

WYLER

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

MANUAL

LEVELMETER2000

THE CONVENIENT INSTRUMENT
TO
ZEROTRONIC-SENSORS
AND
MINILEVEL / LEVELTRONIC NT



Content

1.	INTRODUCTION	5
1.1.	Principal description of the LEVELMETER 2000	5
1.2.	Starting	5
1.3.	Possible configurations (instruments and sensors connections)	6
2.	STARTING/ELEMENTS OF PANEL	7
2.1.	Short description of panel functions	7
2.2.	Panel/Functions	9
3.	HOW TO USE THE LEVELMETER 2000	12
3.0.	Functions of Levelmeter 2000 used with ZEROTRONIC sensors, MINILEVEL and LEVELTRONIC NT with/without radio transmission	12
3.1.	Checking the functions	13
3.2.	ZERO-Setting / ZERO absolute and ZERO virtual	14
3.3.	Selection of the measuring unit	18
3.4.	HOLD-Function	19
3.5.	Function SEND (Print-Function)	20
3.6.	Terminating a measurement or a set up	23
3.7.	Selecting a sensor or an instrument	23
3.8.	Selecting correct filter type for various applications	23
3.9.	Absolute measurement/Relative measurement	24
3.10.	Measuring by setting LIMITS	26
4.	TECHNICAL DATA	27
4.1.	Power supply	27
4.2.	Power consumption	27
4.3.	Battery lifetime	27
4.4.	Measuring range	27
4.5.	Resolution	27
4.6.	Various	27
4.7.	PIN definition / Connector	28
5.	ERROR MESSAGES	28
6.	SERVICE	28
6.1.	General	28
6.2.	Storage / Care and handling of the batteries	28
6.3.	Spare parts	29
6.4.	Changing of sensor address	29
6.5.	Calibrating of ZEROTRONIC sensors	30
7.	REPAIR OF MEASURING INSTRUMENTS	31

Modifications / Änderungen:

Date	Modified by	Description of modifications
2.5.2000	HEH	2.2.1 / automatic shut off is disabled
27.3.2001	HEH	Data collection using ENTER key
29.4.2002	HEH	Start up time ZEROTRONIC
10.1.2003	HEH/MO	Index included
2.4.2003	HEH	New:Express Repair Service
25.4.2003	HEH	Modification: Function - 2 -/ mode „A B“
27.1.2011	HEH/MUE	Quick-Calibration has removed to a separate manual

INDEX

Key word	Chapter	Page
A		
Absolute measurement	3.9.1	24
Absolute measurement/Relative measurement	3.9	24
Address sensor	2.1.1	7
Angular position and direction of connector	2.1.2.2	8
B		
Battery / Care and handling of the batteries	6.2	28
Battery display "BATT"	2.2.2	11
Battery lifetime	4.3	26
Battery powered	4.1	27
Battery-Display	2.1.1	7
C		
Calibrating of ZEROTRONIC sensors	6.5	30
Changing of sensor address	6.4	29
Checking the functions	3.1	13
CLINOTRONIC PLUS	1.3	6
Configurations(instruments and sensors)	1.3	6
Connections with sensors and instruments	1.3	6
Correct horizontal position	2.1.2.1	8
D		
Data format OUT-Port	3.5	20
Default values, basic standards	3.1	13
Description of panel functions	2.1	7
Description of the CLINO 2000	1.1	5
Description of the panel	2.2.2	11
Direction of the inclination	2.2.2	11
Disabling the automatic shut-off of the LEVELMETER 2000	2.1.2.2	8
Display and panel	2.1.1	7
E		
ENTER key	2.1.1	7
ENTER key	2.2.1	9
Error messages	3.1	13
Error messages	5	28
Express Repair Service, ERS	7	31
External power supply	4.1	27
F		
Filter	3.8	23
Format of transmission	3.5	20
Functions of Levelmeter 2000 used with ZEROTRONIC sensors,	3.0	12
H		
HOLD key	2.1.1	7
HOLD key	2.2.1	10
HOLD-Function	3.4	19
How to use the LEVELMETER "==="	3	13
I		
Introduction	1.	5
K		
Key functions, description	2.2.1	9
L		
LEVELTRONIC NT	1.3	6
LIMITS	3.10	26
M		
Main display	2.1.1	7
Measurement with relative base length	3.3	18
Measurements with ZEROTRONIC sensors	2.1.2.2	8
Measuring by setting LIMITS	3.10	26

Measuring range	4.4	27
Measuring unit	2.1.1	7
Measuring units	2.2.2	11
Measuring units	3.3	18
MINILEVEL NT	1.3	6
Mounting of the sensors / codes	2.1.2	8
O		
ON/MODE key	2.1.1	7
ON/MODE key	2.2.1	9
P		
Panel and display	2.1.1	7
Panel/Functions	2.2	9
PIN definition / Connector	4.7	28
Port for power supply	2.1.1	7
Port for RS232 or for power supply	2.1.1	7
Ports for sensors/instruments	2.1.1	7
Possible configurations	1.3	6
Power consumption	4.2	27
Power supply	4.1	27
R		
Relative measurement	3.9.2	24
Repair of Measuring Instruments	7	31
RESET	3.1	13
Resolution	4.5	27
S		
Selecting correct filter type for various applications (to be used only with ZEROTRONIC sensors)	3.8	23
Selection of measuring units	3.3	18
Selection pointer	2.2.2	11
Selection pointer / Mode	2.1.1	7
SEND Function (Print-Function)	3.5	20
SEND/ESC key	2.1.1	7
SEND/ESC key	2.2.1	9
Sensor address	2.2.2	11
Sensor/port A-B	2.2.2	11
Service	6	28
Short description of panel functions	2.1	7
Spare parts	6.3	29
Starting	1.2	5
Starting/Elements of panel	2	7
T		
Technical data	4	27
Terminating a measurement or a set up	3.6	23
V		
Virtual ZERO	3.2.2	15
Virtual ZERO, automatic set-up	3.2.2	16
Virtual ZERO, manual set-up	3.2.2	15
Z		
ZERO absolute (with reversal measurement)	3.2.1	14
ZERO/SELECT key	2.1.1	7
ZERO/SELECT key	2.2.1	10
ZERO-Setting / ZERO absolute and ZERO virtual	3.2	14
ZEROTRONIC sensors	1.3	6

1. INTRODUCTION

1.1. Principal description of the LEVELMETER 2000

The LEVELMETER 2000 was designed by WYLER AG, Switzerland as an intelligent display and measuring unit in connection with the digitized sensor family ZEROTRONIC. It is also used as a display device for the electronic inclinometers MINILEVEL and LEVELTRONIC "NT". Besides the excellent measuring performance the specialty of the ZEROTRONIC as well as the "NT" family instruments is the use of the digital technology. This allows transmitting the measuring signals over long distances without any loss of accuracy.

With the LEVELMETER 2000 all the sensors and instruments of the ZEROTRONIC and the "NT" family instruments may be used. (See point 1.3. Possible configurations (instruments and sensors connections))

The LEVELMETER 2000 is a

- Display unit
- Interface between Measuring instrument and PC
- Control unit for calibrating (ZEROTRONIC sensors only) and identifying/addressing the connected sensors and instruments

On the LEVELMETER 2000 the following parameters may be set or changed:

- Measuring unit
- Sensor address/port
- Type of damping filter
- Base length relative and many more

The LEVELMETER 2000 is fully interchangeable with the other ZEROTRONIC components. This means that the LEVELMETER can be exchanged if necessary by any other family type instrument. All the relevant data, such as

- Calibration data
- Sensor address
- ZERO point etc.

are stored at the respective sensor heads. Through the RS 232 port the measuring data may be transmitted to a PC/Laptop or to an other outlet as well as to the Measuring software LEVELSOFT of WYLER's.

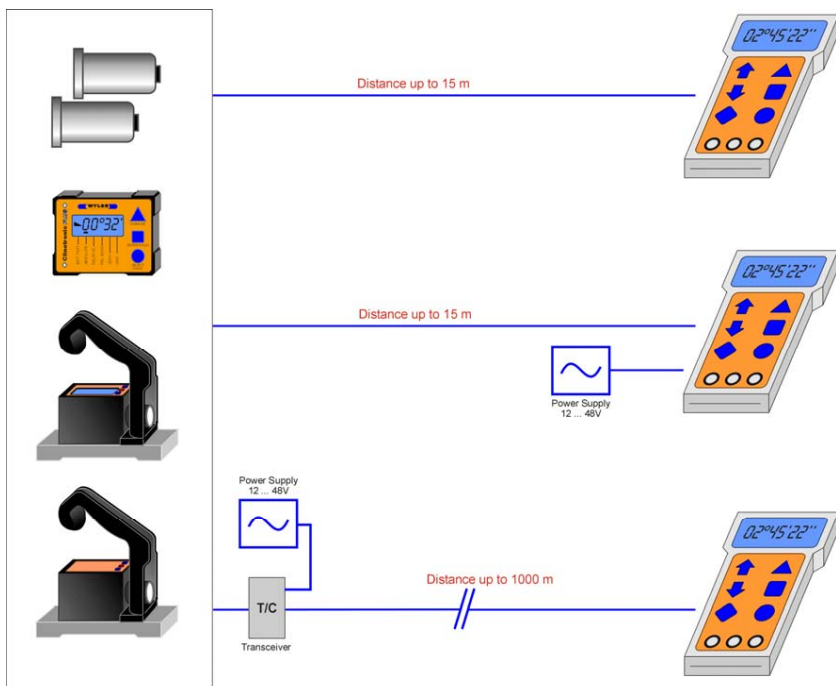
The measuring principle of the ZEROTRONIC family is based on a changing of the capacity of a condenser built of two electrodes and a pendulum in form of a shield installed in between. The measured change of capacity is directly influenced by the change of the inclination of the pendulum. This capacity change is the primarily used signal for the angle to be measured. The measuring system is designed to be completely antimagnetic. The basic signal received in the LEVELMETER 2000 will be computed into an angle by comparing the signal with a reference curve stored and then displayed in the required unit.

1.2. Starting

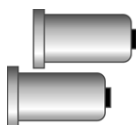
Before working with the LEVELMETER 2000 it is strongly recommended to carefully read this manual first.

This will avoid malfunctioning by making unsuitable manipulations like e.g. deleting the calibration date in the sensor heads etc.

1.3. Possible configurations (instruments and sensors connections)



Possible connections of sensors and instruments:



ZEROTRONIC sensors



Inclination measuring instrument + CLINOTRONIC PLUS +



Inclination measuring instrument MINILEVEL NT



Inclination measuring instrument LEVELTRONIC NT

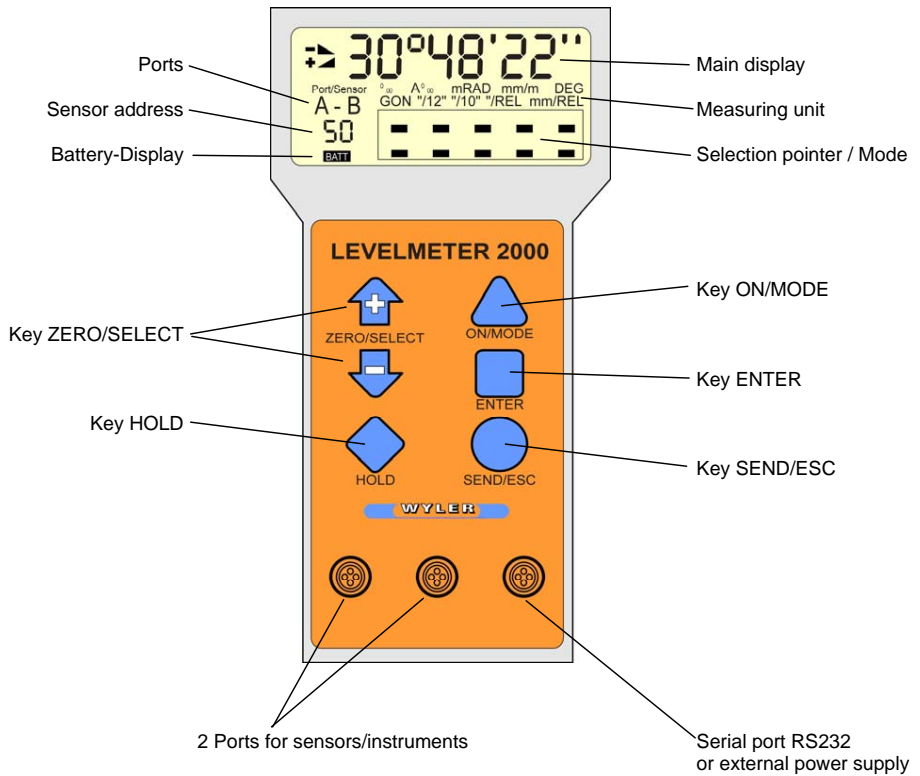
All the displayed configurations are possible. For individual specifications see the respective data sheets. On both of the ports (A & B) up to 31 sensors/instruments may be connected.

This manual covers mainly the combination of the LEVELMETER 2000 with ZEROTRONIC sensors. For other possible combinations such as together with the instruments MINILEVEL and LEVELTRONIC NT please refer to the respective manuals.

2. STARTING/ELEMENTS OF PANEL

2.1. Short description of panel functions

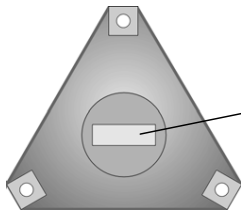
2.1.1. Panel and display



2.1.2. Mounting of the sensors / codes

The following points must be observed:

2.1.2.1. Correct horizontal position



Sensor-Type

Codes:

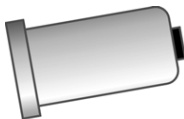
XA-XXX	Sensor type	1 Arcdeg.
XB-XXX	Sensor type	5 Arcdeg.
XC-XXX	Sensor type	10 Arcdeg.
XD-XXX	Sensor type	30 Arcdeg.
XE-XXX	Sensor type	60 Arcdeg.

The sensors are to be mounted so that the reading at the flange horizontally correct. The meaning of the coding is the following.

The sensor measuring range is marked with the letters A to E. The other numbers are part of the identification code

2.1.2.2. Angular position

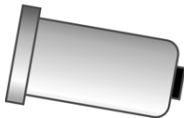
The positive or negative inclination is according to the following definition (Looking at the sensor with the cable connector to the right):



Inclination: positive



Inclination: horizontal (0 Degree)



Inclination: negative

ATTENTION / IMPORTANT for measurements with ZEROTRONIC sensors

For precise measurements it is important that the sensors have been in operation for **at least 15 minutes** (start up time) before the first measurement with a LEVELMETER 2000.

After putting it in function the sensor is slightly heated up by some of the built-in electronic components. After the start-up time mentioned above the system is stabilised and ready for measurements.








Disabling the automatic shut-off of the LEVELMETER 2000




When pressing the **▲ ON/MODE** key for more than 3 seconds the display starts flashing and the automatic shut off is disabled. In the standard mode the instrument shut off after about 10 minutes.



Exception: In case the LEVELMETER 2000 is powered by a connection to a mains adapter, the instrument is never shutting off automatically.

2.2. Panel/Functions

2.2.1. Description of the key functions

	ON/MODE - Key
Function - 1 -	<p>Pressing the  ON/MODE key starts the LEVELMETER 2000. When keeping the key pressed all the LCD elements are lighted. After releasing the key the instrument switches to the measuring mode if a sensor is connected and the calibration data of this sensor has been collected. After a short period of time the actual angle will be displayed in the last used measuring unit. In case of trouble an error message will be displayed. (See point 5)</p> <p>Disabling the automatic shut-off of the LEVELMETER 2000</p> <p>When pressing the  ON/MODE key for more than 3 seconds the display starts flashing and the automatic shut off is disabled. In the standard mode the instrument shut off after about 10 minutes.</p> <p>Exception: In case the LEVELMETER 2000 is powered by a connection to a mains adapter, the instrument is never shutting off automatically.</p>
Function - 2 -	<p>The  ON/MODE is also used for moving the selection pointer on the lower display area. By pressing this key the selection pointer moves from one position to the next.</p>
Function - 3 -	<p>For shutting off the LEVELMETER 2000; the  ON/MODE key needs to be pressed for a few seconds until the displayed figures disappear. If the key is pressed min. 15 seconds a date and a 4 digit number appears. This is the status of the software release of the Levelmeter.</p>
Function - 4 -	<p>Used for „ZERO-Setting“ of saved (memory) values in the functions „REL ZERO“ and „ZERO“ To set the memory in these two functions to ZERO press the  ON/MODE key, the displayed values will become ZERO. This has to be confirmed by pressing  ENTER</p>

	ENTER – Key
	<p>The key  ENTER is used to save an entered value or to accept a selected function.</p> <p>When using the Software LEVELSOFT the key  <ENTER> has the identical function as the push button of the connecting cable (Dongle cable) or the push button of the infrared sender unit for data collection.</p>

	SEND/ESC- Key
Function - 1 -	<p>The key  SEND is used for the transmission of a measuring value through the RS232 port or to send the value to a printer or another connected system. Through the same port the values may also be transmitted to a PC or Laptop for further treatment of the data.</p>
Function - 2 -	<p>Also used for canceling any „HOLD“ function and return to the measuring mode.</p>
Function - 3 -	<p>Canceling any task not yet finished.</p>



ZERO/SELECT "+/-" - Key

Function - 1 -

The key **ZERO/SELECT "+/-"** can be used to change a number of possible parameters like e.g.

- Measuring units
- Measuring units, respectively ports („A“ / „B“ / „A+B“ / „A B“)
- Changing of the measuring range
- Changing of the instruments address
- Set up the relative base length
- Set up of the „Zero-Offset“
- Set up of the „REL Zero-Offset“ etc.

Function - 2 -

In the mode „A B“ the measured value of the instruments connected on Port “A” and Port “B” are displayed alternatively. The changing speed is depending on the Baud rate of the connected instrument.

(MINILEVEL / LEVELTRONIC change time is approx 8 seconds, ZEROTRONIC sensors change time is approx 4-5 seconds)

The alternating display can be stopped and the instrument's value connected to port “B” is constantly seen when the key **ZERO/SELECT "+"** is pressed.

- to change to the value of the instrument connected to port “A” the key **ZERO/SELECT "-"** must be applied.
- By pressing both keys **ZERO/SELECT "+/-"** simultaneously for approx 5 seconds the alternating display mode is activated again.



HOLD - Key



Function - 1 -

With the **HOLD** key a measured value may „frozen“. This value will be displayed until by pressing the key **SEND** the LEVELMETER 2000 will return to the measuring mode.

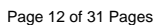
Function - 2 -

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

2.2.2. Description of the panel

Main display	The actual measuring values of an active sensor/instrument are displayed. By using the mode SENSOR the other connected sensors/instruments may be chosen for display.	
Indicator of inclination direction	<p>The pictograph indicates the direction of the inclination</p> <div>  declining to the right (negative angle) </div> <div>  inclining to the right (positive angle) </div>	
Selection pointer	<p>With the selection pointer the intended function can be chosen:</p> <div> SENSOR Select the active sensor/port </div> <div> ABSOLUTE Absolute measuring mode </div> <div> REL ZERO Relative measuring mode </div> <div> UNIT Selection of measuring units </div> <div> ZERO Set absolute zero </div> <div> LIMITS Output of control signals </div> <div> FILTER Adjustment of filter type (ZEROTRONIC only) </div> <div> ADDRESS Display and changing of sensor addresses </div> <div> CALIB Calibration of sensors </div> <div> ONLINE Display of active communication through port </div>	
Battery display "BATT"	When the battery power is low, the sign "BATT" is flashing During the process of charging, the sign "BATT" is constantly on	
Measuring units	The actual measuring unit is displayed. 10 basic units are available and most of them can in addition be changed into subunits.	
Sensor/port A-B	Function - 1 -	The connection/port is displayed for information concerning: - the displayed measuring value - active sensor/instrument for calibration purposes
	Function - 2 -	Shows the measuring mode e.g. individual measuring or differential measuring (A-B)
Sensor address	The active sensor address is displayed	

3.0. Functions of Levelmeter 2000 used with ZEROTRONIC sensors, MINILEVEL and LEVELTRONIC NT with/without radio transmission



3.1. Checking the functions

After connecting a sensor or another measuring instrument according to the point **1.3. Possible configurations** to the LEVELMETER 2000 the key **▲ ON/MODE** can be pressed. As long as this key is pressed all elements of the LCD display will show up. After releasing the key the mode is switched to the measuring mode. The active signal is displayed in the last used measuring unit, e.g. XXX° XX'. This will be the case when the calibration data of the connected sensor have been red before. (During the reading of the calibration data six small „o“ will be displayed)

The following display variations are correct:

➔ 20.834	-20,834 degrees
➔ 4°40'23"	+4°40'23"
➔ OVER	OVER (Over Range)
oooooo	Levelmeter busy

When now the connected instrument or sensor is tilted, the displayed value must change accordingly. If no sensor is connected, the displayed sign "**SENSOR**" is flashing and the message "**ERROR 2**" is displayed.

The following **error messages** are possible:

ERROR 0	Instrument is defect, to be sent to the service center
ERROR 1	Previously defined measurement configuration not correct anymore. Possible cause: Sensors not connected anymore, other sensors connected or communication disrupted.
ERROR 2	No measurement has been done so far with the connected sensor. The sensor must be addressed correctly (See point 3.7. Selecting a sensor or an instrument)
ERROR 3	Calibration data not available. The display shows the malfunctioning item (port and address)

For other error messages see point 5.

To reinstall the basic set up a **RESET** may be done at any time. The procedure is as follows:

Both keys **▲ ON/MODE** and **■ ENTER** must be pressed **simultaneously** for at least one second. All the manually installed data is lost and the LEVELMETER 2000 will be set to the following **basic standards**:

Basic standards (Default values):

Measuring mode:	absolute
Measuring unit:	the next possible and useful unit
Relative Base:	1000 mm
ZERO-OFFSET absolute:	remains intact
Sensor:	PORT A, no Sensor (ERROR 2)
Filter	No 5

Immediately after **RESET** the error message 2 is displayed. This means the connected sensor must be addressed correctly from new. (See point 3.7. Selecting a sensor or an instrument)

3.2. ZERO-Setting / ZERO absolute and ZERO virtual

Remarks:

Using ZERO SETTING two different tasks can be realized:

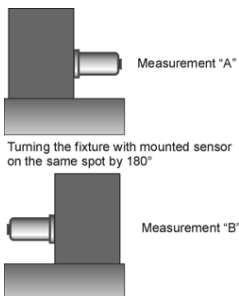
- a) **ZERO ABSOLUTE** / The instrument shows "0" when the angle of the mounting surface is exactly positioned in the direction of the center of the earth.
- b) **ZERO VIRTUAL** / The instrument shows "0" at any predefined angle.

3.2.1. ZERO absolute (with reversal measurement)

The ZERO absolute is the basis for all the inclination measurements in the absolute mode. For such a measurement if high precision is required, it is of utmost importance that the object to be measured and the respective sensor are both at the same temperature level. The LEVELMETER 2000 should have been turned on a few minutes before the measurement procedure. For this procedure a suitable surface must be chosen (rigid, flat and as horizontal as possible). On this surface the inclination sensor must be placed; the exact position of the sensor is to be marked on the surface.

Remarks:

Defining the absolute ZERO by means of reversal measurement the sensor must be properly mounted on a suitable base.



The ZERO absolute will automatically be set by applying the **reversal measurement**. (Taking two measurements on the same spot but in the 180° opposite direction) For this procedure a suitable surface must be chosen (rigid, flat and as horizontal as possible). On this surface the inclination sensor must be placed, the exact position of the sensor is to be marked on the surface.

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

The „ZERO-OFFSET“ is stored in the sensor head.

EXAMPLE:

The selection pointer of the LEVELMETER 2000 must now be placed below the marking **ZERO** by pressing the **▲ ON/MODE** key several times. If the required position is reached, it must be confirmed by pressing **■ ENTER**. On the display the last set „Zero-Offset“ (Basic offset) will be displayed. The direction indicator (+/-) is flashing.



The sensor must now sit at position one and after a few seconds settling time allowed, by pressing the key **◆ HOLD**, the first reading is collected. This first value is displayed and the selection pointer below **ZERO** is flashing which means the second reading is expected.



The sensor must now be rotated horizontally by 180° and placed exactly on the same spot. After a few seconds settling time the key **◆ HOLD** must be pressed again for collecting the second reading.

The computed „Zero-Offset“ (Basic offset) is now displayed on the LEVELMETER 2000.

(The displayed „Zero-Offset“ is calculated by adding the two readings and dividing the result by two.)



If this „Zero-Offset“ (Basic offset) must now be saved, the key **ENTER** must be pressed. Immediately after this, the selection pointer jumps to the measuring mode **absolute** and the measuring result under consideration of the „Zero-Offset“ (Basic offset) will be displayed.



The „Zero-Offset“ (Basic offset) computed by applying the reversal method is the deviation of the sensor's ZERO to the absolute ZERO. The display on the LEVELMETER 2000 therefore is the :

Displayed value =

Value of the sensor minus „Zero-Offset“.

The reversal measurement to establish the exact „Zero-Offset“ (Basic offset) should be done periodically if high quality measurements are required. Especially after longer intervals the method is useful.

3.2.2. ZERO virtual

1) Manual set-up of the virtual ZERO

One possibility of using ZERO virtual means to establish an artificial plane, respectively angle, to be chosen as absolute zero.

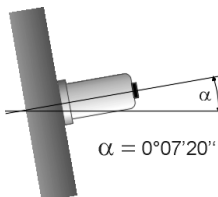
Another possibility is to change the existing „Zero-Offset“ (Basic offset) of a sensor e.g. established by means of using the reversal method.

Only well skilled and trained user should make use of this feature!!!

Example:

Initial position:

The display shows the measured value on the Levelmeter 2000 : +0°07'20". This value is the true inclination of the sensor.



Only one sensor at a time can be set to ZERO virtual. This sensor must be selected first.

The selection pointer must be moved below the marking **ZERO** in the display of the LEVELMETER 2000 by pressing the key **ON/MODE** several times. If reached the selection must be confirmed by pressing **ENTER**.

The last computed or manually entered value „Zero-Offset“ (Basic offset) is displayed. In our example 00° 00' 00"

The direction indicator is flashing



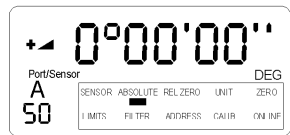
This displayed value may now be changed **manually** by applying the keys **↑↓ZERO/SELECT „+/-“** to the desired value.
e.g. from +0° 00' 00" to new +0°07'20"

The direction indicator is flashing

The value is now the new „Zero-Offset“



If this so **manually** established „Zero-Offset“ must now be saved the key **ENTER** must be pressed. The new „Zero-Offset“ is now saved in the sensor head. Immediately after this, the selection pointer jumps to the measuring mode **absolute** and the measuring result under consideration of the new „Zero-Offset“ will be displayed. The following new value will now be displayed in the absolute mode:



„ZERO-OFFSET“ is stored in the sensor head

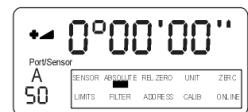
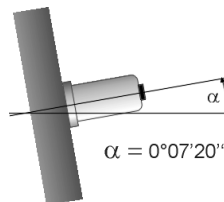
**Displayed value =
Value of the sensor minus „Zero-Offset“.**

Remarks: Until the input is confirmed by using the **ENTER** key, every manipulation can be stopped any time by pressing **SEND/ESC**

Result:

Despite the fact that the sensor is still mounted at the same angle the display of the Levelmeter 2000 now shows the value 0°00'00". This is the so called **virtual ZERO**

This new virtual ZERO is the reference for all the future measurements based on this angle (originally 0°07'20")



II) Automatic set-up of the virtual ZERO

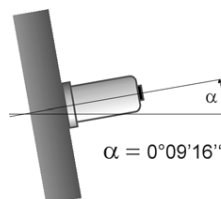
Practically quite often a measuring surface is not absolutely horizontal but should be the reference plane for other measurements. In these cases it is useful to set the basic value for this surface to: **0°00'00"**

This can be done by manually setting the virtual zero as described before or by automatically define the value with the Levelmeter 2000 set-up. (It is done by using a reversal measurement mode without turning the sensor 180 deg.)

Procedure

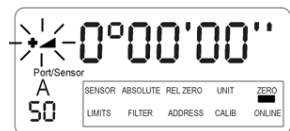
Initial position:

The display shows the measured value on the Levelmeter 2000 : +0°09'16". This value is the true inclination of the sensor.



The selection pointer must be moved below the marking **ZERO** in the display of the LEVELMETER 2000 by pressing the key **ON/MODE** several times. If reached the selection must be confirmed by pressing **ENTER**.

The last computed or manually entered value „Zero-Offset“



The direction indicator is flashing

The sensor must now sit at position one and after a few seconds settling time allowed, by pressing the key **HOLD**, the first reading is collected. This first value is displayed and the selection pointer below **ZERO** is flashing which means the second reading is expected.



After a few seconds settling time the key **HOLD** must be pressed again for collecting the second reading. The instrument/sensor remains at the same position **without turning 180°**.

The newly computed „Zero-Offset“ is now displayed on the LEVELMETER

(The displayed „Zero-Offset“ is calculated by adding the two readings and dividing the result by two.)



If this „Zero-Offset“ must now be saved, the key **ENTER** must be pressed. Immediately after this, the selection pointer jumps to the measuring mode **absolute** and the measuring result under consideration of the „Zero-Offset“ (Basic offset) will be displayed.



The „ZERO-OFFSET“ is stored in the sensor head

Displayed value =

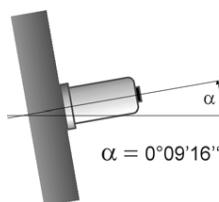
Value of the sensor minus „Zero-Offset“.

Remarks: Until the input is confirmed by using the **ENTER** key, every manipulation can be stopped at any time by pressing **SEND/ESC**

Result:

Despite the fact that the sensor is still mounted at the same angle the display of the Levelmeter 2000 now shows the value 0°00'00" This is the so called **virtual ZERO**

This new virtual ZERO is the reference for all the future measurements based on this angle (originally 0°09'16")



Remarks: Please see also "Relative measurement" Chapter 3.9.2

3.3. Selection of 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** and then the **■ ENTER** is pressed.

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 selection remains valid until changed in the same manner as described above.

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

XX°XX'XX"	DEG	Deg., Min., Sec.
XXX.XXX	GON	New degree, 3 decimal
XX.XXXX	GON	New degree, 4 decimal
XXXX.XX	mm/m	mm per m, 2 decimal
XXX.XXX	mm/m	mm per m, 3 decimal
XX.XXXX	"/10"	Inch per 10 Inch, 4 decimal
XX.XXXX	"/12"	Inch per 12 Inch, 4 decimal
XXXX.XX	mRad	Milliradian, 2 decimal
XXX.XXX	mRad	Milliradian, 3 decimal
XX.XX	mm/REL	mm per relative base, 2 decimal
XX.XXX	mm/REL	mm per relative base, 3 decimal
XX.XXXX	"/REL	mm per relative base, 4 decimal
XXXX.XX	A ‰	mm per relative base, 2 decimal
XXXX.XX	‰	‰, 2 decimal
XXX.XXX	DEG	Degree, 3 decimal
XXX°XX'	DEG	Deg., Min.
XX'XX"	DEG	Min., Sec.
XXXXX"	DEG	Sec.
XXXXX.X"	DEG	Sec. 1 decimal

For a measurement with relative base length the selection pointer must be moved by repeatedly pressing the **▲ ON/MODE** key to the position **UNIT**. Confirm with **■ ENTER**.

By using the keys **▲/▼ ZERO/SELECT "+/-"** the desired unit can now be chosen (mm/REL or inch/REL). The selection must be confirmed with the key **■ ENTER**.



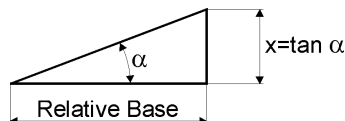
On the display the direction indicator is flashing alternatively plus or minus; the existing base length is shown (Standard length is 1000 mm or 10")

By pressing **■ ENTER** this value may be accepted or with **▲/▼ ZERO/SELECT "+/-"** the relative base length may be adjusted as required and then finally confirmed with **▲/▼ ENTER**.



In the relative mode the angle is related to the height "X" as the elevation over the set relative base length in the chosen unit. (in **mm**, or **Inch**).

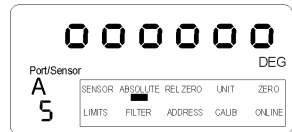
Exception: RESET (see point 3.1)



3.4. HOLD-Function

This function is available in all measuring modes.

Place the sensor on a flat stable surface. Use the key **HOLD**. While the LEVELMETER 2000 waits for a valid measurement (two identical values in succession) the display will show "oooooo". As it is practically impossible for two successive values to be identical while the instrument is handled, the sensor may be positioned after the key is depressed.



As soon as the condition for a valid measurement is fulfilled, the measuring value is displayed, the direction indicator flashing. To read the measurement value, the LEVELMETER 2000 may be removed from its located position. The display value is "frozen".

Use the key **SEND/ESC**. If a printer is connected, the measured value will be transmitted and the LEVELMETER 2000 will be ready for use in the normal mode. If you just want to read the value, pressing **SEND/ESC** again will return to the standard mode.



If **HOLD** is required for the next measurement, it is possible without canceling; directly to recall **HOLD** again.

Remarks:

The level of vibration at the measuring location considerably influences the time necessary to collect a valid measurement. Severe vibration may even completely prevent the condition (two identical values in succession), necessary to register a true measurement.

In order to regain measuring capability under this condition, take the sensor to an object with a lower vibration level and complete the operation in process. By key using **SEND/ESC** the further procedure may be cancelled immediately. The displayed value may now be accepted or the process must be repeated.

If after 60 seconds no value was accepted, the „**ERROR 7**“ message is displayed.

HOLD function has not been successfully completed within 60 seconds. The procedure needs to be repeated.

By using the function **RESET** the LEVELMETER 2000 will return to the standard settings. With the exception of the calibration data all previous adjustments are lost!!

RESET

After the new software is loaded an instrument's reset must be done.

(Press the key ON/MODE, keep it pressed and simultaneously press the key ENTER until on the screen a number of dots appear. At the end of the reset the instrument switches in the last used mode.)

3.5. Function SEND (Print-Function)

Using the key **SEND/ESC** will send the displayed value through the port "OUT" to a connected PC, or Laptop via the RS232 port. This function can also be used in combination with **HOLD** in order to transmit the „frozen“ value.

The function SEND may be activated from a connected PC/Laptop by transmitting a letter „P“ (as letter) through the serial port RS 232

Data format OUT-Port

Measurement active

MessMode_A	[sss Aaaa sn.nnnnnn<cr>]
MessMode_B	[sss Baaa sn.nnnnnn<cr>]
MessMode_A_minusB	[sss Aaaa-Baaa sn.nnnnnn<cr>]
MessMode_A_B	[sss Aaaa sn.nnnnnn Baaa sn.nnnnnn<cr>]

sss = 0 .. 255 - Continuous no.

aaa = Sensor Address 1..255 (e.g. 004) / ML/LT NT 1-32

sn.nnnnnn = +9.999999 - Positive Overage

-9.999999 - Negative Overage

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

Menu active or error (-0.000000 means no data available)

MessMode_A	[9xy Aaaa -0.000000<cr>]
MessMode_B	[9xy Baaa -0.000000<cr>]
MessMode_A_minusB	[9xy Aaaa-Baaa -0.000000<cr>]
MessMode_A_B	[9xy Aaaa -0.000000 Baaa -0.000000<cr>]

aaa = Sensor Address 1..255 resp. 0 when address undefined

x = 0 - General error

1 - Port A error

2 - Port B error

y = 0 - Menu active (no error)

>0 - Error codes (According to manual)

Format of transmission

asynchrony, 7Bit, 2 Stopbits, no parity

Example using the Hyper Terminal of Windows NT or Windows Terminal program (Example is WIN NT)

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

Confirm with OK



2. Enter the serial port definition connected to the Levelmeter 2000.

Confirm with OK



3. Enter the parameters

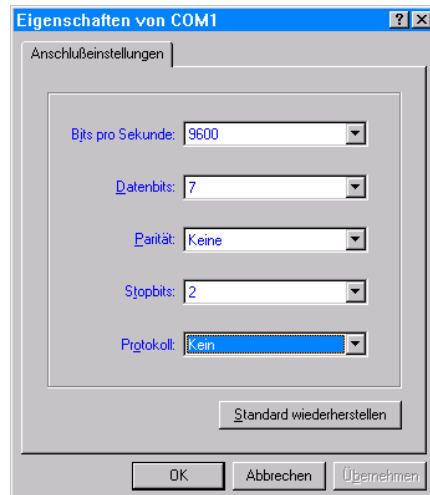
Bits per Second: 9600
Data bits: 7
Parity: no
Stop bits: 2
Protocol: no

Confirm with OK

The HyperTerminal-Window appears.

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

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



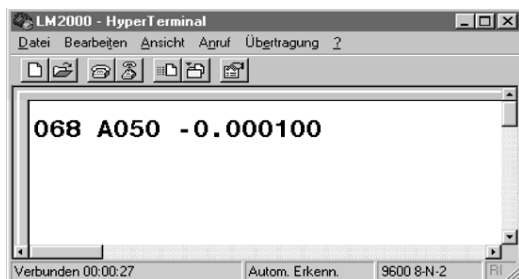
One sensor with address 50 is connected to port "A"

Meaning of the display:

068 Continuous number.
(3 measurements per second are performed)

A050 Port „A“, address 50

-0.000100 - 0.000100 Rad
respectively
- 100 μ Rad



One sensor with address 50 is connected to port "A",
one sensor with address 21 is connected to port "B" / Measuring mode: A & B alternatively measured

Meaning of the display:

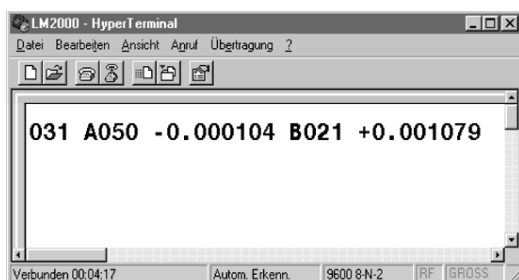
031 Continuous number.

A050 Port „A“, address 50

-0.000104 - 0.000104 Rad
resp.
- 104 μ Rad

B021 Port „B“, address 21

-0.001079 - 0.001079 Rad
resp.
- 1079 μ Rad



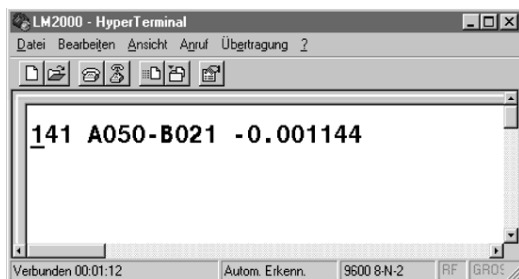
One sensor with address 50 is connected to port "A",
one sensor with address 21 is connected to port "B" / Measuring mode: A - B differential measurement

Meaning of the display:

141 Continuous number

A050 - B021 Measuring mode
Differential mode
Port „A“ sensor with address 50 minus
Port „B“ sensor with address 21

-0.001144 Difference
Sensor [A] - [B]:
- 0.001144 Rad
resp.
- 1144 μ Rad



3.6. Terminating a measurement or a set up

In case of the required canceling of a measuring procedure or the changing of parameters the process may be ended at any time and the previous state will be installed by pressing **SEND/ESC**. This is true only as long as no change ment has been accepted by pressing **ENTER** before.

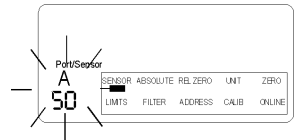
3.7. Selecting a sensor or an instrument

With the LEVELMETER 2000 the possibility exists to display the measured values of individual sensors, respectively instruments connected, or the difference between two connected sensors. In case of the differential measurement the two sensors must be connected to the two ports A and B. It is not possible to measure the difference of two sensors connected to the same port.

Basically the following set-up is possible:

- Display the value of one of several sensors connected to port A
- Display the value of one of several sensors connected to port B
- Display the differential value between sensors connected to port A and port B

For choosing the measuring mode and the address of the sensors connected the **ON/MODE** key must be pressed repeatedly until the selection pointer is below **SENSOR** and accepted by pressing **ENTER**. The possibilities "Port A", "Port B", "Port A-B" or "Port A B" may be selected by applying the key **ZERO/SELECT "+/-"**. The desired selection can be accepted by pressing **ENTER**. After this the LEVELMETER 2000 is looking for all the connected sensors respectively their address. Up to 255 sensors may be connected. The address of the first sensor will be displayed flashing. During the searching procedure the frame of the „Sensor address“ will flash in circular motion below the selected port.



If more than one sensor is connected to the port A, the one desired can be selected by pressing **ZERO/SELECT** and confirmed with **ENTER**. In case of differential measurement between two sensors the same procedure must be repeated for port B.

After pressing **ENTER** the respective measurement starts.

3.8. Selecting correct filter type for various applications (to be used only with ZEROTRONIC sensors)

Factory setting of filter type is filter no. 5. This filter type can be changed by moving the selection pointer below „FILTER“ and press **ENTER**. The standard filter type no. 5 is flashing.

By using the **ZERO/SELECT** button a filter from 1 to 10 may be selected and then confirmed with **ENTER**.

The measurement conditions have usually a great impact on the result of the measurement, the best filter type is normally established by trying different set-ups.

Basically the filter no. 1 gives the direct reading from the sensor's output, this means minimum smoothing of the value is applied. The filter no. 10 gives the maximum smoothing of the measured values.

3.9. Absolute measurement/Relative measurement

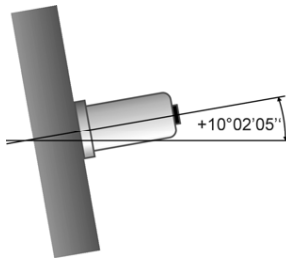
3.9.1. Absolute measurement

The standard mode (by default) is the absolute measurement.

If this is not the case when starting the LEVELMETER 2000 the **▲ ON/MODE** key must be pressed repeatedly until the selection pointer is in position ABSOLUTE. This must be confirmed with **■ ENTER** and the **absolute mode** is ready.

The displayed value is the

Value of the sensor minus „ZERO - OFFSET“



3.9.2. Relative measurement

Important remark:

The defined „REL ZERO OFFSET“ is superimposed on the „ZERO-OFFSET“ stored in the sensor head.

The „REL ZERO OFFSET“

- is stored in the sensor / measuring instrument in case of single measurement and can be recalled at any time. Starting a new relative measurement the existing value is displayed (blinking +/- sign). This value can be accepted or a new value can be entered or the value can be set to zero.
- is temporarily stored in the Levelmeter 2000 in case of differential measurement with two sensors / measuring instruments. The „REL ZERO OFFSET“ value can be changed during the measurement.

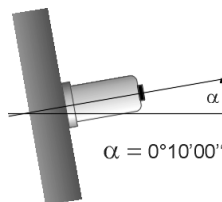
Displayed value =

Value of the sensor minus „ZERO-OFFSET“ minus „REL ZERO OFFSET“

Initial position:

The display shows the measured value on the Levelmeter 2000 : +0°10'00". This value is the true inclination of the sensor.

The requirement is now to set the sensor's inclination at an angle of zero and use this angle as a reference for future measurements.



The selection pointer must be moved below the marking **REL ZERO** in the display of the LEVELMETER 2000 by pressing the key **▲ ON/MODE** several times. If reached the selection must be confirmed by pressing **■ ENTER**.

The last computed or manually entered value „REL ZERO value“, in our example 0° 00'00" The direction indicator is flashing
The sensor must now be at the correct position and after a few seconds settling time allowed, by pressing the key **◆ HOLD**, the reading is collected. This value („REL ZERO OFFSET“) is displayed.



Should this value not be stored press **■ ENTER**. This relative zero value is stored in the sensor head. The display jumps into the measuring mode "REL ZERO", the display is 0°00'00" and the measurement continues by considering the "REL ZERO OFFSET"

As an **alternative** the value can also be changed manually by using the key **▲ ▼ ZERO/SELECT "+/-"** before confirming with **■ ENTER**



Result:

Despite the fact that the sensor is still mounted at the same angle the display of the Levelmeter 2000 now shows the value 0°00'00" (Fig. 1)

This new relative zero is the reference for all the future measurements based on this angle (originally 0°10'00")

The selection pointer of the LEVELMETER 2000 can now be placed below the marking **ABSOLUTE** by pressing the **▲ ON/MODE** key several times to return to the absolute measuring mode. After confirming with **■ ENTER** the original value is displayed. (Fig. 2)

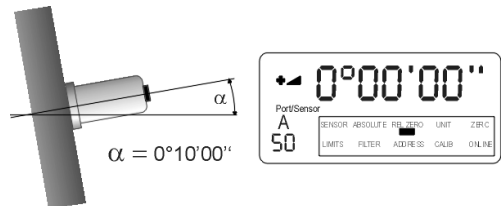


Fig. 1

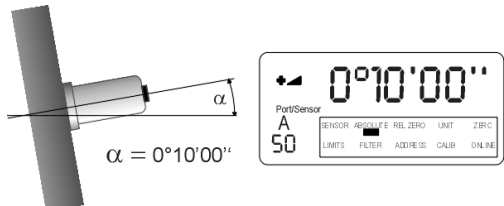


Fig. 2

The values stored in the stacks of „ZERO“ and „Relative Zero“ can be deleted as follows:

Press the **▲ ON/MODE** key repeatedly until the selection pointer is located under "REL ZERO" or "ZERO" and confirm with **■ ENTER**. In the display the existing value is seen. By pressing the key **▲ ON/MODE** the value will be set to "0". This can now be confirmed with **■ ENTER** and the Levelmeter 2000 starts in the measuring mode. The stack is empty.

3.10. Measuring by setting LIMITS

When your tasks requires the indication of a surpassed measuring value with an "alarm" the LIMITS function must be used.

In this mode it is possible to define an upper and a lower **measuring limitation (LIMITS)**. After installation of the limits a signal will be seen on the screen and also sent through the port OUT if the measured value rises above the upper limit or falls below the lower limit.

For the setting of limits the selection pointer must be moved to the position **LIMITS** by repeatedly pressing the key **▲ ON/MODE**. If reached it needs to be accepted by pressing **■ ENTER**. In the display of the LEVELMETER 2000 a possible installed lower limit is displayed with a marking **LO**. This value may now manually be adjusted to the required value by using **▲ ▼ ZERO/SELECT „+/-“**. If reached it must be accepted by pressing **■ ENTER**. After this the upper value is displayed with the marking **HI**. This value may now manually be adjusted to the required value by using **▲ ▼ ZERO/SELECT „+/-“**. If reached it must be accepted by pressing **■ ENTER**.

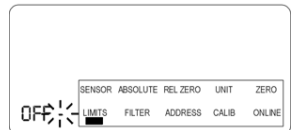


ATTENTION: The upper limit (HI) must always, absolutely seen, be higher than the lower limit (LOW)

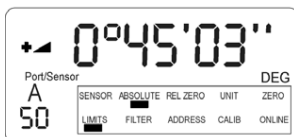
After the confirmation in the display the upper limit is seen (remark HI). This value can be changed **manually** by using the keys **▲ ▼ ZERO/SELECT „+/-“** and after confirming with **■ ENTER** the limit is set.



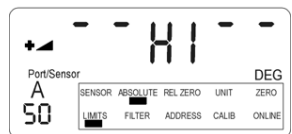
After the saving of the upper limit the display shows **OFF** or **ON**. By using the key **▲ ON/MODE** the display jumps between the two possibilities.



The desired mode must be confirmed with **■ ENTER**. (Means: limits ON or limits OFF) If the limits must not be stored, the procedure can be cancelled by using **● SEND/ESC**



If during a measurement the limits are reached the display starts flashing, alternatively the measured value and the remark HI or LO depending on the limit reached are seen.



At the same time two signal will be transmitted to the port OUT. The first signal may be used for an external control action or a relay (12V/500 mA) may be activated.

The second signal transmits the polarity of the signal in relation to the set limitation.

4. TECHNICAL DATA

4.1. Power supply

Battery powered

4 Batteries alkaline type, size AA, 2 Ah
or
4 NC rechargeable batteries AA, 0.8 Ah
or
4 Ni-MH- rechargeable batteries, size AA, 1.2 Ah

External power supply

12.0 to 48.0 V, DC, connected to port A or B or OUT
Using external power supply the automatic sleep mode of the display is inactive.

Remarks:

The rechargeable batteries are automatically charged when an external power supply is connected
The regular batteries can stay in the LEVELMETER 2000 when an external power supply is connected as they will automatically be shut off.

4.2. Power consumption

LEVELMETER 2000

180 mW, battery powered
500 to 3000 mW, external power supply

Connected sensors / instruments

approx. 100 mW

Transceiver/Converter

1200 mW, only with external power supply

4.3. Battery lifetime

LEVELMETER 2000
with one sensor connected

approx. 40 hours, battery powered
approx. 25 hours, rechargeable batteries used

with two sensors connected

approx. 33 hours, battery powered
approx. 20 hours, rechargeable batteries used (Ni-MH)

4.4. Measuring range

depending on the connected sensors/instruments

4.5. Resolution

depending on the connected sensors/instruments and on the filter type installed

4.6. Various

Dimensions:

100 mm x 210 mm x 45mm (incl. Battery cover)

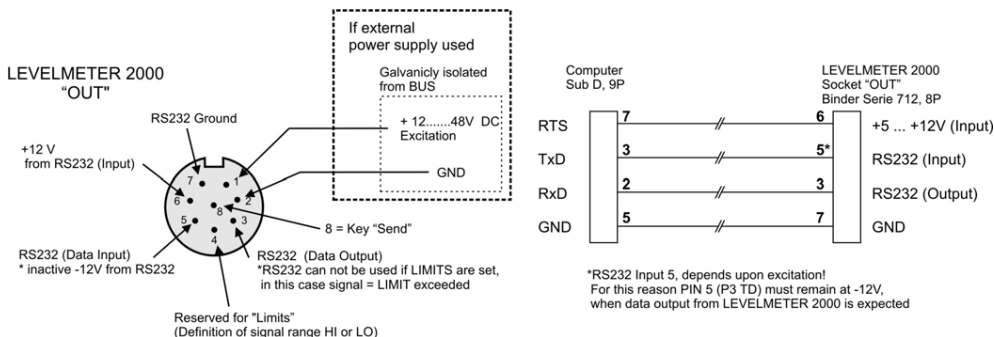
Weight incl. Batteries:

462 gr.

Temperature range (storage):

-20 to +70°C

4.7. PIN definition / Connector



5. ERROR MESSAGES

ERROR 0	Instrument's fault, needs to be sent to the service center
ERROR 1	Sensor(s) /Instrument(s) not connected, or not correct address
ERROR 2	No measuring has been made with the connected sensor. The sensor must be addressed first (See point 3.7. Selecting a sensor or an instrument)
ERROR 3	No calibration data available (the respective sensor/port is displayed)
ERROR 4	No sensor address found
ERROR 5	More than one sensor found
ERROR 6	Changing of sensor address was not successful
ERROR 7	HOLD function has not been successfully completed within 60 seconds. The procedure needs to be repeated.
ERROR 8	Battery not correctly installed
ERROR 9	It was not possible to save the calibration data successfully in the sensor head

Remarks:

After the error message is displayed and confirmed with **ENTER** the position indicator jumps to the position **SENSOR** (select sensor)

6. SERVICE

6.1. General

The LEVELMETER 2000 needs no special service other than the regular cleaning.

6.2. Storage / Care and handling of the batteries

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.

6.3. Spare parts

The following spares are available:

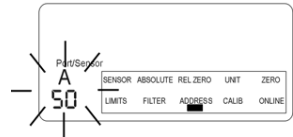
- Batteries, rechargeable batteries
- Stand with connection to external power supply
- Cables



6.4. Changing of sensor address

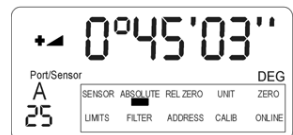
Only the **one sensor** which address must be changed is allowed to be connected either on port A or B.

Move the position indicator to the position **ADDRESS** by repeatedly pressing the key **▲ ON/MODE** and confirm the setting with **■ ENTER**. If only one sensor is connected as described above the respective port and address number is displayed flashing.



Remarks: If more than one sensor is connected, the error message **ERROR 5** is displayed. (More than one sensor found)

Using the keys **▲ ▼ ZERO/SELECT** the new address can be entered and confirmed by pressing **■ ENTER**. If the procedure was successful the measurement starts with the newly given address.



Addresses of **Zerotronic sensors** may be chosen between no. 1 and no. 254

Addresses of **Measuring instruments** (Minilevel NT, Leveltronic NT) may only be chosen between no. 1 and no. 32

The address no 255 is reserved for service purposes and should not be used.

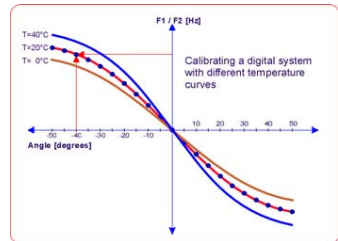
The following error messages are possible:

- | | |
|----------------|---|
| ERROR 4 | No sensor address found |
| ERROR 5 | More than one sensor found |
| ERROR 6 | Changing of sensor address was not successful |

6.5. Calibrating of ZEROTRONIC sensors

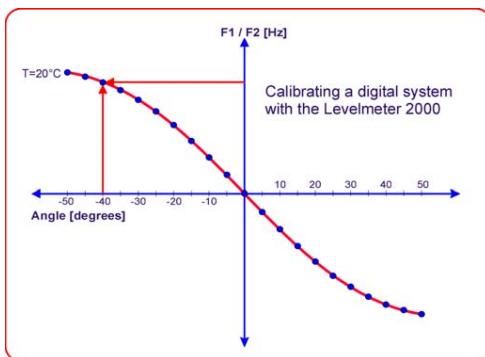
Preparations:

The ZEROTRONIC sensors will regularly be supplied with 3 calibration curves incorporated, each at another temperature. (see picture)
By newly calibrating the sensors with the Levelmeter 2000 all the existing curves are lost.



With the Levelmeter 2000 only one curve at one temperature can be installed.

Principle of the calibrating:



The bases of all the measurements with the LEVELMETER 2000 and the connected sensors/instruments are the calibration data stored in the sensor heads. Throughout the whole measuring range a number of reference calibrating points are stored in the sensor heads. The linearity of the measuring range depends on the number of these reference-calibrating points. Each measured angle delivers a signal in form of a frequency and to these reference frequencies the respective calibration points are matched. From these values a calibration curve will be established.

The measured angles between these calibration points are computed by interpolation and displayed on the screen in the desired measuring unit.

All sensors/instruments leaving the factory at WYLER's are calibrated according the measuring range and have undergone a severe quality test procedure.

The LEVELMETER 2000 offers the possibility by superimposed 3-point calibration to impair the calibration curves stored in the Sensor.

This corrective interference we call "Quick Calibration". Quick Calibration can be executed on ZEROTRONIC sensors. This method is suitable to compensate for linear errors of gain. The method is **not** suitable to correct non-linear errors which originate from a damaged measuring unit.

As this method is superimposed on the calibration, the original calibration data remains unchanged. The Quick Calibration can be repeated any number of times.

For instructions consult www.wylerag.com

Should a carefully executed Quick Calibration not condition the sensor to perform within the limits of error according to specifications, the sensor must be sent to our service department for complete calibration with exchange of all data sets.

7. REPAIR OF MEASURING INSTRUMENTS

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

Filename: Im2000_e.doc