the brightness and colour pattern, are possible.
- **Option "Logscale"**  
With this option the logarithmic scaling can be switched on or off.
- **Option "Programmable Keys"**  
With this option it is possible to switch the scale-functions of the keys <ZERO/SELECT> and the functions of the key <ON/OFF> on or off.
- **Option "Functions ON/OFF"**  
With this option specific functions can be switched on or off. Functions switched off will no longer appear in the main menu.
- **Option "Hide disabled Functions ON/OFF"**  
If this option is enabled, disabled functions will not be shown.
- **Option "Radio ON/OFF"**  
With this option the wireless data transmission can be activated or deactivated.
- **Option "Gravity"**  
With this function the correction of the gravitation can be switched on or off and the local gravity force can be entered.
- **Option "Version"**  
With this option the version of the firmware will be displayed.
- **Option "Factory Reset"**  
A complete factory reset will set the instrument to the factory (default) settings as it has been configured at the factory. All personal settings are lost.
- **Option "Self Test"**  
A function check of the instrument will be performed.

## 4.1 SET PIN-CODE

In order to protect the settings of the BlueLEVEL-2D against unauthorised changes you have the possibility to block the entering of options with a PIN code.

Using the key   select the menu point [Options] and confirm with  . Select now [Set Pin Code] and confirm with  .

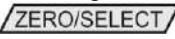






Switch the blocking of options with the keys    to ON and confirm with the key  .

You can now enter your PIN code. The value can be adjusted using the keys   . With the key   the standard value 00000 will be recalled. Confirm your entry with the key  .



The measuring instrument will change back to the measuring mode.

If the option PIN code is activated, the code must be entered before the list of options will be shown.

Entering the PIN code: The value can be adjusted using the keys   . With the key   the standard value 00000 will be recalled. Confirm your entry with the key  .









As a factory setting the PIN code is deactivated. The default value is 00000.

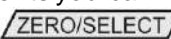


## 4.2 DISPLAY SETTINGS

The brightness of the display, the brightness in the energy safe mode and the colour pattern can be adjusted individually. The BlueLEVEL-2D will work in the energy safe mode as long as no external power supply is connected and it is powered by batteries. The brightness is indicated as a percentage of the maximum brightness. As the power consumption is considerably reduced with a reduced brightness, it is recommended to use in the energy safe mode a brightness of 50 % (default). With the colour pattern the background colour can be adjusted. The colour of the fonts changes according to the brightness of the background between white and black. Standard background is blue.



Using the key   select the menu point [Options] and confirm with  . Select now [Display Settings] and confirm with  .

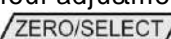




With the keys    select the display option you would like to change and confirm the selection with the key  .

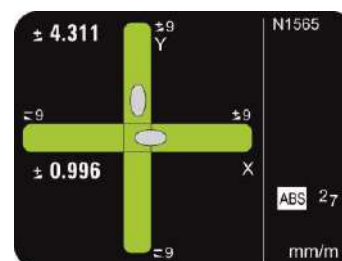
In the brightness adjustments you can increase or reduce the brightness using the keys   . The range is from 10% to 100%.

With the key   the default value of 50% will be recalled.

Confirm the new value with the key  .



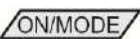





In the colour adjustments you can select the colour preferred using the keys   . Confirm your choice with the key  .

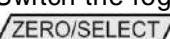






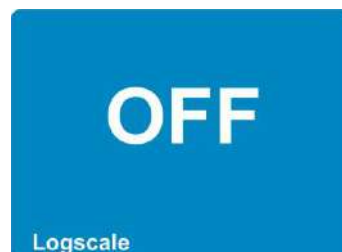
The measuring instrument will return to the measuring mode.

### 4.3 LOGSCALE

With this option the logarithmic scaling can be switched on or off.




Using the key   select the menu point [Options] and confirm with  . Select now [Logscale] and confirm with  .




Switch the logarithmic scaling ON or OFF using the keys    and confirm with the key  .






The measuring instrument will return to the measuring mode.



## 4.4 PROGRAMMABLE KEYS


The function of the keys **ZERO/SELECT**   as well as the key **REL ZERO**  can be switched on or off.

Using the key **ON/MODE**  select the menu point [Options] and confirm with **ENTER** . Select now [Programmable keys] and confirm with **ENTER** .

Select the key you want to activate or deactivate using the keys

**ZERO/SELECT**   and confirm your choice with the key **ENTER** .

With the keys **ZERO/SELECT**   you can switch the selected key ON or OFF. In the display the selected status will be shown. ON means activated, OFF means deactivated.

Confirm with the key **ENTER** .

The list of the programmable keys will be shown again. For switching another key on or off, repeat the procedure as described above.

In order to store the settings select "Ok" and confirm with the key

**ENTER** .

Programmable Keys  
> Ok  
 - Rel.Zero {ON}  
  - Scale {ON}

ON




  - Scale

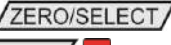



Programmable Keys  
> Ok  
 - Rel.Zero {ON}  
  - Scale {ON}

The measuring instrument will return to the measuring mode.

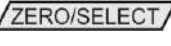



## 4.5 FUNCTIONS ON/OFF

The menu functions provided can be switched on respectively off. Thus the menu displayed can be adjusted to the needs of the user.

Using the key  select the menu point [Options] and confirm your selection with . Select now [Functions ON/OFF] and confirm with .


Select the function you want to switch on respectively off with the keys    and confirm your selection with the key .



With the keys    you can switch the selected function ON or OFF. In the display the selected status will be shown. ON means enabled, OFF means disabled. Confirm with the key .



The list of the switchable functions will be shown again. For switching another function on or off, repeat the procedure as described above.


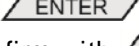
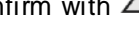
In order to store the settings select "Ok" and confirm with the key .







The measuring instrument will return to the measuring mode.

## 4.6 HIDE DISABLED FUNCTIONS ON/OFF

This adjustment allows you to hide the functions disabled. The list of functions will only show those functions which are enabled. If this adjustment is not activated, disabled functions will be shown in the list of functions in grey fonts.

Using the key  select the menu point [Options] and confirm your selection with . Select now [Hide disabled Functions ON/OFF] and confirm with .




Switch the adjustment "Hide disabled functions" ON or OFF with the keys    and confirm with the key .

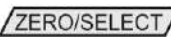





The measuring instrument will return to the measuring mode.

## 4.7 RADIO ON/OFF

This adjustment allows you to switch the wireless data transmission on or off.

Using the key  select the menu point [Options] and confirm your selection with . Select now [Radio ON/OFF] and confirm with .

Switch the wireless transmission ON or OFF using the keys    and confirm with the key .



The measuring instrument will return to the measuring mode.

## 4.8 GRAVITATION

The inclination displayed by the BlueLEVEL-2D is based on the gravitation. Around the globe the gravitation is, however, not constant but it varies with the latitude and with the height above sea level. Furthermore variations of the density in the lithosphere cause additional local deviations.

As an example the gravity at sea level is

- 9,78033 m/s<sup>2</sup> at the equator ,
- 9,80620 m/s<sup>2</sup> at 45 degree of latitude,
- 9,83219 m/s<sup>2</sup> at the poles.

In the table to the right the values of gravity for some cities are listed.

The BlueLEVEL-2D has been calibrated at the head office of WYLER AG. The inclinations displayed are exact only in this location. In different places the displayed value must be corrected. If the correction of the local gravity is switched on, the inclination measured will be corrected accordingly before the value is displayed.

Amsterdam	9.813	Istanbul	9.808	Paris	9.809
Athens	9.807	Havana	9.788	Rio de Janeiro	9.788
Auckland, NZ	9.799	Helsinki	9.819	Rome	9.803
Bangkok	9.783	Kuwait	9.793	San Francisco	9.800
Brussels	9.811	Lisbon	9.801	Singapore	9.781
Buenos Aires	9.797	London	9.812	Stockholm	9.818
Calcutta	9.788	Los Angeles	9.796	Sydney	9.797
Cape Town	9.796	Madrid	9.800	Taipei	9.790
Chicago	9.803	Manila	9.784	Tokyo	9.798
Copenhagen	9.815	Mexico City	9.779	Vancouver, BC	9.809
Nicosia	9.797	New York	9.802	Washington, DC	9.801
Jakarta	9.781	Oslo	9.819	Wellington, NZ	9.803
Frankfurt	9.810	Ottawa	9.806	Zurich	9.807




The correction is calculated according the following formula:




$$\alpha_{eff} = \arcsin\left(\frac{g_c}{g_m} \sin(\alpha_m)\right)$$

whereas





- $g_c$  gravity at the place of calibration
- $\alpha_m$  displayed angle at place of measurement
- $g_m$  gravity at the location of measurement
- $\alpha_{eff}$  effective angle

In order to switch the correction of the local gravity on respectively off, proceed as follows:

Using the key  select the menu point [Options] and confirm your selection with . Select now [Gravity] and confirm with .

Switch the correction of the gravitation ON or OFF using the keys **ZERO/SELECT**   and confirm with the key **ENTER** .






Now you can enter the value of the local gravity. The value is adjusted with the keys **ZERO/SELECT**  . With the key **ON/MODE**  the standard value 9.80700 m/s<sup>2</sup> will be recalled. Confirm your entry with the key **ENTER** .



The measuring instrument will return to the measuring mode.

## 4.9 VERSION FIRMWARE

With this option information about the firmware installed and the configuration can be displayed.

Using the key **ON/MODE**  select the menu point [Options] and confirm your selection with **ENTER** . Select now [Version] and confirm with **ENTER** .

The following information will be displayed:

- Serial number of the instrument
- Number of the Firmware
- Release date of the Firmware
- Type of the instrument (Wireless / Cable)
- Version of the Bluetooth module
- Serial number of the integrated sensor
- Measuring range



With the key **ENTER**  this display will be left.







The measuring instrument will return to the measuring mode.



## 4.11 FACTORY RESET


A complete factory reset will reset the instrument to the state as it has been configured at the factory. All personal settings are lost.

The BlueLEVEL-2D will be set to the following standard configuration:

Standard-Values:	
measuring mode:	absolute
measuring unit:	DEC xx°xx'xx"
relative base:	1000 mm
absolute Zero point (ZERO-OFFSET):	0
relative Zero point (REL ZERO-OFFSET):	0
Filter	No. 3
Display	numeric display
Limits	OFF
Upper Limit	0
Lower Limit	0
Scale	maximum range
Join	not joined
Pin Code	OFF; Code = 00000
Display Settings	Colour Blue; Saturation 100%; Saturation Power Save 50%;
Logscale	OFF
Programmable Keys	all keys enabled
Functions	all functions enabled
Hide disabled Functions	OFF
Radio	ON, if available
Gravitation	OFF; value = 9.807 kg·m/s <sup>2</sup>

Using the key   select the menu point [Options] and confirm your selection with  . Select now [Factory Reset] and confirm with  .

In order to prevent a resetting by error the question "Are you sure?" will appear. If you really want to delete all personal settings, press now the key  .




After 10 seconds or with the key   the instrument will return to the measuring mode.

The measuring instrument returns to the measuring mode.



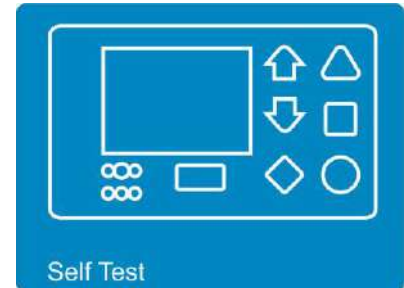
## 4.12 FUNCTION CHECK

At the start of the instrument a system test will be performed, checking the most important functions. In addition to this test the functions of the keys and of the LEDs can be checked.

Using the key **ON/MODE**  select the menu point [Options] and confirm your selection with **ENTER** . Select now [Self Test] and confirm with **ENTER** .

In the display a simplified design of the front foil of the BlueLEVEL - 2D will be shown. If any key or the IR zapper is pressed, the real LEDs as well as those on the display will lit. In addition the key pressed will be marked. Each key will create an individual pattern. Thereby the real LEDs and those on the display must be identical. If this is not the case, either a key or an LED is defective.

After 10 seconds without activating any key the instrument will leave the function check mode.



The measuring instrument will return to the measuring mode.

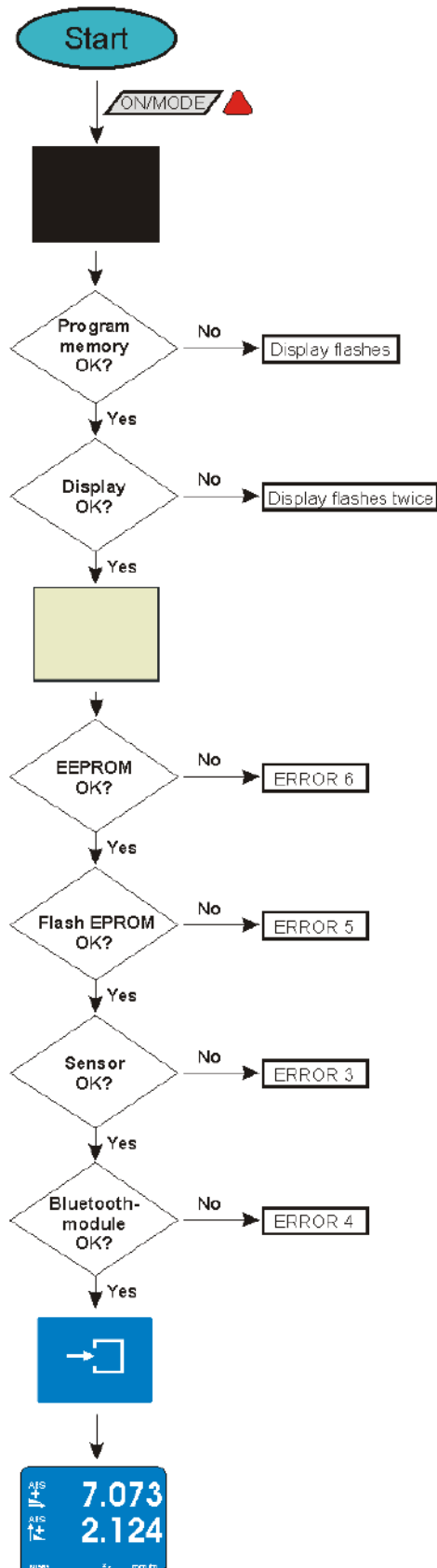


## APPENDICES

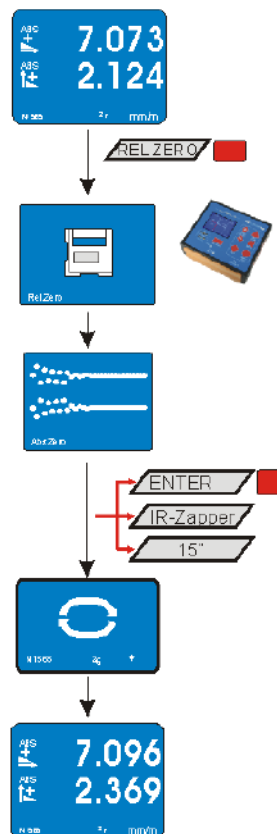
### A FLOAT CHARTS GENERAL

#### A1 START THE INSTRUMENT / **ON/OFF**

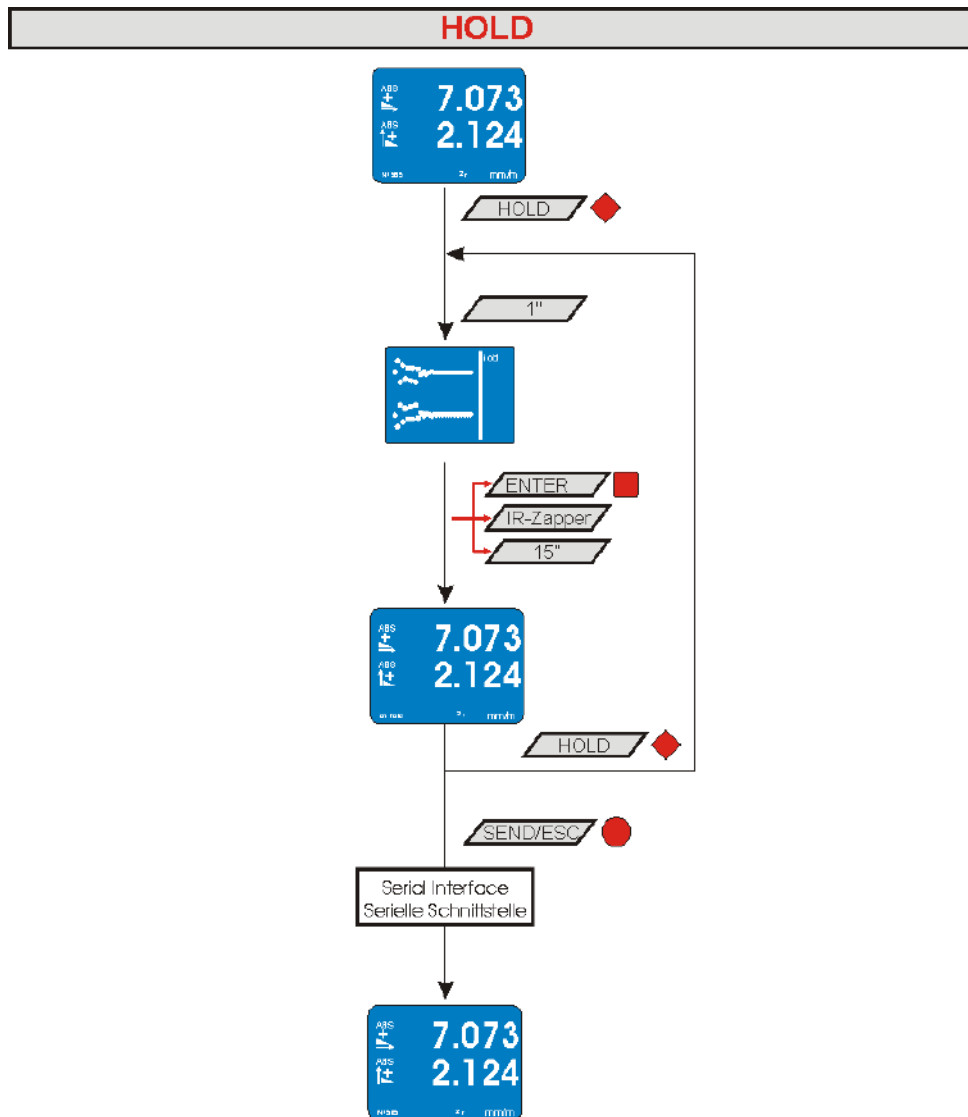
#### POWER UP / Switch on instrument

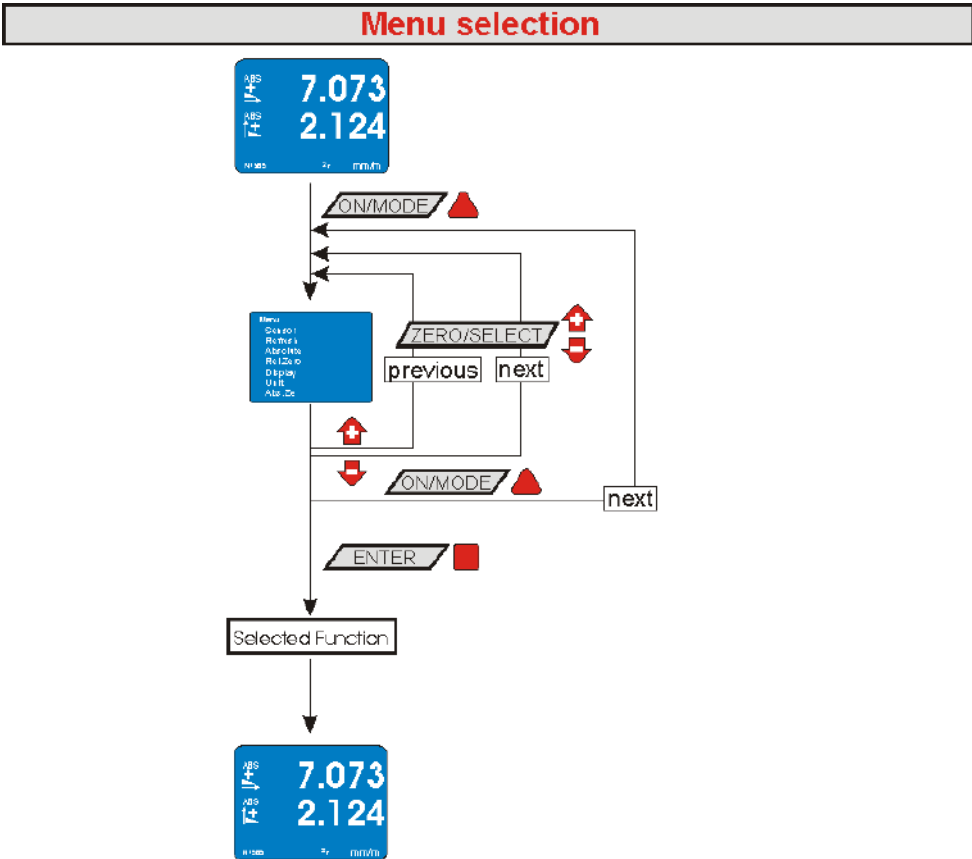


## Relative ZERO Key

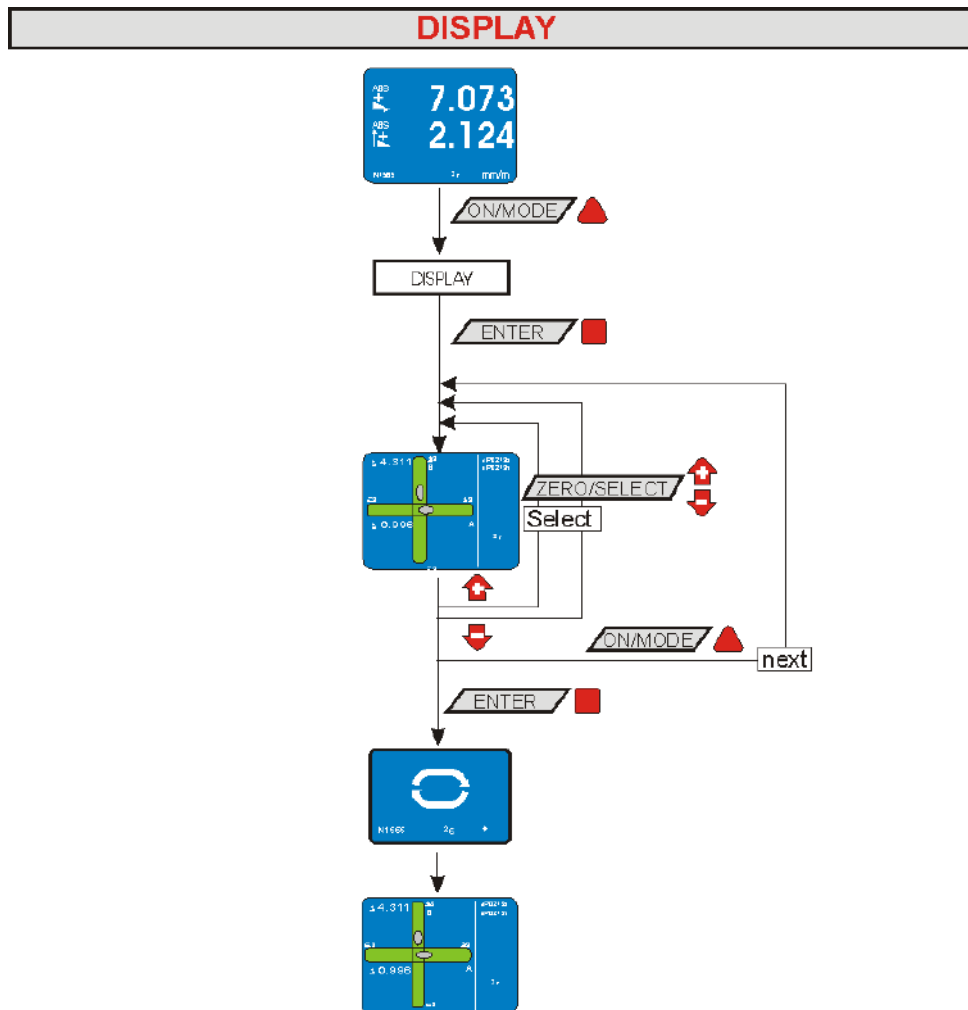


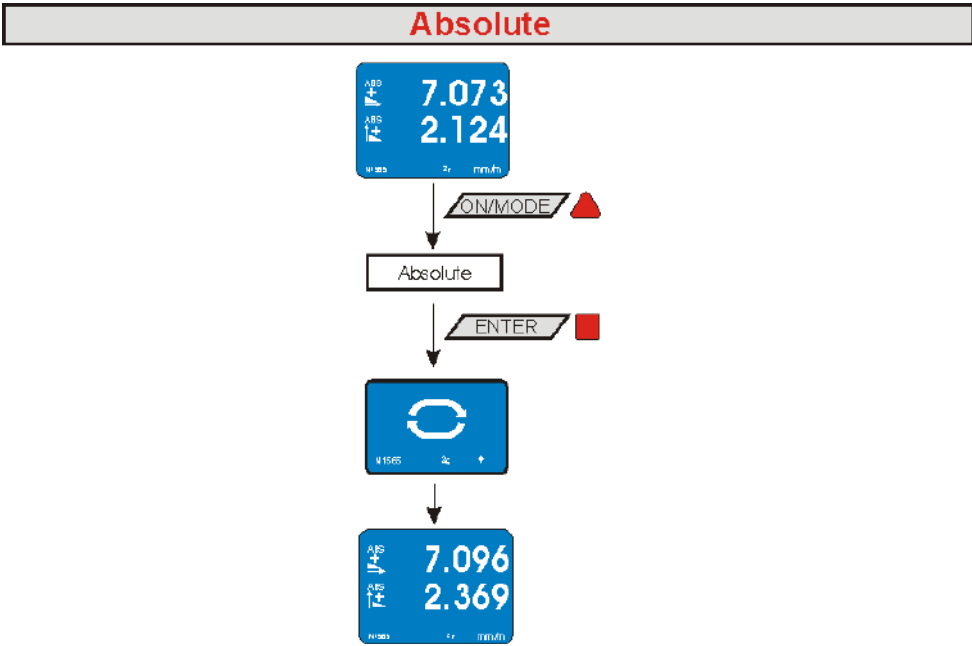
### A3 KEY HOLD, FREEZING OF A MEASURING VALUE / **HOLD**

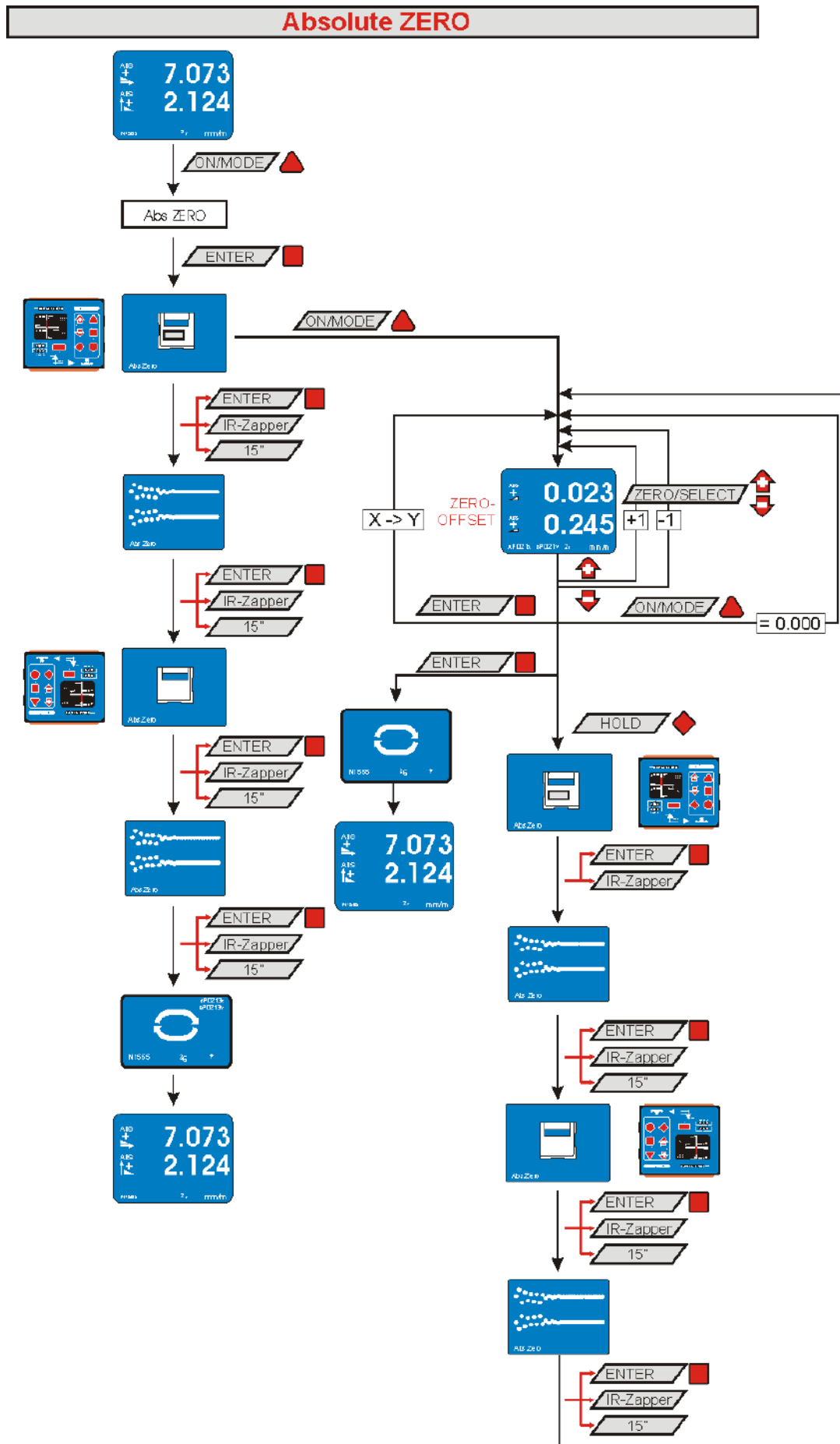


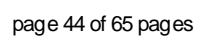


## A5 ADJUSTMENT OF THE DISPLAY / **DISPLAY**



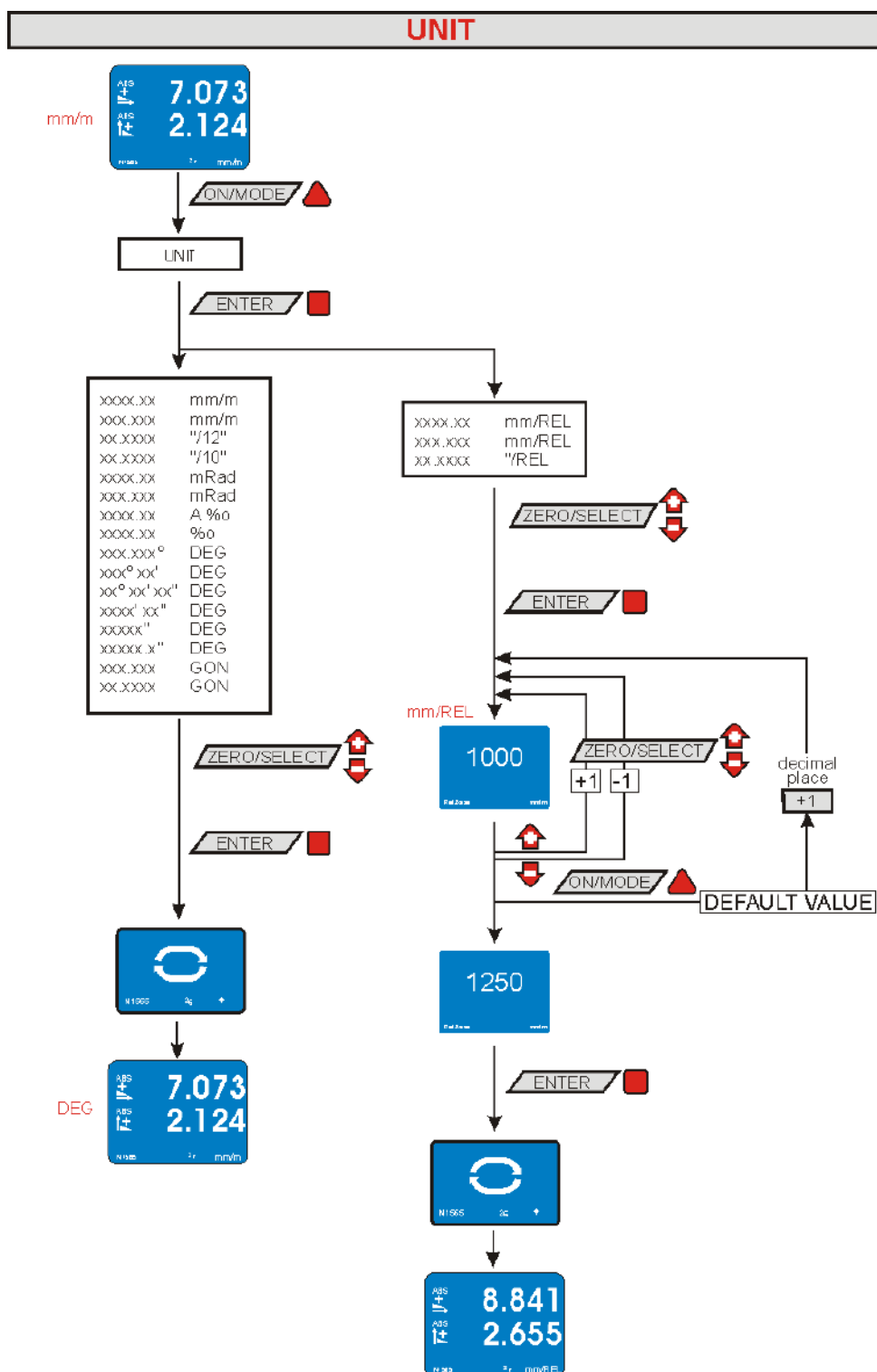


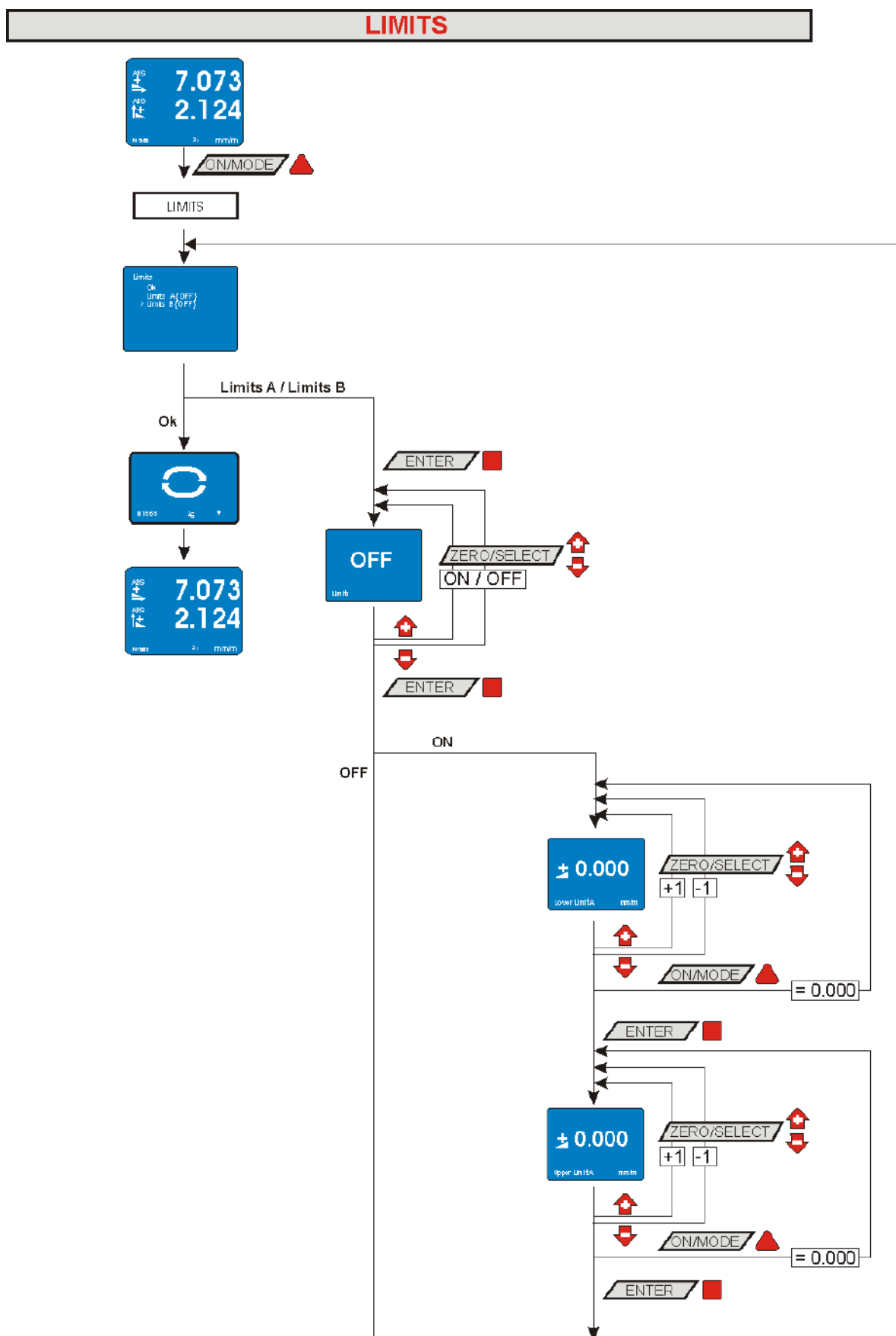


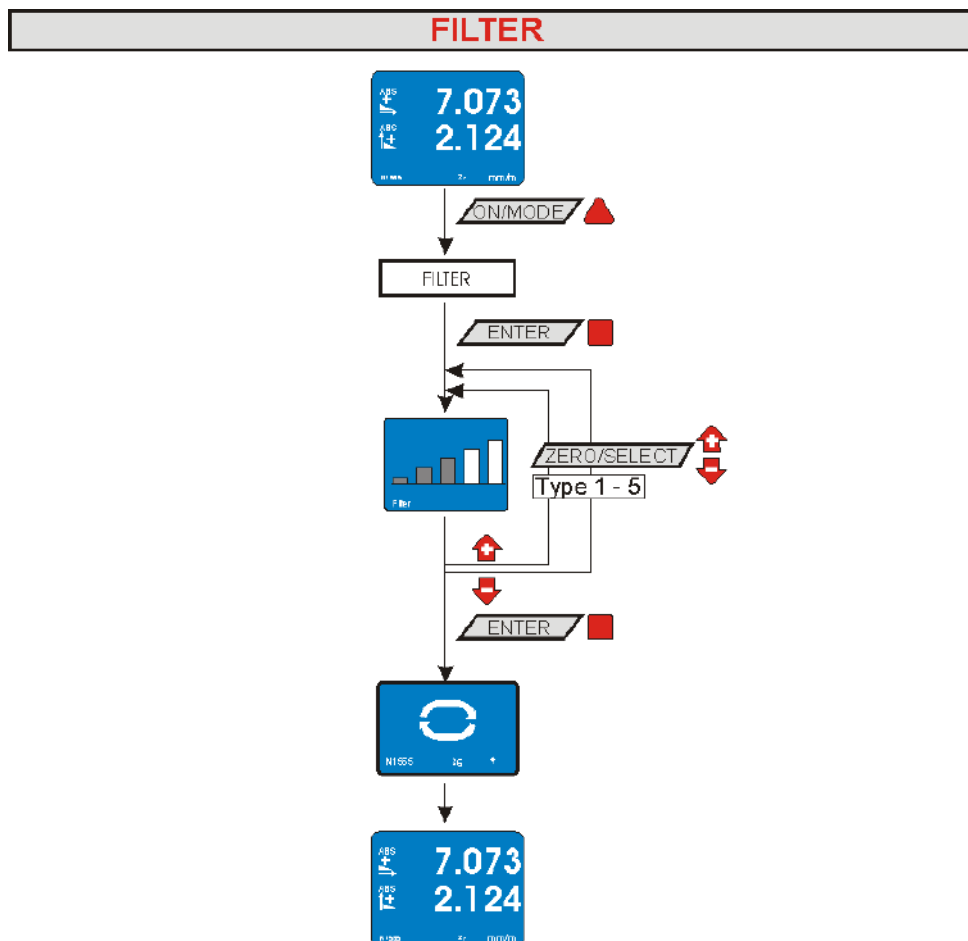


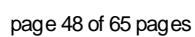


## A9 ADJUSTMENT OF THE MEASURING UNIT / UNIT

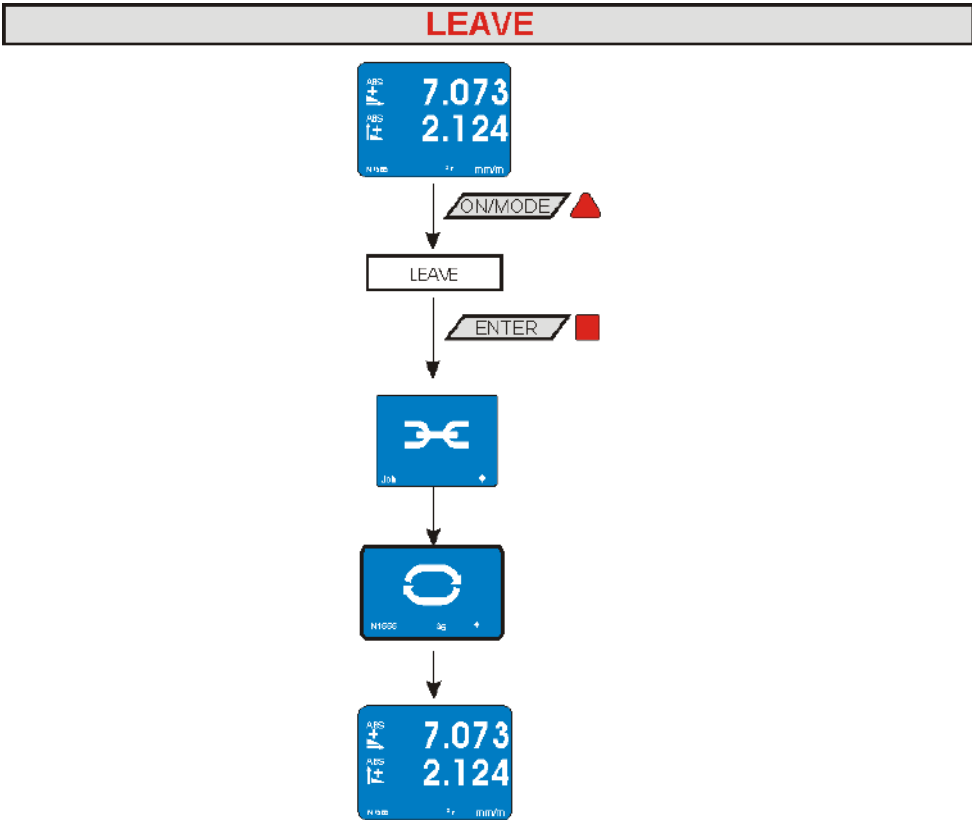








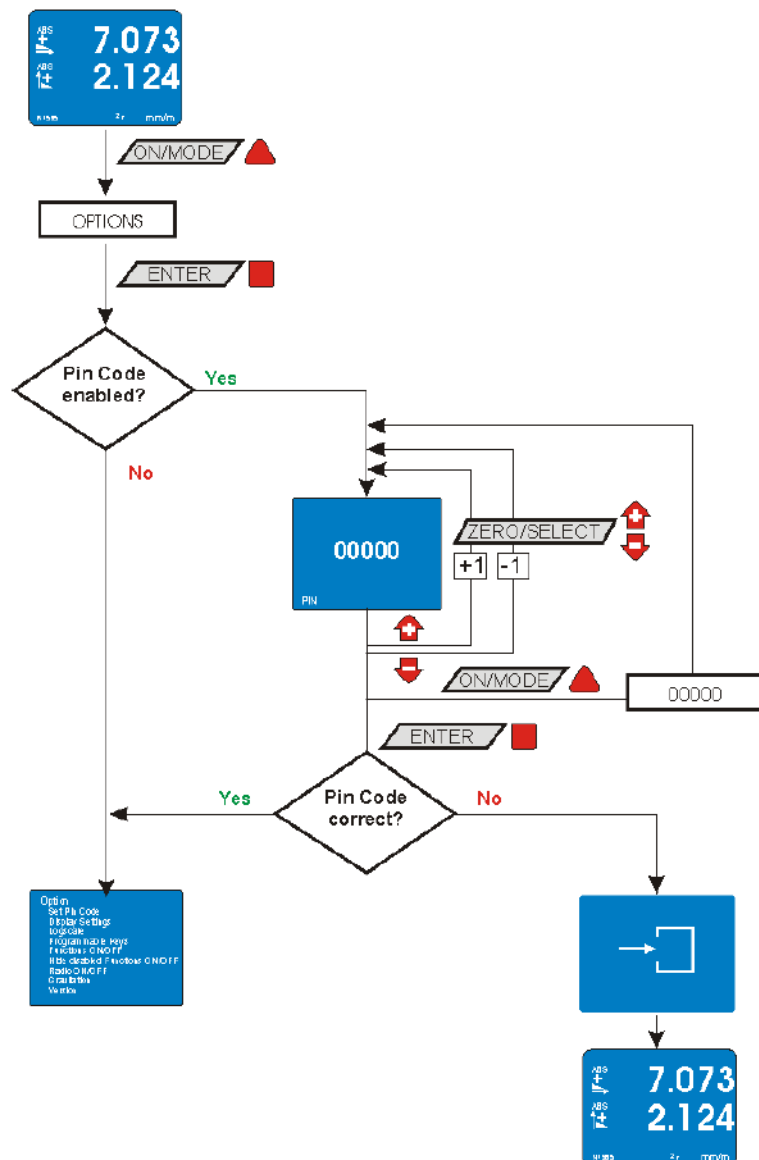
A13 LEAVING A GROUP OF INSTRUMENTS / **LEAVE**



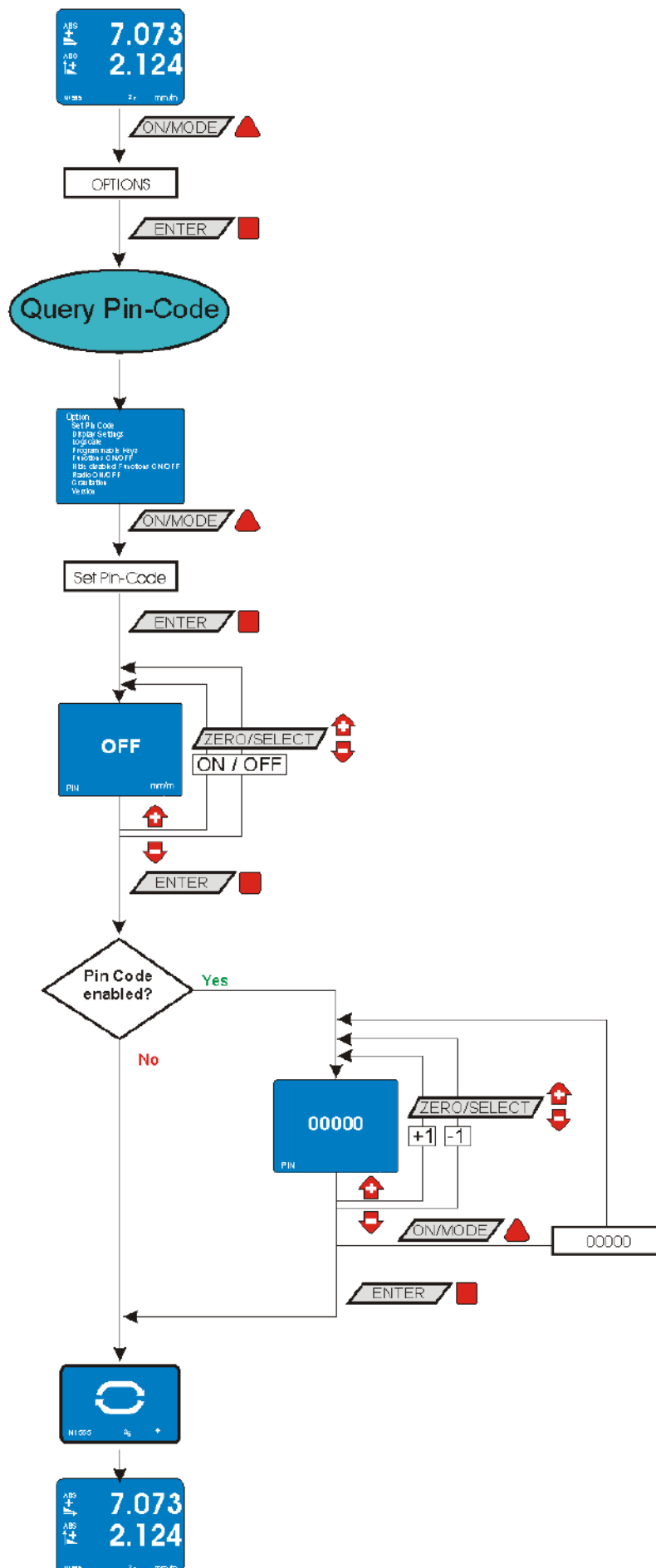
## B FLOAT CHARTS OPTIONS

### B1 PIN-CODE-QUERY FOR ACCESS TO THE OPTIONS

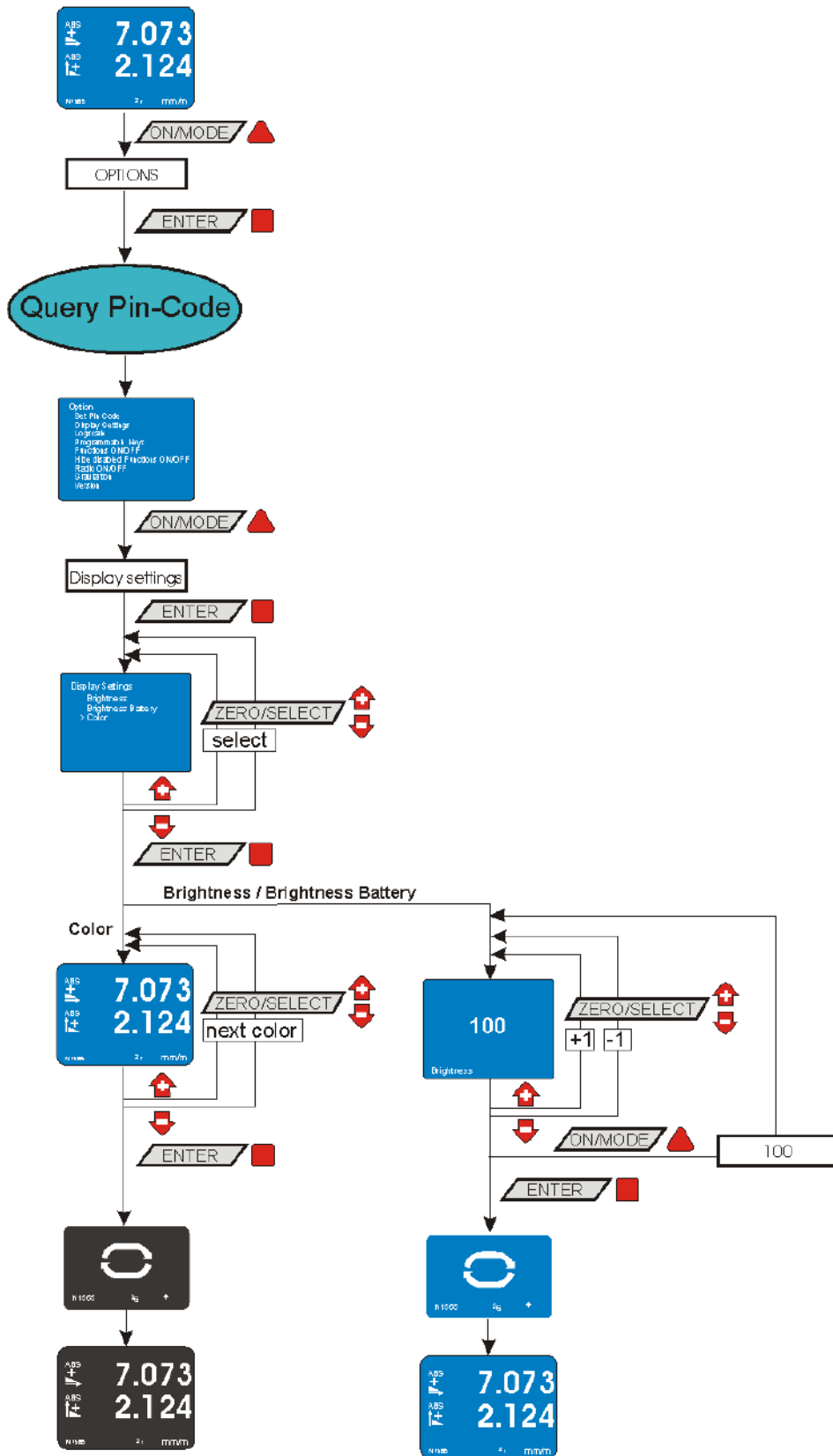
#### OPTIONS / PIN-Code query



OPTIONS / Set Pin-Code

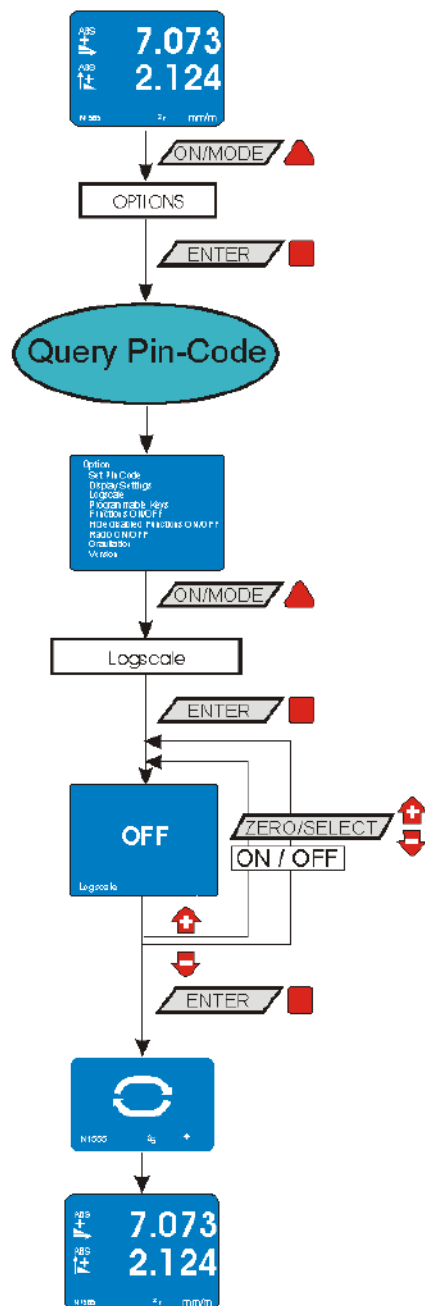


## OPTIONS / Display Settings

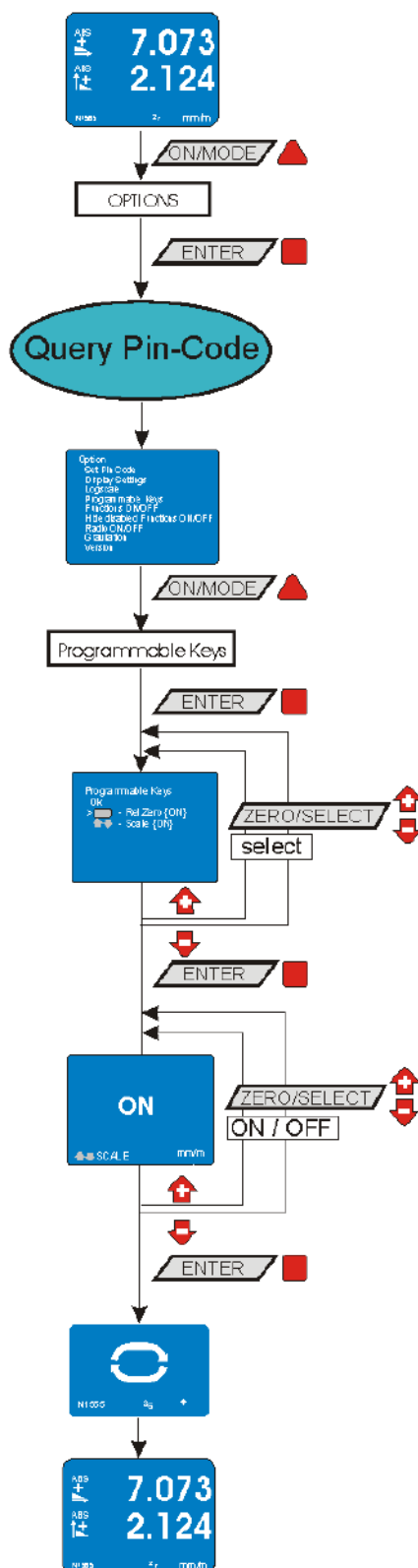




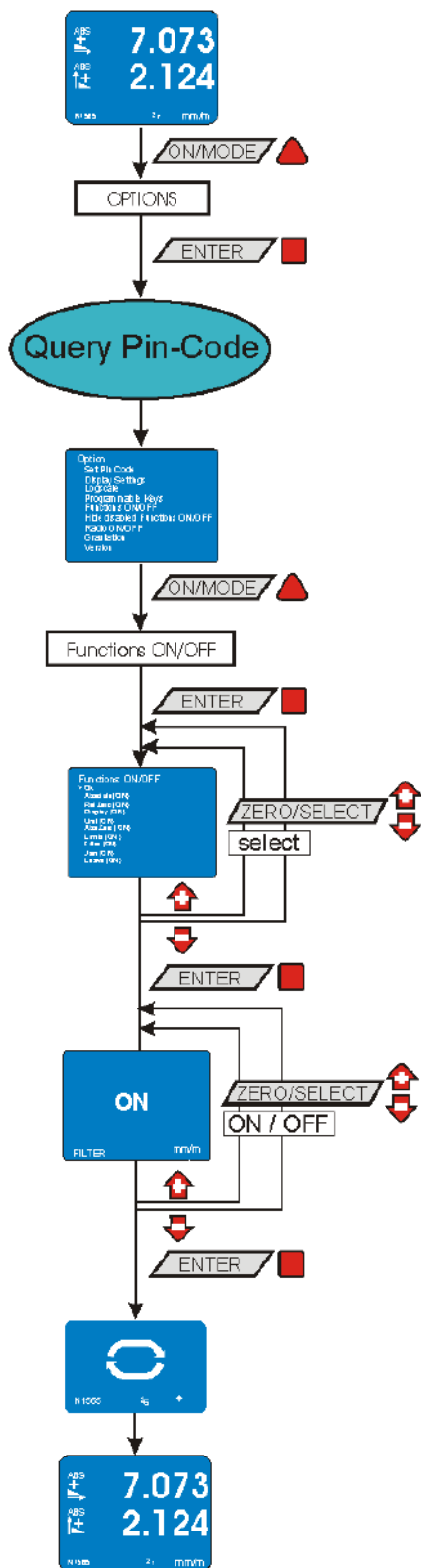
**OPTIONS / Logscale**



OPTIONS / Programmable Keys

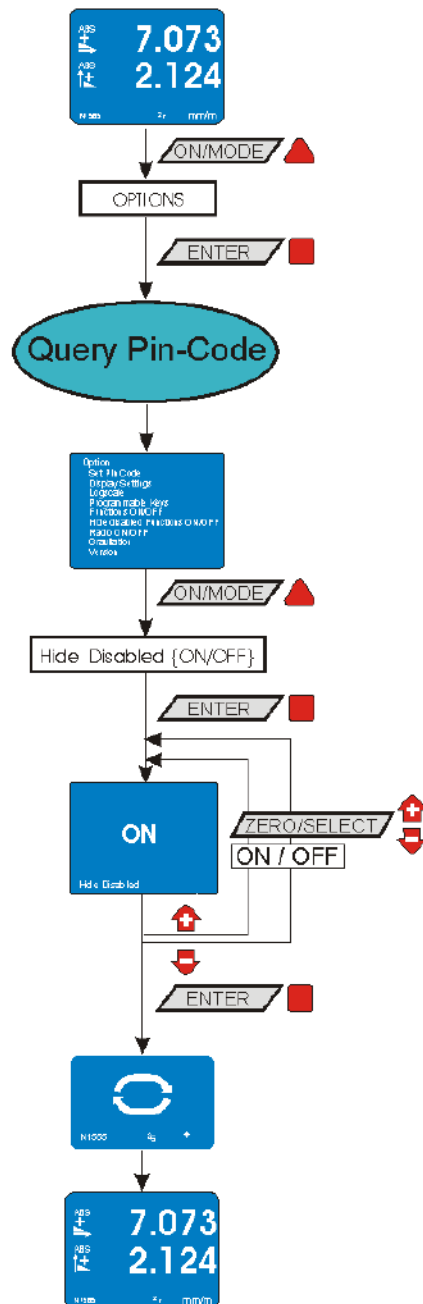


## OPTIONS / Functions ON/OFF

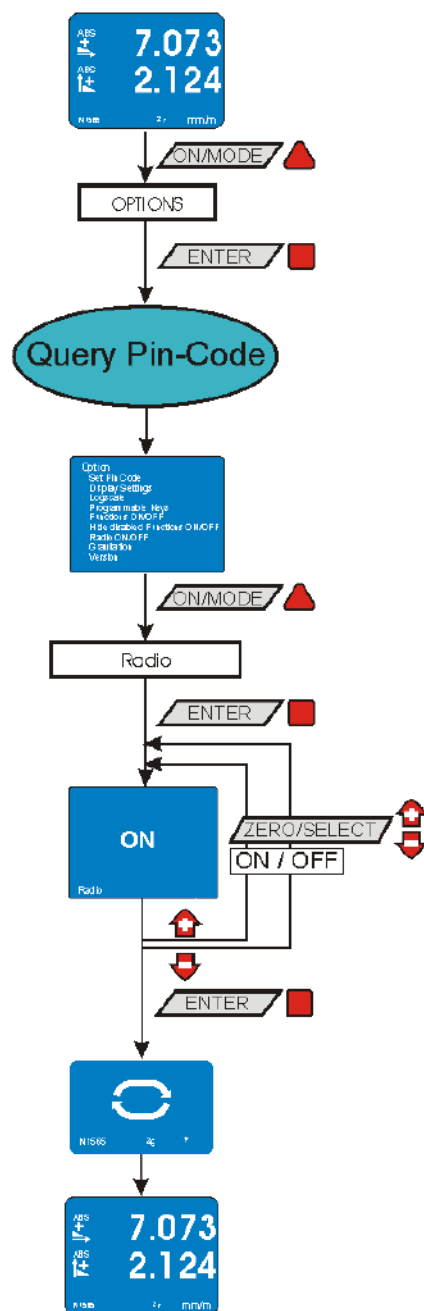


**B7 SWITCHING THE HIDING OF DISABLED FUNCTIONS ON OR OFF /**  
**HIDE DISABLED FUNCTIONS ON/OFF**

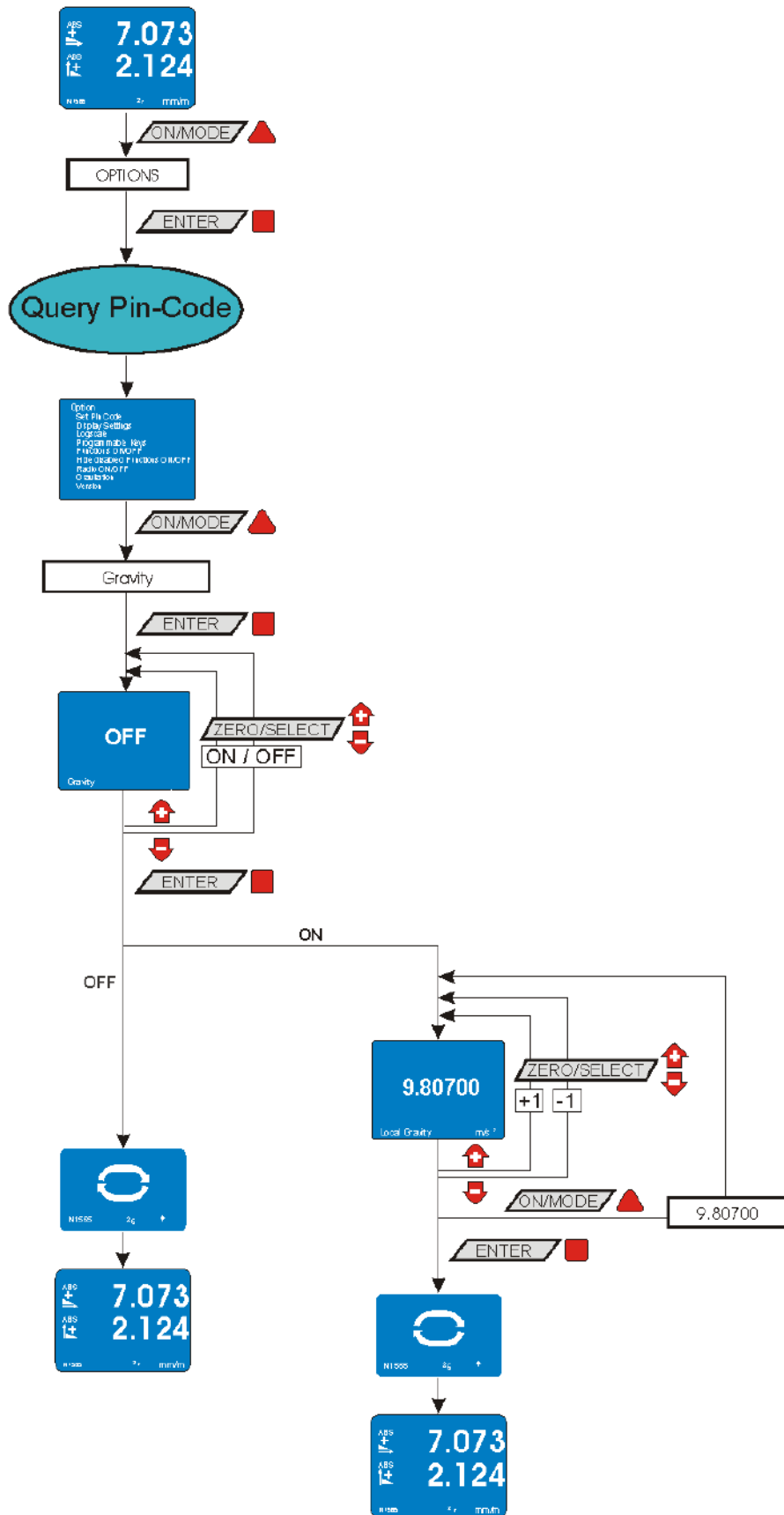
**OPTIONS / Hide disabled Functions**



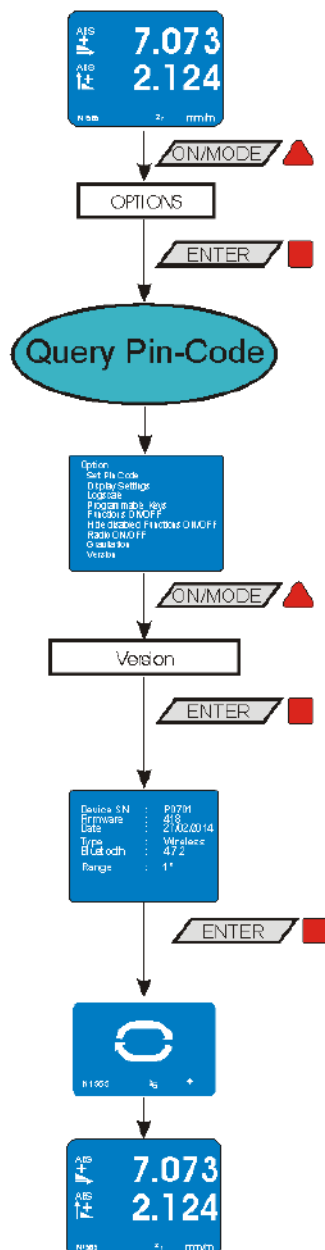
**OPTIONS / Radio ON/OFF**

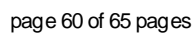


## OPTIONS / Local Gravitation



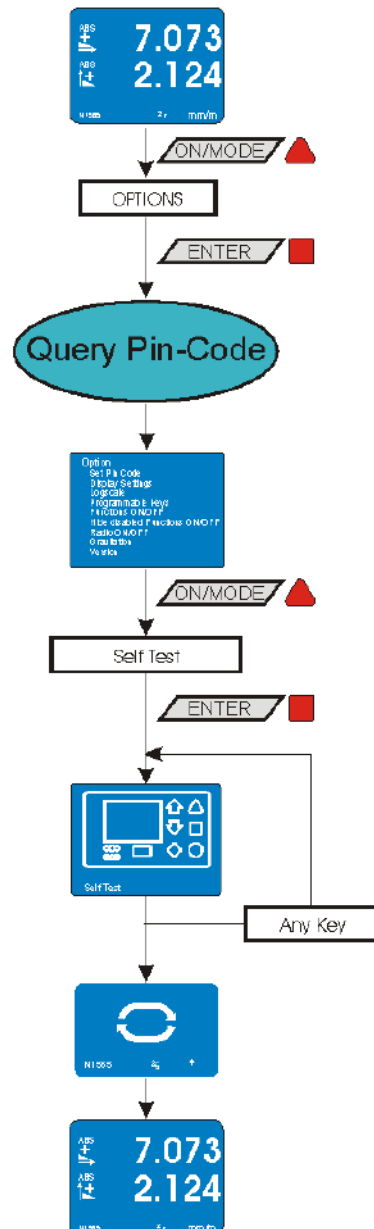
**OPTIONS / Version FIRMWARE**







## OPTIONS / Self Test



## C Error Messages

After the start of the instrument the BlueLEVEL-2D performs a function check. If any defects are detected **the instrument must be returned to the distribution partner**. A proper functioning can not be guaranteed. The following error messages may appear:

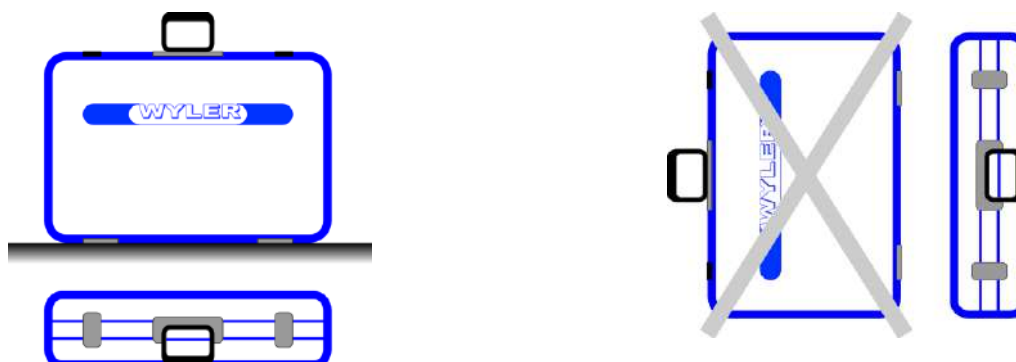
Display is blinking grey mottled.	Programme memory is defective
Display blinks two times grey mottled	Display error
<b>ERROR 1</b>	General instrument defect
<b>ERROR 2</b>	No calibration data available
<b>ERROR 3</b>	Sensor not found
<b>ERROR 4</b>	Bluetooth not found
<b>ERROR 5</b>	Defective Flash memory
<b>ERROR 6</b>	Defective EEPROM

## D MAINTENANCE

### D.1 GENERAL

The BlueLEVEL-2D needs no special service other than the regular cleaning.

### D.2 STORAGE/ CARE AND HANDLING OF THE BATTERIES



For storage periods the measuring instrument should be placed in a position in which the instrument is also used when measuring (upright position).

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

Operating temperature (min/max): 0°C ... +40°C  
relative humidity: max. 85%

### D.3 SPARE PARTS / ACCESSORIES

The following spare parts are available:

- Batteries, NC-accumulators
- various cables
- Infra-red Zapper

## E 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/>

## F SERVICE AND REPAIR

### F1 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.

## F2 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.**





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