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Instruction manual

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ZRP 6030 Retroreflectometer R



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Enclosures:

- Certificate of manufacturer
- Certificate of calibration

Exclusion of liability

Illustrations, descriptions as well as the technical specification conform to the instruction manual at hand at the time of printing. All changes resulting from technical progress, modified construction or similar are reserved.

The instruction manual has been drafted with the utmost care. Nevertheless, errors cannot be entirely excluded. The manufacturer will not be liable for errors in this instruction manual or for damages resulting from any errors.

The manufacturer will be grateful at any time for suggestions, proposals for improvement and references to errors.

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1. Instrument description

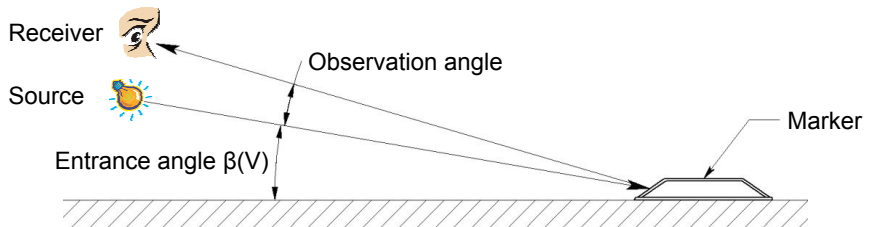
1.1 Summary

The Retroflectometer ZRP 6030 is a portable, rechargeable battery-powered precision measuring instrument for the determination of retroreflective properties of raised pavement markers (road studs).

The following features describe the ZRP 6030:

- The determination of retroreflection of a pavement marker at any time of the day – in full daylight as well as by night.
- Possible stray light is being compensated.
- Easy and quick calibration.
- Suitable for all kinds of road studs.
- Integrated temperature measurement (°C / °F)
- Integrated measurement of relative humidity (rH)
- Lightweight

2. Graphical illustration of the measuring principle



Entrance angle $\beta(V)$: 1.00°

Observation angle ZRP 6030.2 (ASTM E 1696): 0.20°

Observation angle ZRP 6030.3 (EN 1463): 0.30°



3. Safety precautions and warnings

3.1 Dangers



Caution !

You will find this caution symbol throughout this instruction manual, where you may run the risk of minor or fatal injury caused by the inappropriate operation of this instrument.

Please observe these regulations and use caution in these cases. Pass on all safety precautions to other users. Besides the safety indications in this manual the user must have consideration for general safety precautions.



Note

This symbol marks instructions you should take notice of in order to follow directions, specifications and the correct working process as well as to avoid damage or destruction of the instrument.

3.2 Notes regarding safety at work



The ZRP 6030 Retroflectometer is a high quality, state of the art instrument and is safe to operate. Nevertheless there is a chance of risk when the instrument is handled inappropriately.



Every person working with the ZRP 6030 or maintaining the ZRP 6030 must read and understand the manual completely. In particular the safety precautions and warnings.



The ZRP 6030 is exclusively designed for the determination visibility of raised pavement markers. Any other application is not in accordance with the regulations. The manufacturer is not liable for damage resulting from inappropriate application. The user bears the full responsibility.



Avoid any mode of operation that could affect the safe working with the ZRP 6030. Especially the determination of the visibility of raised pavement markers must take place as described in this operating manual.



Unauthorized modifications and changes of the ZRP 6030 are not allowed. The manufacturer is not liable for damage resulting from inappropriate application. The user bears the full responsibility.



All maintenance and repair not explicitly allowed and described in this manual (cf. chapter "14 Maintenance" on page 39) may only be executed by Zehntner GmbH Testing Instruments or your authorized ZEHNTNER-dealer, otherwise all warranty expires.



Make sure that the ZRP 6030 is unplugged from power supply and turned off before any maintenance.



For the operation of the ZRP 6030 apply all local safety regulations.

4. Delivery of the instrument

4.1 Transport damages

Handle with care during transport. Avoid shocks.

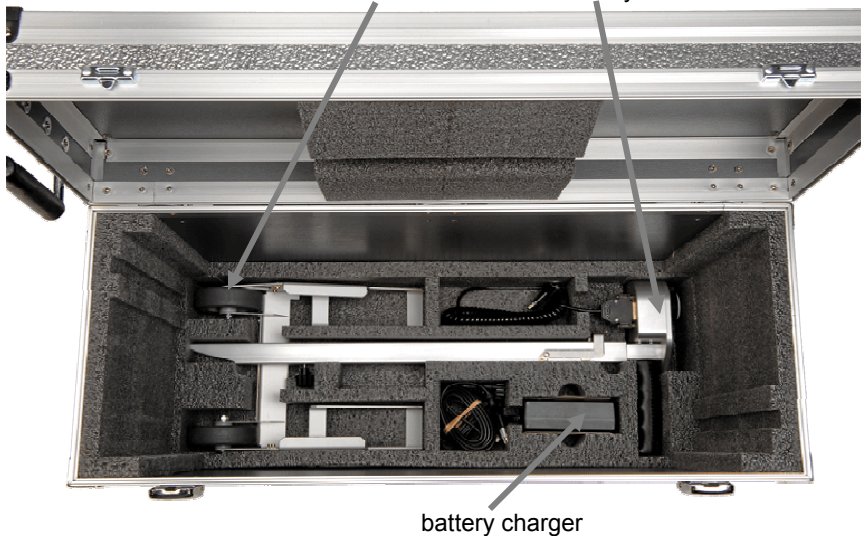
After unpacking the instrument, please look for any transport damage in which case we kindly ask you to inform the insurance company and your authorized ZEHNTNER-dealer or **ZEHNTNER GmbH TESTING INSTRUMENTS** respectively.

4.2 Transportation case

The ZRP 6030 is delivered in a transportation case. Whenever you want to transport the instrument, use the case. Nevertheless, please take care that for shipments the case has to be put into a cardboard box and protected with filling material. The transportation case is at the same time an optimal storage case for the ZRP 6030 when not in use.

The case includes:

This picture shows ACC 178 wheels, remote control incl. handle which is not included in the standard delivery.



4.3 Standard extent of delivery

The ZRP 6030 Retroreflectometer R will be delivered together with the following parts:

- 1 ZRP 6030 Zehntner-Retroreflectometer R
- 1 calibration standard
- 1 accumulator (inside Retroreflectometer)
- 1 universal battery charger (100-240 V, 50-60 Hz)
- 1 CD with RetroTools software
- 1 certificate of manufacturer
- 1 certificate of calibration
- 1 carrying case (cf. prior illustration)

4.4 Options:

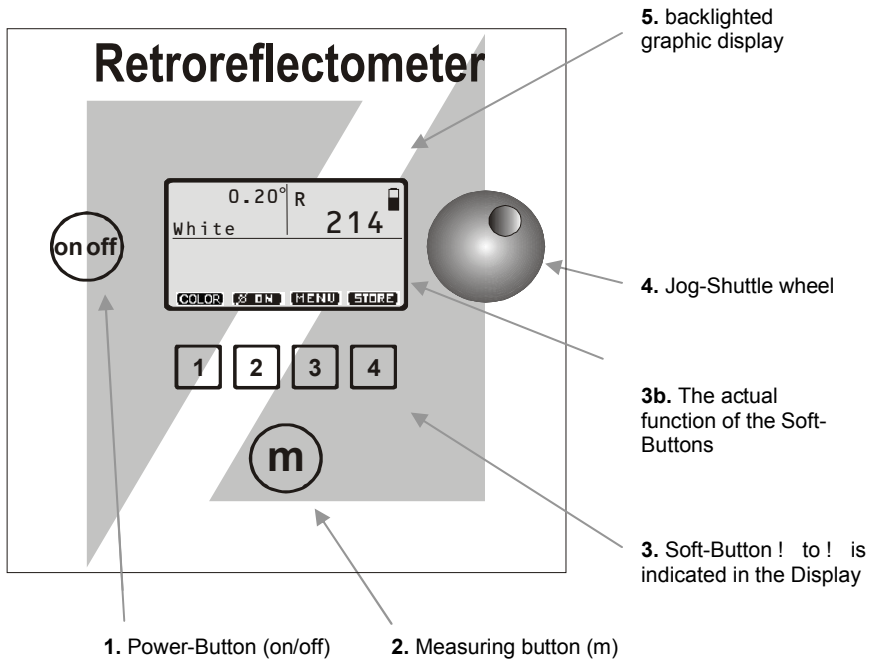
- ACC 022 data transfer cable serial
- ACC 178 wheels, remote control incl. handle
- ACC 090 voltage converter DC/AC 12V/230V to be plugged into the car cigarette lighter
- ACC 097 data transfer cable USB
- ACC 169 Bluetooth communication adapter
- ACC 184 WAAS GPS unit
- ACC 201 set portable printer incl. ACC 169 Bluetooth communication adapter, ACC 202 Bluetooth printer card and battery
- Fugawi GPS Mapping Software

All options can be bought after the sale at Zehntner or an authorized agent. ACC 184 GPS unit and ACC 178 wheels, remote control incl. handle require an upgrade of the ZRP 6030 at the manufacturer. It is recommended to combine this with the maintenance and calibration.

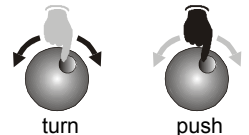
! **Zehntner GmbH Testing Instruments** refuses all warranty and liability claims for damages caused by usage of the ZRP 6030 in combination with **non-original accessories**, or accessories from 3rd party suppliers.

5. Display and functions

5.1 Short description



- 1 Power-Button for switching on and off your ZRP 6030 Retroreflectometer.
- 2 Measuring button. Starts the measurement.
When pushing this button, you may return at any time from any menu into the measuring mode.
- 3 Soft-Button ! to ! with changing functions as indicated in the display (3b). Soft-Button ! **ESC** enables you to quit the present action in any menu and to return one level.
- 4 Jog-Shuttle wheel with double-function:
Turn the wheel in order to change a value or select a command, push the wheel in order to confirm a value or selection.
- 5 The Display (shown above in the measuring mode) indicates the readings battery status as well as the functions of the Soft-Button ! to ! . It also provides information about the state of the ACC 184 WAAS GPS unit (optional).



6. Setting up

6.1 Switch on

Push the button labelled "on/off".

During the turn-on period, it is possible to adjust the contrast with the Jog-Shuttle wheel.

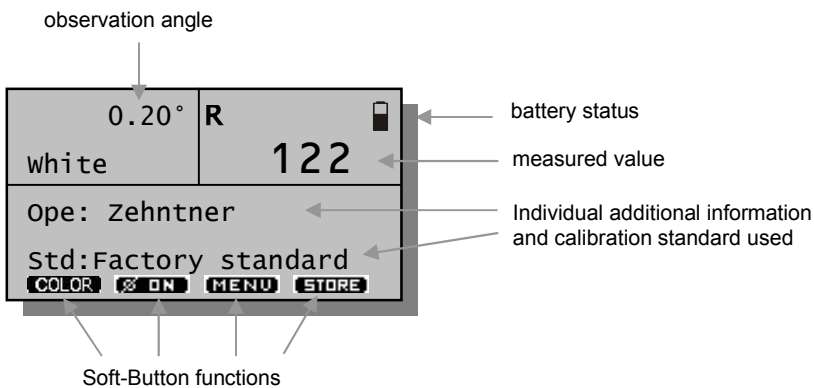
As soon as the display changes into the measuring mode, the instrument is ready.



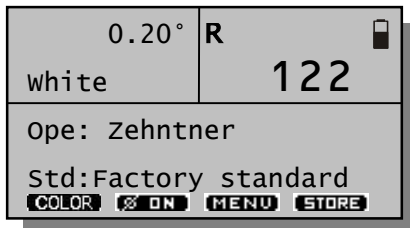
7. Basic instructions

7.1 Measuring mode

After switching on, the ZRP 6030 is in the measuring mode:



7.1.1 Measuring



By pressing the measuring button (m) the reading is started.

A measurement takes about 5 seconds.

After measuring has finished, the value is displayed in mcd/lux.

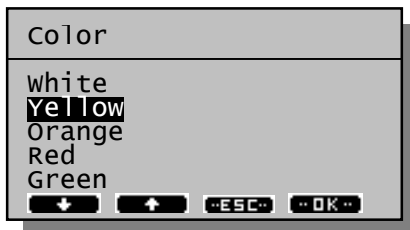
The latest value is always kept in memory, even after switching off the ZRP 6030.

7.1.2 Color selection

Before measuring a road stud, please make sure you have set the color to the corresponding color of the road stud.

Setting the color is important, because depending on the color selected a correction factor is applied to the measured value.

To change the color, press the Soft-Button ! **COLOR** in the measuring mode window.

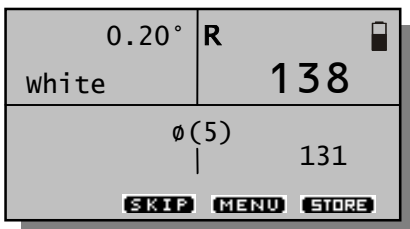


Now you are able to change the color either with the Soft-Button ! (**DOWN**) and ! (**UP**) or by turning the Jog-Shuttle wheel.

Push the Soft-Button ! (**OK**) or the Jog-Shuttle wheel to confirm the selection.

If you need to leave this window without any changes press the Soft-Button ! (**ESC**) or the measuring button (m).

7.1.3 Average Measurements

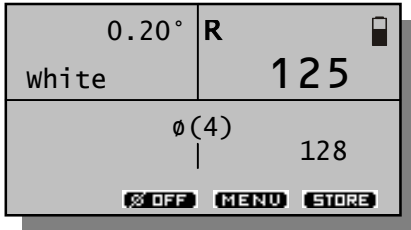


For an average reading of multiple measurements, push Soft-Button ! , labelled **ON** . Push the button before or after the first measurement of a series. Afterwards, you may execute as many measurements as required. The actual readings are displayed in large digits, the number of readings and the average is displayed in small digits.

7.1.3.1 Delete a freak value

If you get a “freak value”, will say a faulty measurement, it can be deleted with the Soft-Button ! (**SKIP**). This value will also be excluded from the average:
Important: Only the last value can be deleted!

7.1.3.2 Turning off the average

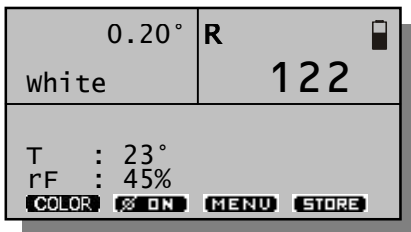


The average reading may be turned off with Soft-Button ! (**OFF**).

7.1.4 Temperature measurement and measurement of relative humidity

The ambient temperature and the relative humidity will be indicated automatically at each measurement. This useful information is required in several standards and regulations.

By turning the Jog-Shuttle wheel you will see the indication as follows:

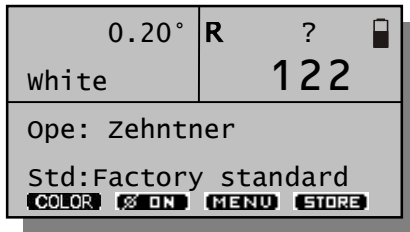


If you require indication in degrees Fahrenheit instead of Celsius, you can change the temperature dimension unit.

This procedure is explained at chapter 8.2.4.

7.1.5 Faulty Measurements

The ZRP 6030 has a built in reading supervisor. Whenever a measurement value seems to be uncertain or faulty to the Retroreflectometer, a question mark will appear on top of the measured value.



This question mark will stay on the display until the next measurement is carried out.

With this restriction we assure that everything is fine before the next measurements are taken.

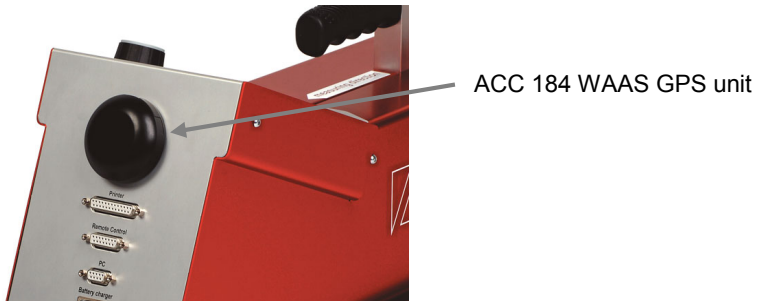
With this the reliability of the measurements is assured. If in any case the question marks appear after taking a measurement, please consider the last measurement as void and repeat it.

Remark:

Please keep in mind that the question marks does not provide any information about the quality of the measured object, but only points out an eventual parasitic coupling.

7.1.6 ACC 184 WAAS GPS unit

ZRP 6030 Retroreflectometer is capable to store your measuring position in the GPS (Global Positioning System) format with every measurement you perform. Therefore an ACC 184 WAAS GPS unit can be purchased as an option to the ZRP 6030 Retroreflectometer R.



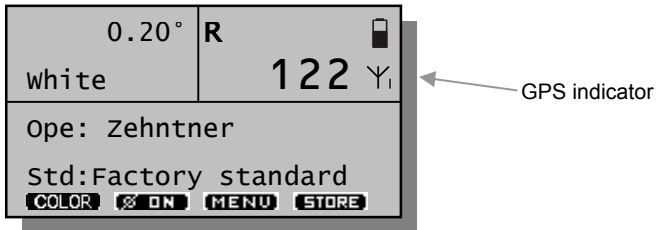
After the ZRP 6030 is switched on, the GPS indicator which is located below the battery symbol on the display provides information about the GPS status.

The indicator can show different states of the WAAS GPS unit, whereas the small bar on the right side shows how good the signal quality is:

	No GPS Signal	The WAAS GPS unit is not able to receive a positioning signal. The coordinates cannot be displayed.
	Normal GPS Signal	The WAAS GPS unit is receiving the positioning signal. The quality of the signal is fine.
	Intense GPS Signal	The WAAS GPS unit is receiving the positioning signal. The Signal quality is very good.
	Weak GPS Signal	The WAAS GPS unit is receiving the positioning signal. The quality of the GPS signal is poor.

The quality of the GPS Signal basically indicates how many satellites are used to determine the position of the ZRP 6030. Better signal quality means more precision of the coordinates.

Sample Display that shows normal reception:



As long as the "Reception OK" symbol is shown on the display, the GPS data will be stored with each measurement automatically.

The coordinates are stored in the following format:

Latitude	Longitude
N 47.436863°	E 7.765566°

The following steps explain how to take a measurement with GPS data.

- Switch on the ZRP 6030
- You will see the start display, that says "Wait for GPS data"
- Wait until the "Reception OK" symbol appears.
- By turning the Jog shuttle wheel clockwise, your actual GPS coordinates are displayed.
- Take a measurement by pressing the measuring button
- Storing this measurement into the archive will store the related GPS coordinates as well.

When no GPS coordinates are available, a dash is printed instead of the Latitude and Longitude information.

Please note:

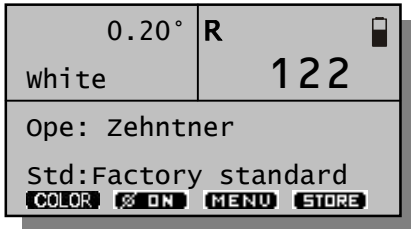
After connecting the WAAS GPS unit it can take up to 15 minutes until the unit is receiving coordinates. The performance of the WAAS GPS unit can be affected by narrow streets and high buildings that prevent clear view to the sky. In most cases it is not possible to receive coordinates indoors.

Technical Data:

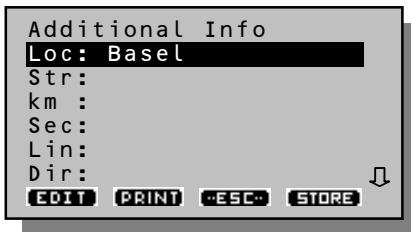
Accuracy: min. ±15 meters, < ±3 meters under good conditions
 Earth Datum Index: WGS84

7.2 Store & Print

After taking a measurement, you can store it into the archive and print it out directly with a printer.



To do so, push the soft-button ! labelled **STORE** once.



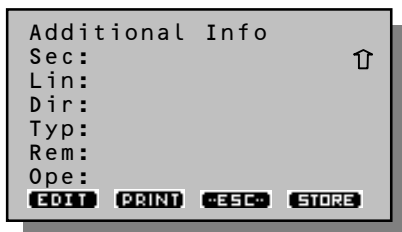
Now you are able to enter additional information with your measurement (refer to next chapter 7.2.1).

After you have entered all information, you can push the soft-button ! labelled **PRINT** to print out a report directly (see an example of such a report in chapter 7.3).

Afterwards you have to push the soft-button ! labelled **STORE** **once again** in order to write the values into the archive.!

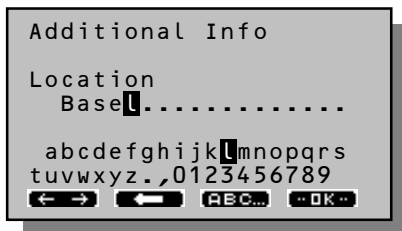
If you decide not to store the data, push Soft-Button ! (**ESC**) or the measuring button (m).

7.2.1 Enter additional information



Select the requested line with the Jog-Shuttle wheel.

Push the Jog-Shuttle wheel or the Soft-Button ! **EDIT** to confirm the selection.



Then enter the respective text as described in the following:

The dots (.) indicate the maximum number of characters.

With the Jog-Shuttle wheel you select the requested character at that position, where the cursor is. By pushing the Jog-Shuttle wheel, the selection is confirmed.

Space

For a space turn the Jog-Shuttle wheel in front of the letter a or A and push the wheel where the cursor is flashing to confirm the selection.

Erase characters

Soft-Button ! (**←**) erases the left character of the flashing cursor.

Switching between capital and small letters

Soft-Button ! (**abc...** or **ABC...**) enables to switch between capital letters (and special characters) and small letters (and numbers).

Confirm the input

With Soft-Button ! (**OK**) the input is confirmed. The instrument returns back to the list with additional information, and the next text may be chosen and edited or input.

Corrections

If you hold Soft-Button ! pressed (**←→**), while turning the Jog-Shuttle wheel, you may change the position of the cursor to the letter/number you want to correct. Then change the letter as described above.

The current text will not be moved, only the letter will be changed.

7.2.2 Storage of additional information

If all required information is entered, **the input has to be stored by pushing soft-button ! **STORE****. So the additional information together with the measuring values will be stored in the archive. If you decide not to store the data, push Soft-Button ! (**ESC**) or the measuring button (m).

7.3 Test report

An example of a Test report is shown below. Refer to chapter 8.1.2.2 on page 20 to find out how you can print a test report.

```

*****      Test Report      *****

Measured with Zehntner ZRP 6030
S/N       : 406030123
Company   : SafeRoads Inc.
Date/Time : 3.Dec.07   10:12
Average   : 7 measurements
R         : 510 mcd/lx
Color     : White
Angle     : 0.20°

Location  : Basel
Street    : A3
Kilometre : 3.5
Section   : Basel
Direction : South
Line      : Left line
Type      : I

Standard  : Factory standard
Color     : White

Coordinates: N+ 47.466988°
           E+  7.802403°

Temperature: 24° C
Humidity   : 56% rH

Road stud details
Producer   : Swareflex
Product    : Globemarker classic
Certificate: 12345
Manufact-no: 3551
Color      : White
Size       : 100 x 100 x 17.9
% Undamaged: 80

Remarks   : OK

Signatures
Operator   : J. Smith

by order of:
    
```

} Programmed data of the factory
 } Data delivered from the ZRP 6030
 } Input of user before saving the measured values and informations
 } Data delivered from the ZRP 6030
 } Additional information you may write with a pen
 } User information, saved before measurement

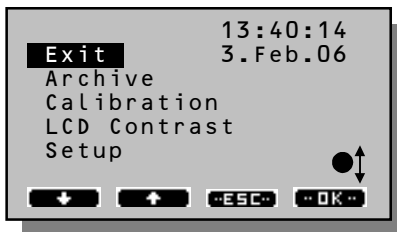
8. Menu

8.1 First level of menu

To get to the first level of menu press in the measuring mode the Soft-Button ! **MENU**. In the menu you may select the requested item either with the Soft-Button ! (**↓**) and ! (**↑**) or by turning the Jog-Shuttle wheel. Push the Soft-Button ! (**OK**) or the Jog-Shuttle wheel to confirm the selection.

*By pushing the Soft-Button ! (**ESC**) you go back one level from the actual menu. With the measuring button (**m**) you may return at any time from any menu into the measuring mode.*

8.1.1 Exit

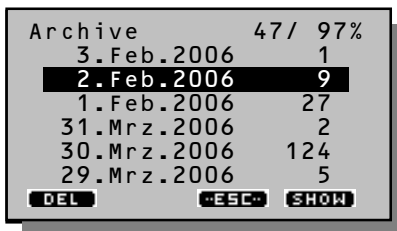


Confirm by Soft-Button ! (**OK**) or push the Jog-Shuttle wheel to return into the measuring mode.

8.1.2 Archive

8.1.2.1 Stored files

In the archive, classified according to time and date, all saved measured values with additional info are stored.



In a list – sorted by date – all measurements are stored. Select the requested date by turning the Jog-Shuttle wheel. You may either delete the selected date or select it in order to explore the measurements taken.

8.1.2.2 Inspect and print out data records

In order to look at a data record and print it, confirm your selection with the Soft-Button ! (**SHOW**) or by pushing the wheel.

For the illustration of the different information, the following screenshot, 3rd February, has been selected:

3. Feb 13:35 1/9
White R 166
Loc:Basel
Str:A1
km:3
Sec:Basel
DEL PRINT ESC PAGE

Measurement 1 of 9 dated 3 February stored at 13:35 h (1:35 pm). When you turn the Jog-Shuttle wheel, it enables you to watch further measurements (2-9) of this day.

Measured value in mcd/lx:

Additional information. Pushing Soft-Button ! (**PAGE**) displays additional information, that has no place on the display simultaneously.

By pressing the Soft-Button ! **PRINT**, a test report will be printed.

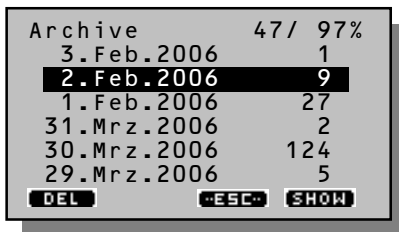
8.1.2.3 Delete individual measurements

When viewing an individual measurement, press the Soft-Button ! **DEL** in order to delete the measurement.

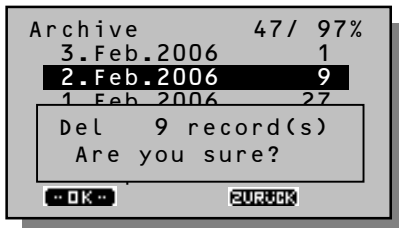
3. Feb 13:35 1/9
White R 166
Loc:Basel
Delete record
Are you sure?
DEL ESC

To prevent loss of data, you are asked if you really want to delete the record you selected. If you do so, confirm with Soft-Button ! (**OK**).
If you decide not to delete the data, push Soft-Button ! (**ESC**).

8.1.2.4 Delete measurements of the whole day



If you want to delete measurements from a whole day, choose the requested date with the Jog-Shuttle wheel as described in chapter 8.1.2.1 (Stored files). Then press Soft-Button ! **OK**.



To prevent loss of data, you are asked if you really want to delete all data of the selected day. If you do so, confirm with Soft-Button ! **OK**. If you decide to keep the data, push Soft-Button ! **ESC**.

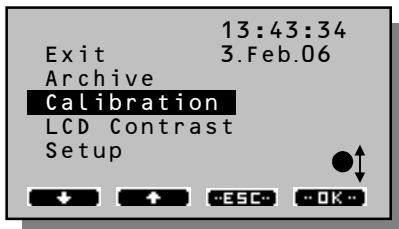
8.1.3 Calibration on factory standard

8.1.3.1 Procedure

If the instrument indicates an outdated calibration during the turn-on period, or if calibration is required by the applicable regulations, the ZRP 6030 has to be calibrated.

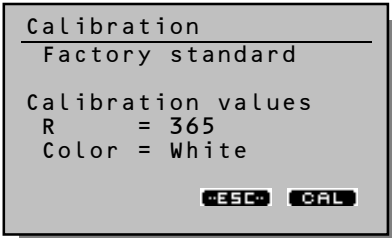
Place the instrument on the included calibration standard, the ZRP 6030 has to snap in.

Push Soft-Button ! , labelled **MENU**, or the Jog-Shuttle wheel to enter the menu.



In the menu you may select the "Calibration" with the Soft-Button ! (**↓**) and ! (**↑**) or by turning the Jog-Shuttle wheel. Push the Soft-Button ! (**OK**) or the Jog-Shuttle wheel to confirm the selection.

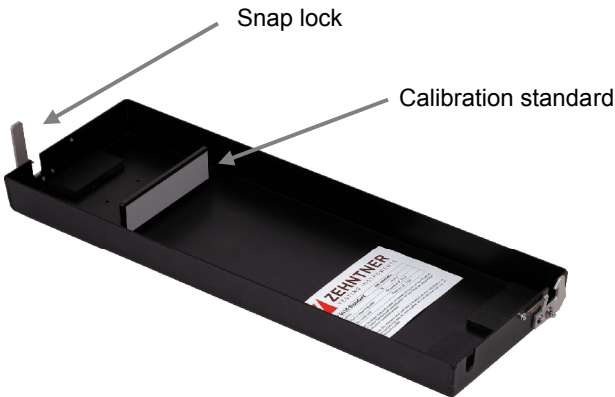
In the Display, all necessary data for the calibration is indicated:



Now, you may execute the calibration by pushing the Soft-Button ! (**CAL**) or the Jog-Shuttle wheel.

You can exit the calibration menu with Soft-Button ! (**ESC**) or with the measuring button (m).

In order to remove the calibration standard, release the snap lock in the front of the calibration standard (cf. illustration).



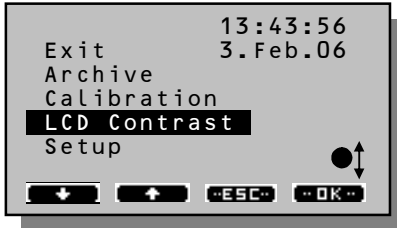
Before calibrating, always place the ZRP 6030 on the included calibration standard correctly. The instrument has to snap in the snap lock of the calibration plate. Only in this way precise calibration can be obtained.

HINT: In the menu "Setup" → „Calib. Period“, the calibration interval can be set, will say: the day, after which the ZRP 6030 shall remind you, when the next calibration is due.

8.1.4 LCD Contrast

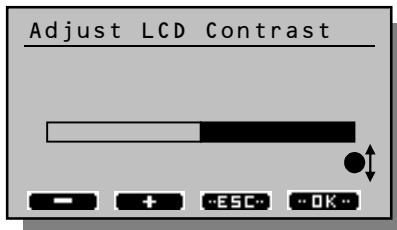
You may either adjust the contrast during the turn-on period (refer to chapter 6.1 on page 10) or in the menu “LCD Contrast”

8.1.4.1 Setup contrast



Push Soft-Button ! (MENU) (or Jog-Shuttle wheel), to enter the menu.

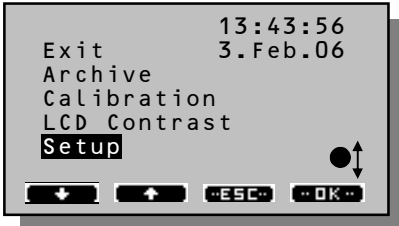
In the menu you may select “LCD Contrast” with the Soft-Button ! (↑) and ! (←) or by turning the Jog-Shuttle wheel. Push the Soft-Button ! (OK) or the Jog-Shuttle wheel to confirm the selection.



Then, you will get the following display: Now, you may set the contrast with Soft-Button ! (←) and ! (→) or by turning the Jog-Shuttle wheel. By pushing Soft-Button ! (OK) or the Jog-Shuttle wheel, you confirm the set value.

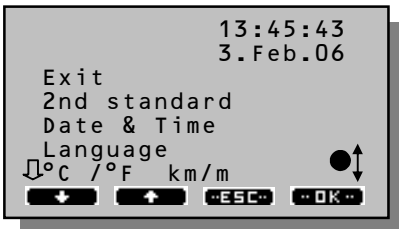
8.1.5 Setup

In the menu „Setup“ you may make settings that you will not need daily but that affect the basic operation of the ZRP 6030: e.g. the language selection and the clock.

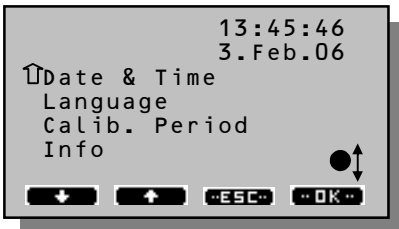


Press the Soft-Button ! **MENU** to get into the menu.

Select the item “Setup” with the Soft-Button ! (**+**) and ! (**+**) or by turning the Jog-Shuttle wheel. Push the Soft-Button ! (**OK**) or the Jog-Shuttle wheel to confirm the selection.



Then, you will get the following display:



There is not enough space for the whole list of items in the menu „Setup“. Therefore, you may scroll down and up with the down and up arrows (Soft-Button ! (**+**) und ! (**+**) or with the Jog-Shuttle wheel.

The arrow to the left of the list of items indicates, that above (or below) are further items.

*By pushing Soft-Button ! (**ESC**), you will always get back one level. With the measuring button (m) you may exit the setup menu and return into the measuring mode.*

The single items of the menu “Setup” are explained in the following chapter.

8.2 Second level of menu (Setup)

8.2.1 Exit



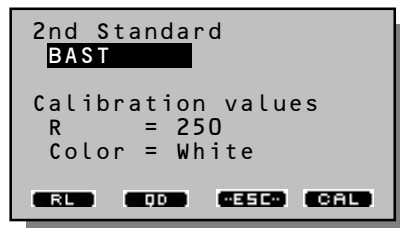
To get back to the first level of the menu, select "Exit" and press the Jog-Shuttle wheel.

8.2.2 2nd Standard

8.2.2.1 Short description

The ZRP 6030 provides the possibility to use a second, alternative calibration standard, which might be a standard prescribed by your company or an official standard.

The name of the calibration standard is stored and/or printed together with the measured values. The results are always traceable to the standard the instrument has been calibrated with.

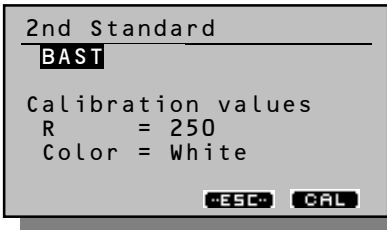


In the „Setup“, select „2nd Standard“. Here you may name the standard and set the respective calibration value and color. Afterwards you can calibrate the instrument to this value.

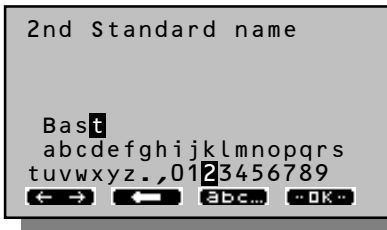
8.2.2.2 Enter or change the name and value of calibration



Select and confirm the item “2nd standard” with Soft-Button ! **⏺** or by pushing the Jog-Shuttle wheel.

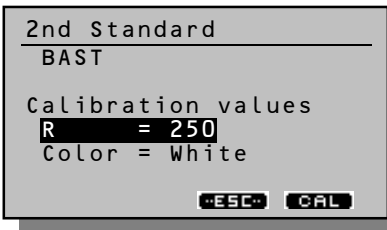


By turning the Jog-Shuttle wheel you may change the name as well as the calibration value of the 2nd standard. First, choose the item to change (e.g. name of the 2nd standard) and push the Jog-Shuttle wheel.



In the following display appearance you may edit the name as described in chapter 7.2.1 on page 17.

Push Soft-Button ! **⏺** to confirm the name and to return to the level “2nd standard”



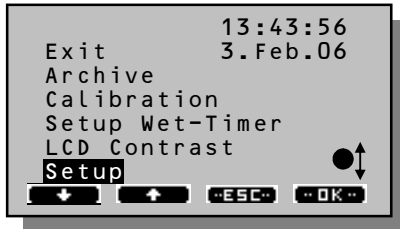
If you would like to change the value or color of the 2nd standard, turn the Jog-Shuttle wheel to the item you want to change. Then push Soft-Button ! **⏺** or the Jog-Shuttle wheel

Now you are able to change the value or color by turning the Jog-Shuttle wheel. To confirm your changes, push the Jog-

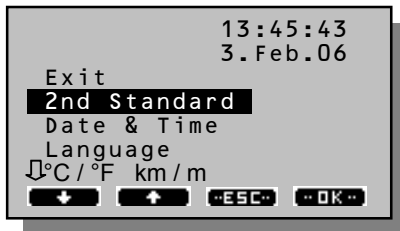
Shuttle wheel or press the Soft-Button ! (**⏹**) in order to exit the calibration menu without saving.

You are also able to reject the changes when you push the measuring button (m).

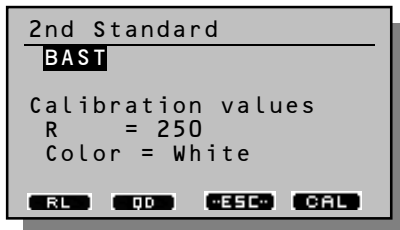
8.2.2.3 Calibration with the 2nd standard



In the menu, select the item “Setup” with the Soft-Button ! (**↓**) and ! (**↑**) or by turning the Jog-Shuttle wheel.
Push the Soft-Button ! (**OK**) or the Jog-Shuttle wheel to confirm the selection.



Place the instrument onto your 2nd standard and select “2nd Standard” in the display.



For a calibration on the 2nd standard, push the Soft-Button ! (**CAL**).

To exit the calibration menu push the Soft-Button ! (**ESC**).

8.2.3 Date & Time

8.2.3.1 Setup date & time

If you want to use your ZRP 6030 in a different time zone, or if the internal watch should be misadjusted, you may set date and time as follows:



By pushing the Jog-Shuttle wheel, you skip (in this order):

- year
- month
- day
- hour
- minute

By turning the Jog-Shuttle wheel, you may change the selected number.

By pushing Soft-Button ! (**OK**), the input is confirmed and stored.

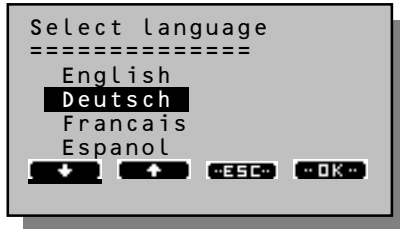
By pushing Soft-Button ! (**ESC**), you will get back to the menu without confirming and storing eventual changes.

You may also discard changes by pushing the measuring button (m).

8.2.4 Language

8.2.4.1 Select language

Here, you may select the language your ZRP 6030 “talks” to you:



Select the language with Soft-Button ! ([Down]) and ! ([Up]) or by turning the Jog-Shuttle wheel. Confirm by pushing Soft-Button ! ([OK]) or the Jog-Shuttle wheel.

By pushing Soft-Button ! ([ESC]), you will get back to the menu without changing the language.

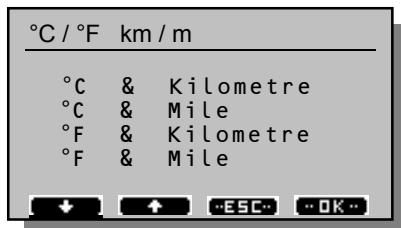
You may also discard changes by pushing the measuring button (m).

If you have accidentally selected a wrong language and you do not find the way back to your preferred language you can do the following: Switch off the device and switch it on again. When you keep the measuring button (m) pressed while the device is starting up, the language selection menu will show up immediately allowing you to select your desired language.

8.2.5 °C / °F and km / m

8.2.5.1 Switching

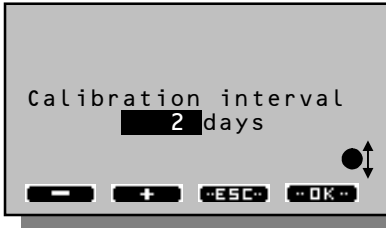
With this Menu you can configure whether the temperature is displayed in centigrade or in degrees Fahrenheit and whether in the test report kilometre or miles will be displayed.



8.2.6 Calibration Interval

8.2.6.1 Interval settings

The ZRP 6030 will remind you after a certain period of time that the calibration of the instrument is due. This time can be modified with the "Calibration interval" property.



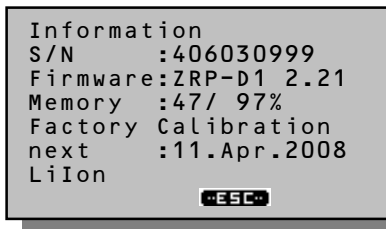
Change the value with Soft-Button ! (**-**) and ! (**+**) (or by turning the Jog-Shuttle wheel). Confirm the new value by pushing Soft-Button ! (**OK**) or the Jog-Shuttle wheel.

By pushing Soft-Button ! (**ESC**), you will get back to the menu without changing the calibration interval. You may also discard changes by pushing the measuring button (m).

8.2.7 Information

8.2.7.1 Instrument information

Here, you can read certain factory settings such as the serial number, the firmware version, the memory capacity as well as the date of the next factory calibration.



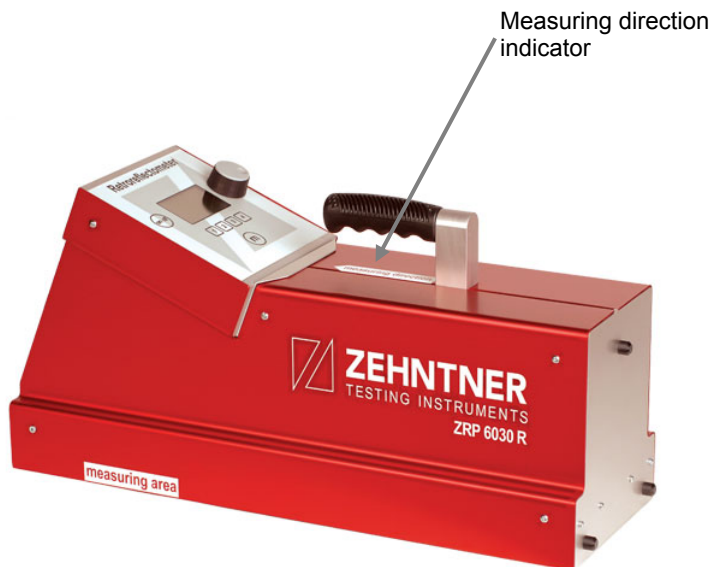
After 2 years, the instrument should be sent back to the manufacturer in order to be checked thoroughly, adjusted and certified. A dialogue box on the welcome display will remind you to do so after this date.

By pushing Soft-Button ! (**ESC**), you will get back to the menu. You may return into the measuring mode by pushing the measuring button (m).

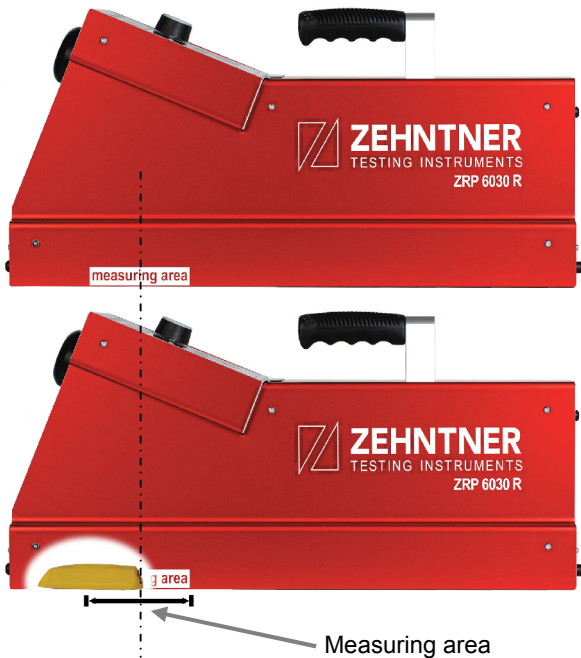
9. Measuring procedure

9.1 Information for a correct measuring procedure

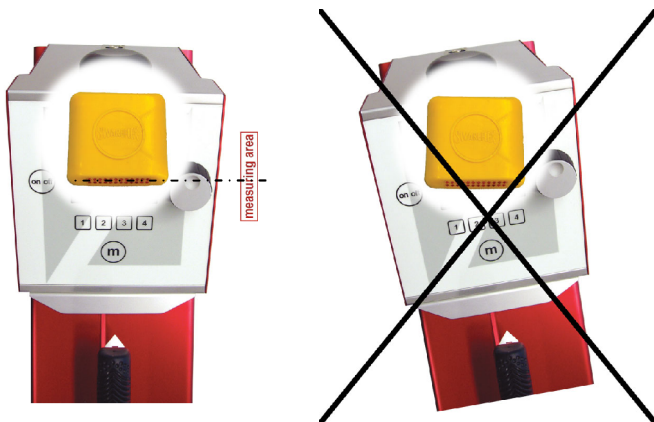
In order to measure the retroreflection of a road pavement marker, place the ZRP 6020 over the road pavement marker. The measuring direction is indicated with an arrow on the ZRP 6020.



The measuring area is indicated on the left and right side of the ZRP 6020. When placing the Retroreflector, the reflective area of the road pavement marker needs to be centred to the measuring area of the ZRP 6020.



When placing the Retroreflector, please also make sure it is aligned with the measuring direction.



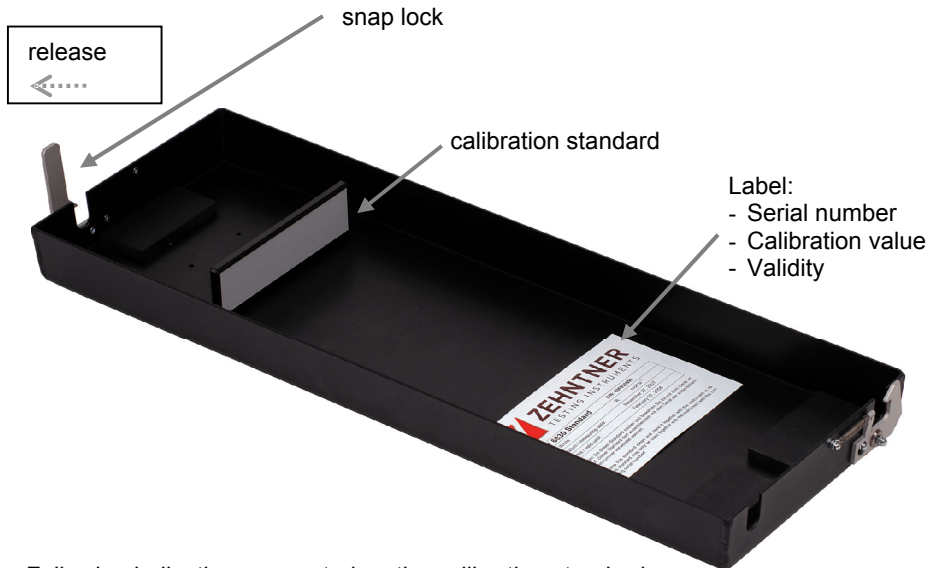
10. Calibration standard

10.1 Factory standard

Always protect the calibration standard from dust, moisture and other environmental factors.

The standard has been measured in the factory and the calibration value has been inscribed. It is valid for 2 years and should be replaced or calibrated at Zehntner after this time.

The factory standard delivered with the ZRP 6030 is not interchangeable and is valid only for the delivered instrument.



Following indications are noted on the calibration standard:

- Calibration value and colour of the standard
- Measuring date of standard
- Expiry date of standard

(After this date the standard should be replaced or calibrated. Contact either **Zehntner GmbH Testing Instruments** or your authorized ZEHNTNER-dealer.)

10.2 Cleaning

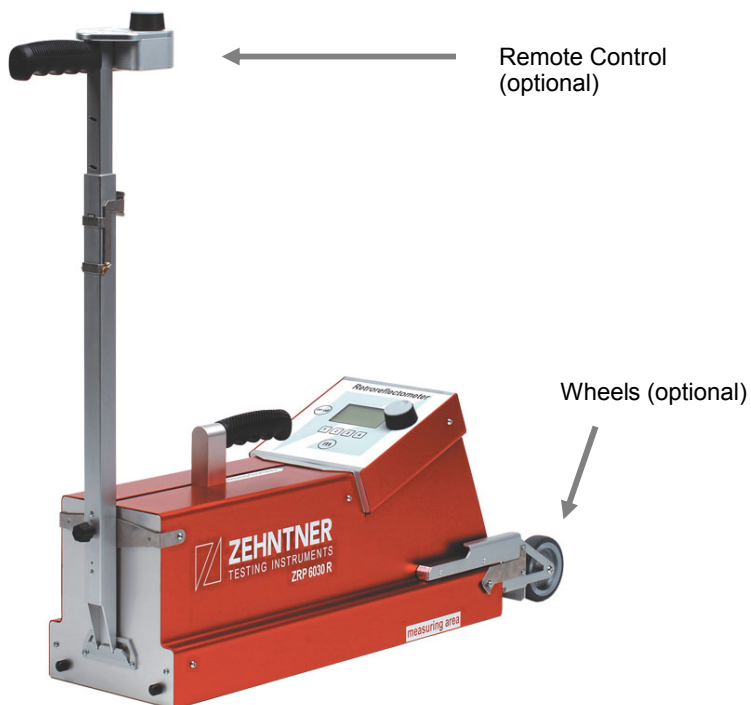
- The calibration standard has to be protected from dust
- If the standard is soiled or covered by dust, it can carefully be cleaned using window cleaner and a soft tissue.

! Note

A damaged or a polluted standard may cause incorrect calibration and therefore incorrect measuring results!

11. ACC 178 Remote Control and Wheels

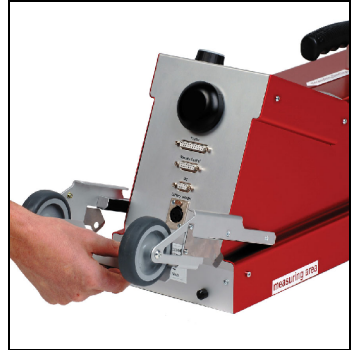
For more convenient use on site, the ZRP 6030 Retroreflectometer can be equipped with an optional remote control and wheels. Both, the remote control and wheels are designed in a way that they can be mounted very easily onto the ZRP 6030 Retroreflectometer.



11.1 Mounting the wheels

The wheels can be mounted in two steps onto the ZRP 6030:

1. Insert the wheel rack easily.



2. Snap in the two clips on either side, finished!



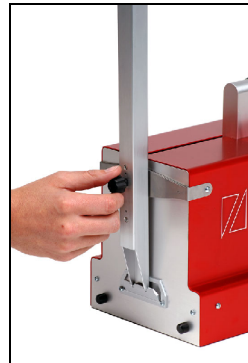
The disassembly is done by lifting the clips and removing the wheels.

11.2 Mounting the Remote Control

1. Insert the lever of the remote control into the leash on the ZRP 6030.



2. Fasten the screw.



3. Connect the plug with the port on the front side of the ZRP 6030, finished!



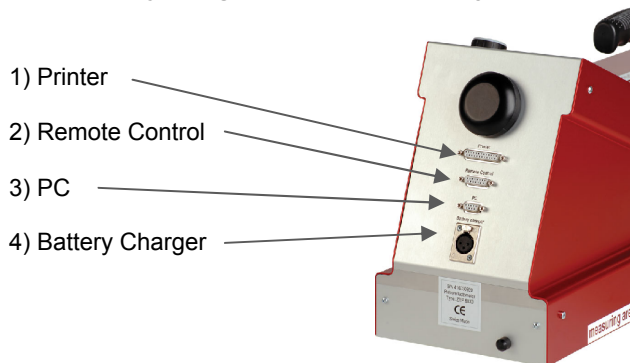
The disassembly is done in reverse order.

12. Connections

12.1 Ports

The ZRP 6030 provides the following ports:

- 1) **Printer port**, 25-channel plug, female
The test report is output in ASCII-code. This enables you to use virtually any usual printer in connection with the ZRP 6030. Unfortunately, not every printer uses a compatible protocol. Therefore, **Zehntner GmbH Testing Instruments** cannot guarantee that all characters are printed properly. **Zehntner GmbH Testing Instruments** offers as an optional accessory a battery-operated Ink-Jet printer that has been tested with the ZRP 6030 and that is perfectly suitable for use in the laboratory or on the road.
- 2) **Connection for the remote control** (available as an option)
- 3) **PC port**, 9-channel D-Sub, female
It is possible to read out the measuring data from a PC via the RS-232 interface (refer to the following chapter "12.2 PC-Interfaces" on page 37).
- 4) **Socket for battery charger** (refer to the following chapter)



12.2 PC-Interfaces

The ZRP 6030 can be connected to a Personal Computer in order to download your readings. Alternatively the readings can be downloaded by use of the optional ACC 169 bluetooth communication adapter. In this case your PC or laptop needs a bluetooth interface. In such a case, please refer to the separate instruction for using bluetooth.

The procedure of downloading the stored values is mentioned in chapter "17 RetroTools (PC Software)" on page 44.

Note

Always switch off your ZRP 6030, the printer and/or the PC before connecting or disconnecting!

13. Built-in battery and charging

13.1 Rechargeable Battery

The used LI-Ionen-Mn battery has a very high capacity. Thousands of measurements can be taken over a period of several months without charging the battery.

The capacity is continuously being observed. When the voltage becomes too weak, "BAT" lights up on the display and the battery has to be charged.

In order to preserve the battery, short time after the last manipulation, the backlight is automatically turned off, and the instrument switches off after 5 minutes.



In order to prevent a damage of the battery, the instrument switches automatically off before the battery is completely empty.

The ZRP 6030 announces this by displaying the symbol of an empty battery.

13.2 Charging

To charge the battery, plug in the charger plug on the ZRP 6030 and connect the charger to a wall socket (100 - 240 V, 50 - 60 Hz).

The special plug on the battery cable has a reverse polarity protection.

The ZRP 6030 can be turned off or on while charging.

In order to unplug the charger plug from the socket, push the unlock button.

Socket for charger plug



The charge indicator light on the charger shows the charge of the accumulator

- Is the indicator light red, the unit is still charging
- Is the indicator light green, the accumulator is fully loaded

The ZRP 6030 charger may stay connected after loading as long as it is plugged in. Charging of an empty battery takes approx. 10 hours.

 **Note**

- Always charge the battery with the charger supplied!
- The accumulator may only be replaced by **Zehntner GmbH Testing Instruments** or by an authorized ZEHNTNER-dealer!
- If you have not used your ZRP 6030 during several months, the battery should be charged before using.

14. Maintenance

14.1 Maintenance carried out by the user

You may only carry out the following maintenance and repair yourself:

- Cleaning (cf. chapter 14.2 on page 40)

All other maintenance and repair operations may only be done by **Zehntner GmbH Testing Instruments** or your authorized ZEHNTNER-dealer, otherwise all warranty expires.

 **Caution !**

Make sure that the ZRP 6030 is turned off and unplugged from battery charger before maintenance.

 **Note**

The instrument consists of delicate optical and electronic precision parts. Do not drop it and protect it from shocks, moisture and dust.
Please store the instrument including its accessories in the transportation case.

14.2 Cleaning

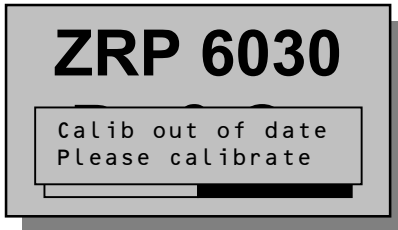
We recommend that the instrument is checked and certified by **Zehntner GmbH Testing Instruments** once a year. Otherwise clean the instrument periodically using water- and oil-free compressed air (max. 1.5 to 2 bar), or wipe the exit window on the bottom of the optics housing with a soft brush.

The exit window is coated with a special anti reflection coating that should not be damaged. If the soft brush is not sufficient for cleaning the window, you may use a soft paper tissue and window cleaning liquid.

The optics housing **must not be opened under any circumstances** since the measuring geometry would be misaligned. The measuring geometry can only be adjusted by means of special testing equipment in our factory.

15. Status- and error messages

15.1 Calibration



During start-up the “Calibration out for date” message is displayed.

Solution:

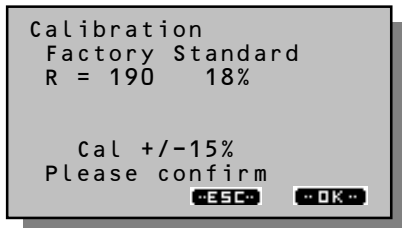
- Perform a calibration



During start-up the “Factory Calibration expired” message is displayed.

Solution:

- The instrument has been calibrated in the factory for 2 years ago. It should be sent back to the manufacturer for checking, calibration and certifying.



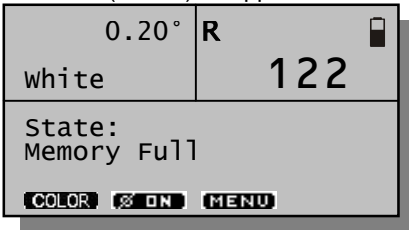
In order to prevent an unintentional calibration to completely wrong values (e.g. when the instrument is not placed properly onto the standard, the standard is damaged or the optics window is soiled), the instrument tells you how much the calibration diverges from the nominal value.

Depending on the alternative calibration standard, variations are possible.

- Confirm variation or reject with **ESC** and determinate the cause through e.g. cleaning the standard or window and recalibrate again as described in chapter “8.1.3.1 Procedure” on page 21)
- At a variation of more than 15% a calibration by the manufacturer will probably be needed.

15.2 Memory

In the measuring mode the message is displayed as in the illustration and the Soft-Button ! (STORE) disappeared:

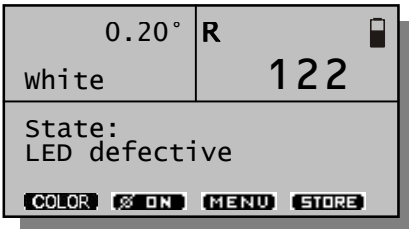


- The memory is fully used; delete some values. You may either delete individual values as well as measurements from a whole day (cf chapter 8.1.2.3 on page 20 and 8.1.2.4 on page 20).

15.3 LED defective

The ZRP 6030 is equipped with robust LED, which has a longer life cycle than normal lamps. If the ZRP 6030 displays that a LED is defective, the instrument has to be shipped to **Zehntner GmbH Testing Instruments** or your authorized ZEHNTNER-dealer.

In the measuring mode the following message is displayed:



- Ship the unit to **Zehntner GmbH Testing Instruments** or to your authorized ZEHNTNER-dealer.

15.4 Battery low

The capacity is continuously being observed. When the voltage becomes too weak, "BAT" lights up in the display and the battery has to be recharged.

In order to preserve the battery, short time after the last manipulation, the backlight is automatically turned off, and the instrument switches off after 5 minutes.



In order to prevent a damage of the battery, the instrument switches automatically off before the battery is completely empty. The ZRP 6030 announces this by displaying the symbol of an empty battery. In order to charge the battery, refer to chapter 13 on page 38.

16. Technical specification

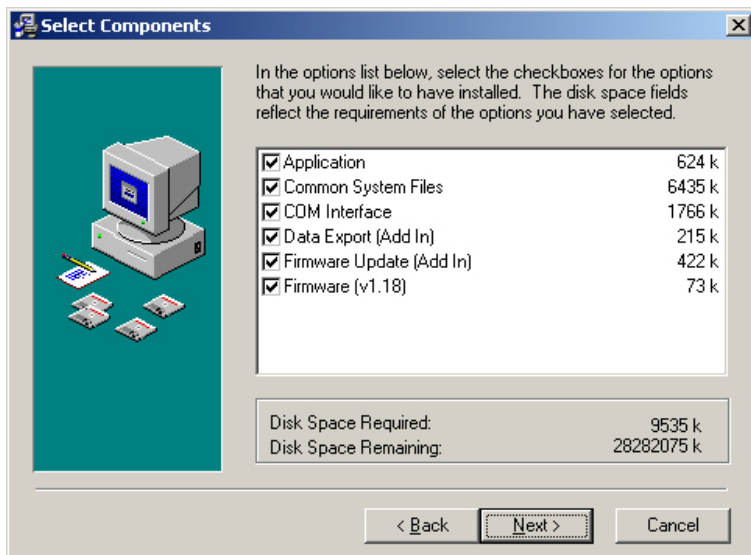
Measuring principle:	Entrance angle $\beta(V)$:	1.00°
	Entrance angle $\beta(H)$:	0.00°
	Observation angle	EN 1463: 0.30° ASTM E 1696: 0.20°
Measuring area (WxH):	130 mm x 30 mm	
Observation field:	52 mm x 218 mm	
Measuring sensor:	adapted to V (λ)	
Measuring range:	0 - 2'000 mcd/lx	
Display:	graphical display, background-lighted 128 x 64 dots	
External charger:	100 - 240 V / 50 - 60 Hz, 35 W, universal	
Battery:	Li-Ion-Mn accumulator, 14.4 V, 5.4 Ah	
Charging time:	approx. 10 hours	
Capacity:	approx. 40'000 measurements with 1 charging	
Life cycle LED:	approx. 500'000 measurements	
Operating:	- 10° C (14°F) to + 50° C (122°F)	
Storage:	- 15° C (5°F) to + 60° C (140°F)	
Humidity:	non condensing	
Dimensions (L x W x H):	560 mm x 190 mm x 280 mm max. Road studs: 140 mm x 160 mm x 60 mm	
Weight:	8.5 kg 10.0 kg with remote control 17.0 kg with working standard and case 18.5 kg with remote control, standard and case	
Standards:	ZRP 6030.2:	ASTM E 1696-02
	ZRP 6030.3:	in dependence on EN 1463

17. RetroTools (PC Software)

17.1 Installation

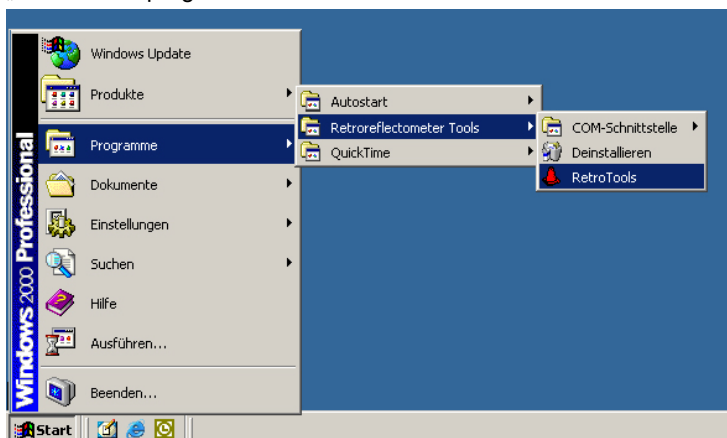
Please put the RetroTools CD into your CD-ROM and start up the Setup-Program „Retrotools.exe“.

Please follow the installation instructions and install all options:



17.2 Program start

In the menu „Start“, „Programs“ you find „Retrorreflectometer Tools“ the „RetroTools“ program can be started here.



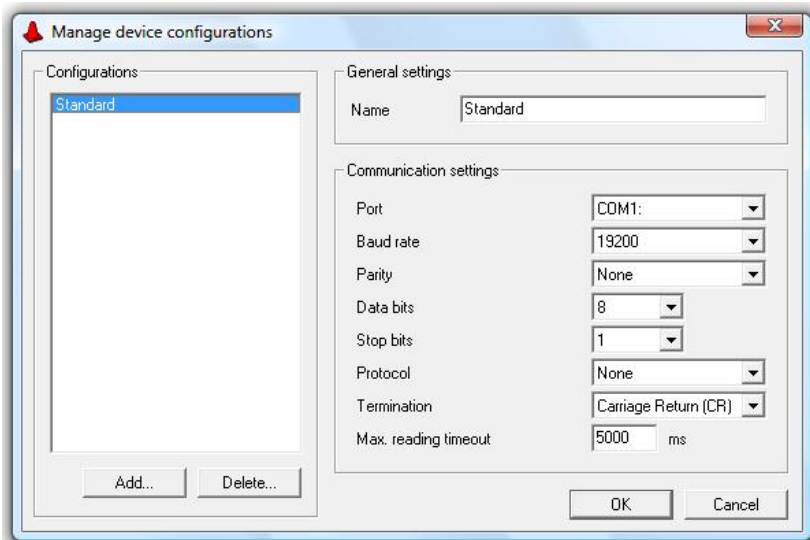
17.3 Main program

17.3.1 Choose language

Under „Extras“ and then „Options“ or directly with the F9 button the language can be changed.


17.3.2 Connection configuration

In the menu “File” and then “Connection configuration...” or with the direct button F7 the connection options can be called. The standard settings are as follows:




17.3.3 Connection set up

Before a connection to the device is possible the COM cable of the PC (Standard COM1 Port) has to be connected to the ZRP 6030 (Port PC) (see chapter “18 System diagram” on page 50). Further the device must be switched on.

Under „File“ -> „open connection“ or with the Direct-icon  the connection to the device opens. This will be shown in the bottom information field:

 Not connected

Shows up when there is no connection.

 Connected to 371013xxx

If connected the serial number of the device will be shown.

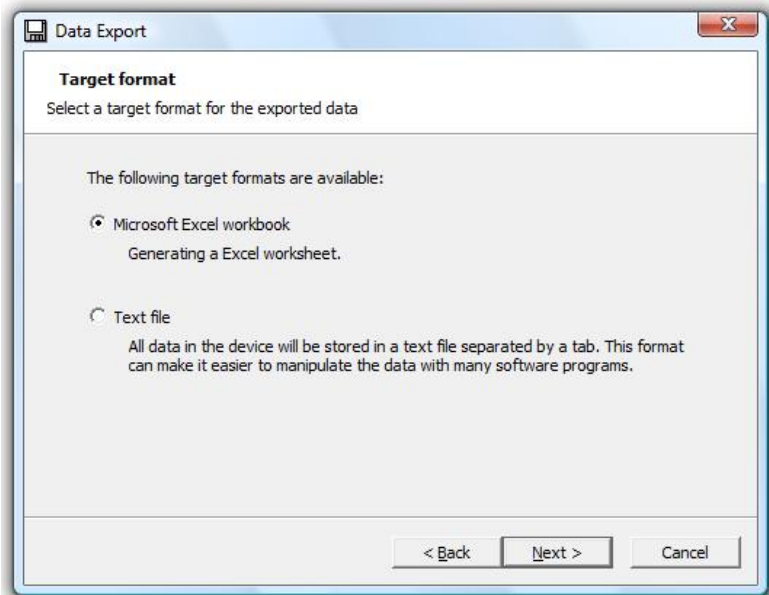
17.3.4 Data Export

- To start up Data Export the corresponding icon has to be double clicked.

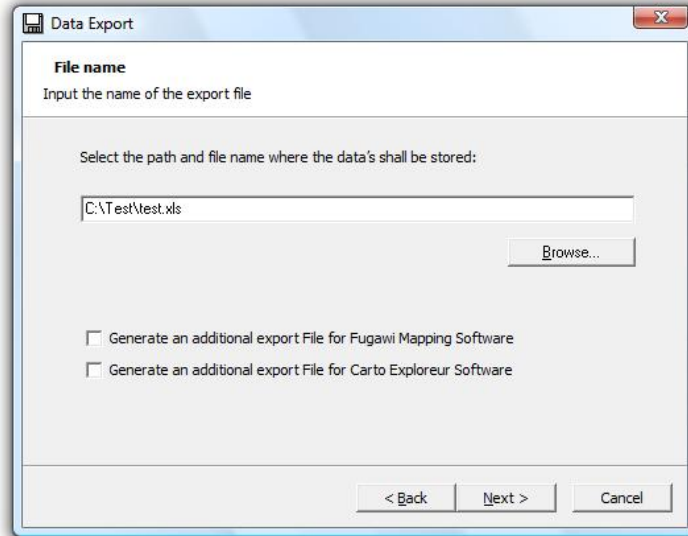


Data Export

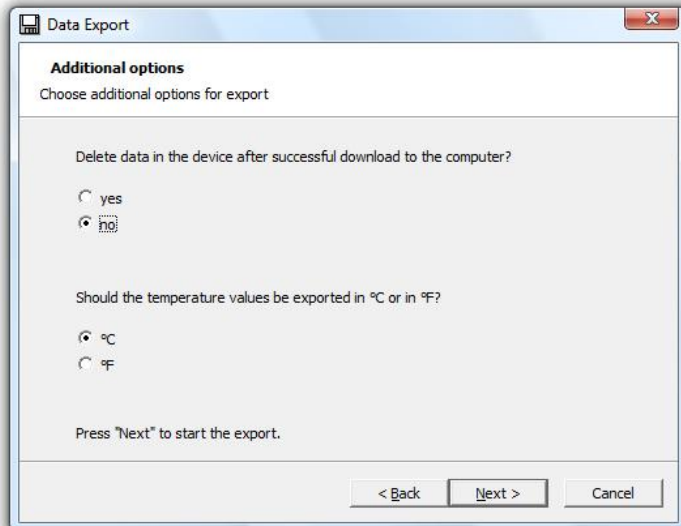
- Data Export can be made as a Text file (.txt) and as an Excel file (.xls). Please select the needed file format, then confirm with the Next button.



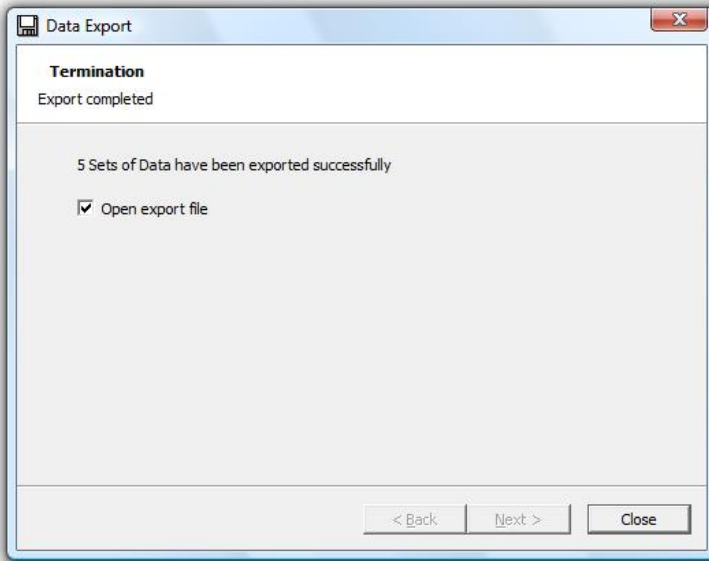
- In the next window, please select the path and file name the data shall be stored to.
For example. c:\Programs\RetroTools\14122002_measurements.xls.
- If you wish to import the data into Fugawi Mapping Software, you have to check "Generate an additional file for Fugawi Mapping Software".
- Confirm with Next button.



- In the next window, please indicate whether the data should be deleted from the device after downloading
- Please also decide whether temperature indication in the export file should be in Celsius or Fahrenheit.

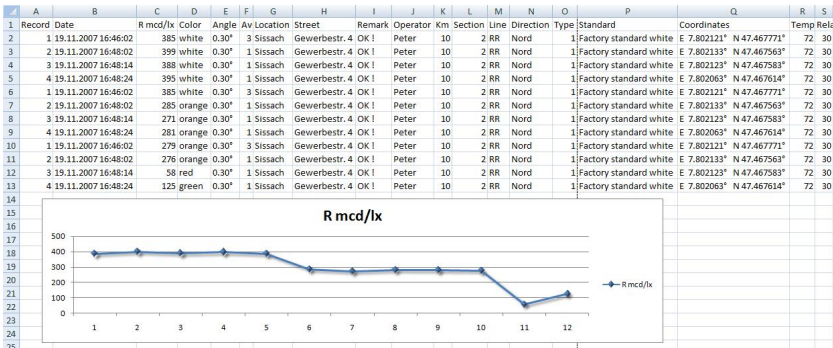


In the last window you can decide whether you would like to open the export file right away or not.



The measuring data is now stored in the indicated data list.

The data can be used for making some analyses. The Excel-export file is very useful for this (see sample below).

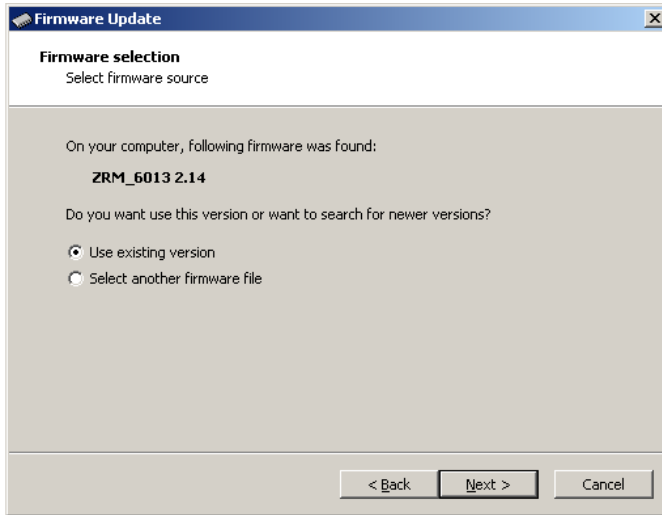


17.3.5 Firmware update

To start up the Firmware update the corresponding Icon has to be double clicked.



After that, 2 Update possibilities can be chosen:



17.3.6 Use the existing version

With this option the latest firmware file of the local saved files will be installed. This is displayed above, in this example: ZRM-D1 1.18

17.3.7 Select another firmware file

With this option a file can be chosen and installed from all local saved files. This allows installing an older version of the firmware if needed.

After choosing the option the firmware will be saved automatically and the device will be restarted, afterwards the firmware update can be closed. At the information desk of the ZRP 6030 the installed firmware version will be shown.

17.4 RetroTools Update

The RetroTools software is not updating automatically. New versions can be obtained at Zehntner e.g. on the occasion of the maintenance and calibration.

Before a new version of the RetroTools can be installed, the former version has to be uninstalled.

18. System diagram

ZRP 6030 with options



Connections:

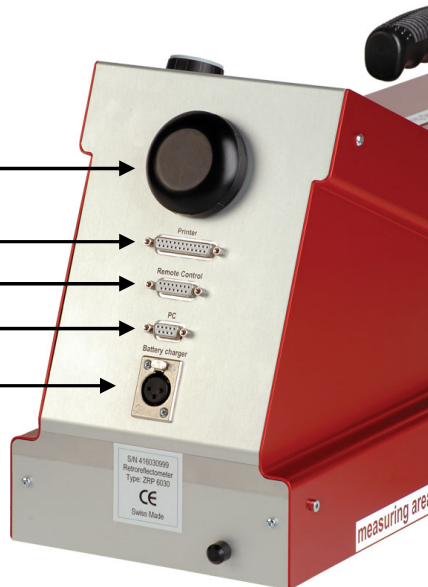
WAAS GPS unit

Printer

Remote Control

PC

Battery charger



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