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1. Introduction

1.1 Instructions as to Application

1.1.1 Materials

The IML-Resi measuring instrument has been designed for use at wooden materials (wood, trees). Inappropriate utilization may cause damages to the measuring system and/or the material to be examined.

1.1.2 Certainty of Reading

The measuring results gained by utilizing the IML-RESI are not self-explanatory, they require qualified interpretation. Any conclusions with respect to the examined object (e.g. tree) will be left to the sole responsibility of the person who examines. The manufacturer of the instruments will not be responsible for wrong interpretations and conclusions, he recommends the user to attend special seminars and training.

1.2 General

1.2.1 Conception

It was the intention of those who developed the IML-RESI system to make available a measuring system for practical utilization, which is easy to handle, sturdy, and precise at the same time.

1.2.2 Structure of the System

As to stability, the IML-RESI system has been designed to meet the special requirements of practical examination of trees, structural timbers, poles, and wooden structural materials. All switches and keys required for operation are located in the handle of the measuring instrument and, thus, within easy reach.
Electronic control, printer, power supply are located in the electronic unit which may be connected to the measuring instrument means of a cable.

1.2.3 Moisture

You should generally avoid any contact of the IML-RESI measuring system with water and moisture, despite its splash-proof casing. Although the main components are protected against intake of water, you should – in order to avoid malfunction or failure – consider that electronic instruments are generally sensitive to moisture.

1.3 Application

1.3.1 How to Hold the Drilling Instrument

There is no special way of holding the IML-RESI measuring instrument. The measuring results do not depend on a certain orientation. You will, however, have to ensure your own stability during each measuring procedure, as, when the instrument penetrates the material to be examined, there will be forces acting in opposite direction of drilling.

1.3.2 Examination of Wooden Poles

If you examine a wooden pole, it is expedient to drill at an angle of e.g. 45°. A 45° adapter (optional) will serve as support for the instrument for utilization in inclined position. Thus, by means of a special drilling needle, the examination of wooden poles will be easier.
1.4 Maintenance

On principle, maintenance of the IML-RESI measuring instrument will be carried out by the manufacturer or by an authorized service company. According to the conditions of guarantee, the drilling instrument will have to be sent in for a first inspection after approx. 1000 measurements or after one year at the latest. Afterwards, we recommend an inspection after every 1000 measurements or at least once a year.

1.5 Guarantee Conditions

The term of guarantee for the IML-RESI system is 24 months. Guarantee is based on the condition that the instrument will be used exclusively for the purposes it has been designed for and that the safety instructions below are observed. The manufacturer will not be liable for damages owing to inappropriate utilization or handling. The warranty for defects does not cover normal wear and tear (wearing parts and the like), nor damages that result from inappropriate or negligent handling and excessive strain that have not been provided in the contract of purchase. See the manufacturer's General Terms of Business.

*The drilling instrument must not be opened by any person, only by the manufacturer or an authorized service company. Otherwise, the guarantee will become extinct.*
1.6 Conditions of Use

The user recognizes the manufacturer's conditions of use as soon as he puts the instrument into service. The instrument must not be put into service, unless the present Instructions for Use have been thoroughly read. The manufacturer will not assume any liability for inappropriate handling, nor for damages caused by the application of the instrument for purposes that it has not been provided for, nor in case of non-observance of the safety instructions.

1.7 Safety Instructions

The instrument must not be utilized but for the purpose described in the present Instructions for Use (examination of wood or material that is similar to wood). The manufacturer will not assume any liability in case of inappropriate utilization of the instrument. The safety instructions of the manufacturers of other devices bought along with this instrument or required for the operation of this instrument will have to be observed.

The safety pins mounted to the instrument ensure that the system will only start if the instrument has been correctly applied to the object to be examined. Removal or bridging of the safety installation is strictly prohibited.

The manufacturer will not be liable for inappropriate utilization of the instrument. The buyer agrees to hand the present Instructions for Use over to any person whom he may let the instrument and to draw his attention to the notes concerning danger.

For normal utilization of the IML-RESI system, opening of the drilling instrument will not be required. If the drilling instrument has been opened by any person that has not been authorized by IML, the guarantee will immediately become extinct.
2 Scope of Delivery

Prior to familiarizing yourself with the instrument, please check, whether the package contains all components comprised in the scope of delivery of the IML-RESI B Line:

- Case
- Drilling instrument with handle and cable
- Electronic unit (incl. printer and operating elements)
- Digital drilling depth indicator
- Battery charger
- Quiver with drilling needles
- Universal pliers
- Stand (ring and two telescope legs)
- Printer paper
- Data transmission cable for PC
- Analysing software B-Tools or B-Tools Pro

Should any of the above components should be missing, please contact your distributor.
3 Operating and Indicating Elements

The following is a description of the operating and indicating elements of the drilling instrument and of the electronic unit.

3.1 Drilling Instrument

1. Drilling needle
2. Safety pins
3. Key for exchange of needle and for amplitude amplification
4. Key for reverse movement and socket for digital drilling depth indication
5. Start key with locking lever
6. Connection cable
3.2 Electronic Unit

The figure below shows the expanded electronic unit with memory operating unit.

1. Display indicating battery voltage
2. Key for switching-on of the printer
3. LED indicating amplitude amplification
4. Display indicating the advance stage selected
5. Key for change of advance stage
6. Key-operated switch for switching-on of electronic unit
7. Connection socket for drilling instrument
8. Connection socket for charger
9. Connection socket for data transmission cable
10. Key for operation of memory (only expanded electronic unit)
11. LC-Display for indication of various information (expanded electronic unit only)
12. Thermo-printer
13. Key for indication of battery voltage
14. Key for paper feed
4 Functional Description

4.1 Switching on the Electronic Unit

The drilling instrument will be connected to the electronic unit by means of the connection cable. When inserting the plug, please pay attention to the direction of the contact guides, as otherwise the contacts may be damaged.

Switch the electronic unit on by turning the key-operated switch. In case of the electronic unit with memory operating unit, the display will show the name of the instrument and the version number. In case of the electronic unit without memory operating unit, a status report will be printed out. In both cases, a short signal will sound indicating that the instrument is ready for service.

If the instrument has been out of use for 10 minutes, a warning signal will sound. Switch off the warning signal by pressing any key of the electronic unit or the drilling instrument (except Printer On and Paper feed).

4.2 Drilling Depth Indication

The drilling depth indicator included in the scope of delivery may be connected to the drilling instrument. It serves for indicating the actual drilling depth during the measurement, which allows observing the progress of the drilling depth. This is of particular importance in case of structural timber, to prevent damage to the head of the drilling needle. You may fix the indicator to the drilling instrument in various positions by means of the elastic ribbon.

The drilling depth indicator must only be connected with the socket on the drilling instrument. If you connect it to the charging socket of the electronic unit, both the depth indicator and the electronic unit may be damaged.
### 4.3 Advance Speed

The *Advance speed* key (on the electronic unit) serves for selecting the desired advance stage. Factory setting:

<table>
<thead>
<tr>
<th>Advance stage</th>
<th>Advance speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 cm/min</td>
</tr>
<tr>
<td>2</td>
<td>10 cm/min</td>
</tr>
<tr>
<td>3</td>
<td>15 cm/min</td>
</tr>
<tr>
<td>4</td>
<td>20 cm/min</td>
</tr>
<tr>
<td>5</td>
<td>30 cm/min</td>
</tr>
<tr>
<td>6</td>
<td>40 cm/min</td>
</tr>
<tr>
<td>7</td>
<td>50 cm/min</td>
</tr>
</tbody>
</table>

The advance stage is shown in the display above the key.

If the advance speed is too high, the overload protection of the instrument will usually respond and abort the measurement in order to prevent the destruction of the drilling needle or other components. On principle, you should pay attention to the noise caused by the drilling instrument during the drilling procedure. As you can recognize the variations in density of the annual rings from acoustic signals, you can likewise perceive cavities, obstacles or contact with stones or other non-wooden materials. Prompt interruption of the drilling procedure will prevent the destruction of the sensitive point of the needle.

As to selection of the optimal advance speed, please refer to the following table and to the instructions and hints to be found in the respective literature. To ensure a verifiable evaluation it is expedient and necessary to select the same advance speed for the examination of the same species of trees or types of wood. Therefore, the switch serving for changing the advance speed is not located on the drilling instrument but on the electronic unit.

*As a rule, you should select an advance speed that allows measurement below the maximum load to be expected from the tree or timber to be examined. You should, therefore, prefer a lower advance speed to a higher one.*
As to the selection of the advance speed, please refer to the table below, which serves as a guideline. Owing to the different characteristics of the individual species of wood, the advance stage will have to be determined in each single case of application.

<table>
<thead>
<tr>
<th>Object</th>
<th>Wood species</th>
<th>Usual advance speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard wood</td>
<td>Carpinus, Quercus, Fagus, Acer, Platanus, Castanea, ...</td>
<td>6-30 cm/min</td>
</tr>
<tr>
<td>Soft wood</td>
<td>Abies, Pinus, Picea, Tilia, Betula, Aesculus, ...</td>
<td>20-50 cm/min</td>
</tr>
<tr>
<td>Structural timbers, poles</td>
<td>Quercus, Picea, Pinus, Abies, Larix, Thuja, ...</td>
<td>10-50 cm/min</td>
</tr>
</tbody>
</table>
4.4 Amplitude

The Amp. key (on the drilling instrument) serves for selecting the desired sensitivity of the instrument. Depending on the hardness of the wood, you may enlarge or reduce the height of the amplitude. The factor of amplification selected will be indicated by the LED on the electronic unit. The table below shows the different states of the LED.

<table>
<thead>
<tr>
<th>State of the LED</th>
<th>Amplification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Factor 1</td>
</tr>
<tr>
<td>ON</td>
<td>Factor 2</td>
</tr>
<tr>
<td>flashing</td>
<td>Factor 3</td>
</tr>
</tbody>
</table>
4.5 Execution of a Drilling

To start a drilling procedure, at least one of the two safety pins and the start key must be pressed. The drilling needle will start rotating, and after 0.5 seconds, the advance will start at the speed selected. The start key may be locked by means of the locking lever.

If the printer is switched on, first the header and then the curve will be printed out. Print-out will be effected simultaneously only if the advance speed is low enough to allow the printer to make up for the time lost by printing the header.

The measurement will regularly end if:

- the start key and / or both safety pins are released
- the maximum drilling depth has been reached
- the Reverse key on the drilling instrument is pressed.

The measurement is aborted if:

- the overload protection of the instrument responds
- the battery voltage amounts to less than 33 volts.

The following applies to the expanded electronic unit with memory operating unit:

If a measurement is aborted, the LC display will show the respective message. Please confirm this message by pressing the Cancel/OK key.

In case of the electronic unit without memory operating unit the respective message will appear on the print-out. No confirmation will be required.

Reverse motion of the advance unit will be controlled in dependence of the load and regardless of the advance speed. This means that the higher the load is, the lower is the withdrawal speed of the drilling needle. This ensures that the drilling needle will not be withdrawn too fast in hard wood.

After the advance unit has run back into the rear position, the drilling motor will keep on running for another approx. 2 seconds before it is switched off. During this time, the instrument will carry out a no-load current measurement of the drilling motor. This is equivalent to an automatic zero line adjustment.
You are, therefore, recommended to wait until the motor is switched off in the rear position in order to obtain the actual alignment. The measured value will be printed out under the designation of Offset. If there is a deformed drilling needle in the instrument or the mechanism is defective, the offset value will increase owing to the higher frictional forces. Thus, the increased value allows the detection of an anomaly of the drilling instrument. Normally, the value should remain under 15%.

Please proceed as follows to withdraw the drilling needle without starting a new measurement:

- Press and hold the Reverse key
- Press the Start key
- Release the Reverse key.
4.6 Thermo-printer

The thermo-printer integrated within the electronic unit serves for printing out the measuring curve during the measurement. The thermo-paper, just like fax paper, will have to be protected from heat and prolonged exposure to direct sunlight.

Switch on the printer by pressing the Printer On key. Readiness for service is shown by the Printer On key and the Paper feed key lighting up. Flashing of the Printer On key shows that the printer receives and prints out data. If there is malfunction of the printer (e.g. no paper), the Paper feed key will flash.

To place a new paper roll, please take the following steps:

- Switch off printer
- Open printer cover
- Turn lateral fixing lever upward
- Cut or tear paper slantwise and pass it below the printing cylinder until it appears above the cylinder
- Turn lateral fixing lever downward
- Switch on printer and press Paper feed key
- Pass paper through slot in printer cover and close cover.
4.7 Drilling Needles

4.7.1 Preservation

The drilling needles will have to be kept dry to prevent oxidation (e.g. rust formation) of the surface. This may lead to particles getting into the guiding mechanism of the instrument during drilling, thus affecting its operability. Especially for transportation purposes, you may keep the drilling needles in a quiver, which may be put into the case.

4.7.2 Stability

The dimensions of the drilling needles of the IML-RESI system have been designed so as to allow the least possible damage to the object to be examined. This means that the needles are extremely thin and sensitive. You should, therefore, treat them with the greatest care.

4.7.3 Wear and Tear

Above all, the service life of the drilling needles depends on appropriate handling and on the density of the wood to be examined. Wear and tear will mainly affect the front part of the needle point. If you use a needle with a worn-out point, the consequence will be lateral deviations from the straight drilling direction and decrease of the density resolution. Thus, reproducible and reliable annual ring analyses and the examination of zones of transition to decay will become difficult, if not impossible.

Wear of the point of the drilling needle will have to be visually checked after a certain number of drillings or after certain events (such as drilling on stone or other non-wooden materials). Considering examination of trees, the mean service life of the drilling needle will be 200-300 drillings in case of conifers and soft leaf-wood and 50-100 drillings in case of hard wood. This analogously applies to structural timbers, however, in this case, certain events (e.g. contact with stones) or inappropriate handling may entail premature wear.
Drilling with worn-out drilling needles may cause damages to the IML-RESI system and to misinterpretation of the measuring curves, owing to - for instance - deviations from the straight drilling direction. The drilling needle must not - under no circumstances - be reground. Regrinding of the needles may reduce their overall length and may, therefore, be withdrawn too deeply into the drilling instrument by the motor running in reverse direction. This may lead to damages to the front guiding sleeve, the drilling needle support, and the motor-gear system as well as to the linear guiding elements. Such damages and consequential damages can be clearly identified and will entail immediate extinction of the guarantees on the part of the manufacturer. Moreover, the ratio of the diameter of the needle head and the shaft of reground needles does not comply with the set value. Hence, the measuring profiles will have significantly different features, which may lead to misinterpretation of the measuring curves.

4.7.4 Exchange

In the drilling instrument, the needles will be connected to the motor shaft by means of an automatic drill holder. For removal, the needle must extend from the instrument by at least 2 cm. Then, hold the needle by means of the pliers supplied.
Upon pressing the key *Change Needle* on the drilling instrument, the needle will come off the drill holder and may be pulled out by gently drawing.

Then insert a new drilling needle as far as possible into the instrument. Fix the needle in the drill holder by either switching on the drilling instrument for a short moment or by manually turning the needle clockwise. Now you may reset the motor to the rear position.

### 4.7.5 Disinfection

At the front of the drilling instrument, the front guiding sleeve is located. This sleeve is equipped with a piece of felt which serves for removing soiling from the drilling needle. This piece of felt may be soaked with alcohol. The drilling needle will thus additionally be disinfected to minimize the risk of transmitting putrefactive agents.

In order to remove the front guiding sleeve, the drilling needle will first have to be removed from the instrument (refer to the section Exchange of the Drilling Needle). Then loosen the three screws and remove the sleeve. To impregnate the piece of felt inside the guiding sleeve, immerse the entire sleeve into the liquid for several minutes. Then attach the sleeve and insert the drilling needle anew.
4.8 Deleting all Measurements (Standard electronic unit only)

Please take the following steps to delete all measurements in the electronic unit without memory operation unit:

- Switch off electronic unit
- Switch on printer
- Press key Change Needle and Amp. key
- Hold both keys and switch on electronic unit
- Wait until the status report has been printed out completely
- Release both keys.

The status report will contain a message confirming that all measurements have been deleted.
4.9 Memory Operation Unit (expanded electronic unit only)

The following is a description of the memory operation unit, which is part of the expanded electronic unit. The indicating and operating elements are located on the right side of the electronic unit.

4.9.1 Information Menu

After the electronic unit has been switched on, the information menu is activated. This menu serves for displaying various information on the instrument. Press key 1 (left) or key 2 until the following message appears:

0 measurements
stored

In this case, the first information is the number of measurements stored (here: 0 measurements). After pressing key 1, the following message will be shown:

Rem. length: 3814.07 cm

It shows the remaining storage capacity. The above example shows that the memory allows the storage of another 3,814.07 cm of drilling. The next information will appear after pressing key 1.
The identification is shown. In the above example, no number has yet been entered. The user-defined identification, which may be a tree number, is assigned to the measurement. Entry and modification of the identification are described below. Upon pressing key 1 anew, the charge of the battery will be displayed.

The battery charge will be displayed in 4 steps: *Full*, *medium*, *low*, and *empty*. If the display reads 'empty', it is not possible to start a measurement.

Upon pressing key 1, the date and the hour will be displayed:

Upon pressing key 1 again, the number of measurements stored will be displayed. Key 2 serves for scrolling backward through the information menu.
4.9.2 Display During the Measuring Procedure

When a drilling procedure is started, the display will show the drilling depth and the advance speed. If the printer has been switched on, the above data will not be displayed before the header has been printed out.

![Display showing 3.89 cm depth and 30.1 cm/min speed](image)

The advance speed displayed is the actual, measured advance speed of the drilling instrument (not the selected one). You may, thus, check whether the actual advance speed equals the selected speed.

The measurement will be automatically stored as soon as the drilling procedure has been terminated. The display will read:

![Measurement stored message](image)

This message will be shown for 2 seconds. Then, the information menu is displayed again (e.g. the remaining length). If, owing to full memory, the measurement cannot be stored, the following message – which must be confirmed by pressing the Cancel/OK key – will be displayed instead of 'Measurement stored':
If a measurement is aborted owing to overload or low battery voltage, a message will be shown on the display. Confirm this message by pressing key 4 (Cancel/OK).
4.9.3 Deleting the Last Measurement

To delete the last measurement, press key 1 for approx. 2 seconds. The display will read:

Delete last measurement?

The last measurement will actually be deleted upon pressing key 4 for approx. 2 seconds. The following message will be displayed.

Last measurement deleted!

If you do not want to delete the last measurement, press key 4 only for a short moment. The display will read:

Last measurement not deleted!

If you want to delete the last measurement, although there is no measurement stored, the display will show a message.
4.9.4 Deleting all Measurements

To enable deletion of all measurements, key 2 will have to be pressed for approx. 2 seconds. The display will read:

```
Delete all measurements?
```

To actually delete all measurements, press key 4 for about 2 seconds. The following message will be displayed:

```
All measurements deleted!
```

If you do **not** want to delete the measurements, press key 4 for a short moment. The display will read:

```
All measurements not deleted!
```

If you want to delete all measurements, although no measurement is stored, a message will be displayed:
4.9.5 Changing the Identification

To enable entry or modification of the identification, press key 3 for about 2 seconds. The display will now be in the identification entry mode:

![Change ident.: ](image)

Select a cipher by pressing key 2 several times for a short moment. Short pressing of key 1 will move the cursor to the next space or cipher. To activate the letter mode, press key 3 shortly. The letter 'A' will be displayed and you may select the desired letter by pressing key 2. To get back into the numerical mode, press key 3 shortly. The following figure gives an example:

![Change ident.: 162-A13](image)

To confirm the modification, press key 4 for about 2 seconds. The display will show the following message:

![Identification changed!](image)
If you do **not** want to confirm the modification, press key 4 shortly.
4.9.6 Printing the Last Measurement

Your have the option of printing out the measurement either with the same or with a different amplitude amplification.

Select the amplitude amplification you want to have the last measurement printed out with (cf. section 4.4 Amplitude). Now press key 1 and key 2 simultaneously for about 2 seconds, until the following message appears:

```
Print last measurement?
```

Ensure that the printer is switched on. The last measurement will be printed out upon pressing key 4 for about 2 seconds. The following message will appear:

```
Printing last measurement...
```

If you do not want to print out the last measurement, press key 4 shortly. The display will read:

```
Last measurement not printed!
```
5 Charging the Batteries

The batteries in the electronic unit will be charged by means of the charger supplied:

1. LED On
2. LED Status
3. Key Discharge - Charge
4. Key Prompt Charge
5. Connection cable for electronic unit
6. Mains connection
7. Fuse
8. Main switch
5.1 Switching-on

After the charger has been connected to the mains and switched on, the green LED will light up. Now connect the white cable with the respective socket on the electronic unit.

*The charger must only be connected to the socket on the electronic unit. If it is connected to the socket on the drilling instrument, both the charger and the electronic unit may be damaged.*

After connecting the charger to the electronic unit, you have to select one of the following functions.

5.2 Discharging - Charging

To avoid the memory effect (reduction of capacity), it is essential to completely discharge the battery before it is charged anew. To discharge and automatically charge the battery, press the key *Discharge - Charge*. The battery will now be discharged to approx. 30 – 32 Volt, then the charging procedure will be automatically started. The red LED will indicate the activated function of the charger as follows:

- **Standby**: red LED lights up short with longer interruptions
- **Discharge**: red LED lights up long with short interruptions
- **Charge**: red LED lights up permanently
- **Batt. full**: red LED flashes in equal intervals

When you have connected a battery to the charger, selected a function, and the charger turns to the standby mode, this indicates that the battery voltage is below 30-32 Volts. This may happen if you haven’t charged the battery for a prolonged period and it has, therefore, been deeply discharged. If this is the case, the charger will regenerate the battery (voltage will slowly increase) and wait until the battery voltage has reached approx. 30-32 Volts. Then the charger will turn over to the function selected (e.g. 'Discharge - Charge').
5.3 Prompt Charging

To charge the battery without discharging it previously, press the key *Prompt Charge*. Should the function 'Discharge' be active, you will have to stop it before prompt charging. For this purpose, disconnect the charger from the electronic unit and wait for about 2 seconds. Then reconnect the charger with the electronic unit and start the charging procedure.

*Please prompt-charge the battery only in case of high urgency to prevent the memory effect (reduction of capacity)!*

5.4 No Simultaneous Charging and Drilling

The battery charger is equipped with an intelligent control, which recognizes whether the battery is or is not full by the increase and decrease of the battery voltage.

As the voltage will break down for a short moment when the electronic unit is switched on or during the drilling procedure, it might happen that the charger recognizes this voltage fluctuation and indicates *Battery full* by mistake. Therefore, the electronic unit must never be in operation or switched on during the charging procedure.
6 Problems

6.1 The Drilling Needle Jams

The drilling needle may jam in the material pierced, if

- the advance speed is too high,
- it hits hard, non-wooden materials (stone, splinter...),
- a drilling process in green wood has been stopped and re-started more than several minutes later and the needle has stuck in the wood during this time,
- the drilling instrument has been canted during the measuring process, or
- the drilling instrument has been improperly handled in another way.

In such cases, the overload protection will usually stop the drilling procedure. If you should not be able to remove the needle from the drill hole by turning it, you will have to remove it from the drill holder as you would do for exchange of the drilling needle (by pressing the respective key and slowly withdrawing the drilling instrument). The projecting part of the needle shaft should be extracted or cut off.

If you should not succeed in removing the needle from the drill holder this way, you will have to cut it off between the wood and the drilling instrument. The part that remains in the drill holder will be removed as you would do for exchange of the drilling needle and replaced by a new drilling needle.

6.2 Charge of the Batteries

If the charge of the batteries decreases significantly after some time, you should first think of the following:

- Have the batteries always been completely discharged? (If not, you should totally discharge and re-charge them several times.)
- Is the outdoor temperature below 0°C? (If yes, you should warm up the electronic unit to approx. 20°C.)

If any of the above does not bring a solution to your problem, please contact your service company.
## 7 Technical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.04 mm</td>
</tr>
<tr>
<td>Storage capacity:</td>
<td></td>
</tr>
<tr>
<td>- in case of 256 kB</td>
<td>approx. 8 m</td>
</tr>
<tr>
<td>- in case of 512 kB</td>
<td>approx. 18 m</td>
</tr>
<tr>
<td>- in case of 1MB</td>
<td>approx. 38 m</td>
</tr>
<tr>
<td>Maximum number of measurements:</td>
<td>200</td>
</tr>
<tr>
<td>Voltage supply:</td>
<td>36V NiCd batteries</td>
</tr>
<tr>
<td>Switch off warning:</td>
<td>after 10 minutes</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td>0°C to 50°C</td>
</tr>
</tbody>
</table>
8 B-Tools / B-Tools Pro

8.1 System Requirements

- IBM compatible PC with processor min. 486SX/25 MHz
- Min. 8 MB RAM (16 MB recommended)
- Min. 2 MB hard disk memory
- Graphics adapter min. VGA
- Windows 95 or later

*Attention:* The higher the resolution of the monitor, the clearer will be the presentation of the drilling curves. To obtain the optimum result, please choose the highest possible resolution of your monitor.

8.2 Starting B-Tools / B-Tools Pro

If you haven't changed the default settings during installation, you may now start the program by proceeding as follows:

- Click the Start button (Task bar)
- Select Programs
- Select *IML-Software*
- Select *B-Tools* or *B-Tools Pro*
- Start *B-Tools* or *B-Tools Pro*
8.3 Functional Description

Upon start of the program, the following window will appear:

Below the main menu (File, IML-Resi, View, Options, ?) you see the toolbar, which serves for direct selection of essential functions by clicking an icon with the mouse. In the following, the functions of all menu items of the main menu are described. If there is an icon for any of the menu items in the toolbar, this icon is printed beside the description.

At the bottom of the window you see the status bar, which shows the description of the menu item selected.
8.3.1 Menu Item File

8.3.1.1 Open

This menu item serves for loading a measurement from a drive (e.g. hard disk). Upon selecting this menu item, a dialog box will appear, by means of which a measurement may be opened. During installation of the software, ten examples have been installed. Choose any of these measurements and press the OK button to open the measurement. To obtain a full screen view, press the Maximize button.

**Hint:** You may select and open several curves simultaneously in the dialog box Open by means of the shift key and the Ctrl key.
8.3.1.2 Close

This menu item serves for closing the current measurement. If you have not saved the modifications made in the measurement so far, the program will automatically ask you, whether you want to save the modifications.

8.3.1.3 Close all

This menu item serves for closing all active measurements. If you have not saved the modifications made in any of the measurements so far, the program will automatically ask you, whether you want to save the modifications.

8.3.1.4 Save

Select this menu item, if you have modified a measurement and want to save the modifications. However, in case that several measurements are opened, only the active measurement is saved. You can recognize the current measurement by title bar appearing in a different colour from the one of the other opened measurements.

8.3.1.5 Save as...

Select this menu item, if you want to save the current measurement in another file. A dialog box will appear, where you may choose or create the target directory. After having chosen the target directory, you may enter a new name of the measurement and save the new file by confirming.
8.3.1.6 Export... (B-Tools Pro only)

Select this menu item, if you want to export the measurement into a different format. After having selected this menu item, the following dialog box will appear:

There are two ways of exporting a measurement available:

1. The ASCII format: If you export the measurement into the ASCII format, you will obtain a text file containing all data relating to the measurement. This file may be imported into another program (e.g. Excel®) for you to adapt the curve or the assessment to your requirements. The data of the curve start in line 36.

2. The EMF format: If you export the measurement into the EMF format (enhanced Windows meta file), you will obtain a file which saves the curve in the shape of a graphical representation. You may then import this file into a word processing program in order to document or record it. If you want to export the measurement into this format, select the entry Enhanced windows meta file (*.EMF) in the selection box Type of file.

You may export all opened measurements simultaneously by entering the key word .A as a file name (do not forget the full stop). Upon pressing the Save button, all measurements will be exported in the format selected.
8.3.1.7 Print...

This menu item serves for printing out the current measurement. Upon selection of this menu item, a dialog box will appear, by means of which you may set the printer options. Print-out will be done in the view selected (normal, divided or full-screen).

8.3.1.8 Print all... (B-Tools Pro only)

Upon selection of this menu item, the following dialog box will appear:

Select the printing option One page per curve, to print out all opened measurements one after the other. Print-out will be done in the view selected. If you have selected the view Individual, all measurement will be printed out in the view currently set.

Select the printing option Overview, to obtain a print-out of several curves on one page. After you have selected this option, you may fix the number of curves to be printed on the page (max. 10).

Upon confirmation of this dialog box by pressing the OK button, a dialog box will appear by means of which you may select the printer options. The program automatically selects the orientation of the page (portrait or landscape) depending on the number of curves to be printed (in case of the option Overview).
8.3.1.9 *Files last opened*

Above the menu item *Exit*, the four measurements that have last been opened are shown. You may directly open any of these four measurements by selecting it.

8.3.1.10 *Exit*

Select this menu item, if you want to quit the program. If the modifications of a current measurement have not yet been saved, the program will automatically ask you, whether you want to save these modifications.
8.3.2 Menu Item IML-Resi

8.3.2.1 Transmit measurements...

This menu item serves for transmitting all measurements from the IML-Resi to your PC.

Previously, however, you will have to connect the electronic unit to your PC by means of the cable supplied. Insert one of the plugs into the socket PC on the electronic unit, and connect the other end of the cable with a free serial interface on your PC. If you select an interface different from COM2, you will have to checkmark the respective interface in the software (cf. section 8.3.5.3).

Upon selection of this menu item, a dialog box will appear, by means of which you may choose the target directory for these measurements.

As to the file name, there are two possibilities:

1. Enter a root name (any string of characters **without full stop**). In our example, the name entered is *Test*. The file name is then formed from the root name entered and the measurement number. If, for instance, four measurements are transmitted, the file names of these measurements will be:

   Test001.rgb
   Test002.rgb
   Test003.rgb
   Test004.rgb
2. Enter .ID in the field **File name** (do not forget the full stop). The file name will then be formed from the identifier of each measurement (e.g. the tree number) and the measurement number. If, for instance, four measurements have been carried out and each of these have been given an identifier:

- Measurement 1: 98-001
- Measurement 2: 98-002
- Measurement 3: 98-002
- Measurement 4: 98-003

the file names after transmission of the measurements will be the following:

- 98-001M001.rgb
- 98-002M002.rgb
- 98-002M003.rgb
- 98-003M004.rgb

**Attention:** Since the special characters `\ / : * „ > < |` must not be used in the file name (Windows default), please pay attention to **not using** these characters when entering the identification (option 2 above). If, however, you want the file name to be formed from the root name (option 1), you may use these special characters for the identification.

After the file name has thus been entered and you have confirmed by pressing the **OK** button, the measurements will be transmitted:

![Transmit measurements](image)

The upper progress indicator shows the overall progress, the lower progress indicator shows the progress of the measurement currently transmitted. If you want to quit the transmission, press the **Cancel/OK** key on the electronic unit and wait for the transmission to be aborted.
8.3.2.2 Delete all measurements

Select this menu item to delete all measurements from the IML-RESI. Upon selection of this menu item, a dialog box will appear, asking you, whether you really want to delete all measurements:

![Warning dialog box](image)

**Attention:** Upon pressing the YES button, all measurements are irrevocably deleted!

8.3.2.3 Change header data...

The headers will be printed out by the electronic unit at the beginning of each measurement. This menu item serves for modifying the data. Upon selection of this menu item the following dialog box will appear, which shows the headers actually stored in the electronic unit (ensure that your PC is connected to the electronic unit).

![Header data dialog box](image)

After having modified the headers, press the OK button in order to modify the headers in the electronic unit.
8.3.2.4 Options

This menu item serves for managing the system settings of the electronic unit. The following is a description of the individual submenu items.

8.3.2.4.1 Change Advance speed

Upon selection of this menu item, a dialog box will appear showing the advance speeds actually set in the electronic unit (ensure that your PC is connected to the electronic unit).

You may now enter into the cases the desired advance speed (6-50 cm/min.) for each single advance stage. The Advance speed key on the electronic unit serves for selecting any of these advance speeds. You may reset the configuration to factoring setting by pressing the Reset button. Upon pressing the OK button, the modified advance speeds will be transmitted to the electronic unit.
8.3.2.4.2 Change date / time...

This menu item serves for setting the date and the time of the electronic unit. Upon selection of this menu item, the following dialog box will appear:

The system time of your PC will be automatically entered into the cases. After having checked the data, press the OK button.

8.3.2.4.3 Change language

Select this menu item to select the language of the electronic unit. The following dialog will appear (ensure that your PC is connected to the electronic unit).

After having selected the desired language, press the OK button.
8.3.3 Menu item Data

8.3.3.1 Measuring / object data...

This menu item serves for modifying the measuring and object data of the active measurement. Upon selection of this menu item, a dialog box will appear:

Upon pressing the OK button, the modifications will be shown in the main window.

Hint: You may invoke the dialog box as well by double-clicking with the left mouse button the case Measuring / object data.
8.3.3.2 Assessment...

To facilitate assessment of the measurement, you should previously make a list of the most current special terms. For this purpose, select the menu item Options – Assessment. The following dialog will appear:

Enter a new term into the case New entry. Press the Add button to add this term to the list. The term will be added to the list in alphabetical order. If you want to delete a term from the list, highlight this term and press the Delete entry button.

If the function Replace grey scale values by patterns (b/w printout) is activated, the coloured markings above and below the curve will be filled with patterns in order to achieve a clearer differentiation in case of black and white printout.

The following figure shows an example of an assessment list.
After you have thus made your assessment list, assessment of the curve may be carried out in two different ways:

1. Manual Assessment

Upon selection of the menu item *Data – Assessment* the following dialog box will appear:

![Assessment Dialog Box](image)

The cases *From* and *To* serve for entering the zone to be marked. In the case on the right side, you may either enter a term (e.g. entrance of needle) or select a pre-defined term from the assessment list by clicking the arrow. If you want to delete all cases, press the *Delete all* button.

Upon pressing the *OK* button, you can see the modifications in the main window. The colours of the markings above and below the curve may be individually changed. For the description, please refer to section 8.3.5.4 *Colours*.

**Hint:** You may invoke the dialog box as well by double-clicking with the left mouse button the case *Assessment*.
2. Assessment by Means of the Mouse

If you want to assess the curve by means of the mouse, please press the right mouse button. The following context menu will be shown:

```
Assessment 1
Assessment 2
Assessment 3
Assessment 4
Assessment 5
Assessment 6
```

Please select the line where you want the assessment to be entered. A line will appear (if the mouse pointer is positioned above the curve), which marks the beginning of the marking. As soon as you have positioned the line at the beginning, press the left mouse button. A second line will appear, by means of which you may fix the end of the marking. Upon pressing the left mouse button again, the above assessment dialog box will appear. The beginning and the end of the marking will be automatically entered into the cases. If necessary, you may manually modify the value. Now, please enter an assessment term either manually or by selecting one from the assessment list.

Upon pressing the OK button, you can see the modifications in the main window. You may now carry out the next assessment by pressing the right mouse button.

If you click the Continue button instead of the OK button, the next measurement will automatically be started, the programme adopting the final value of the previous measurement as starting value of the new measurement. This function serves for quickening the assessment of a curve, since each time you only have to select the end of an assessment section.

A checkmark beside an entry in the context menu shows that this assessment has already been carried out.
8.3.3.3 Comment...

Select this menu item to provide the measurement with a comment. Upon selection of this menu item, the following dialog box will appear:

![Comment dialog box]

You may enter 6 lines with 70 characters each.

**Hint:** You may invoke the dialog box as well by double-clicking with the left mouse button the case *Comment.*
8.3.3.4 *Transfer measuring / object data...*

This function serves for transferring different measuring / object data of the active measurement to all other open measurements. This is very helpful if there is a large number of measurements, since many data will have to be entered just once.

Select this function after you have edited the measuring / object data of a measurement. A dialog box will appear, where you may select the data to be adopted. Highlight the desired fields and click the OK button.

8.3.3.5 *Average the curve (B-Tools Pro only)*

Please select this menu item, if you want to add an averaged curve into the diagram. Depending on the extent to which the curve has been averaged, the tendency is more clearly recognizable. You may, however, not activate this function before the averaged curve is shown on the screen (menu View, item Average the curve, submenu Show). Upon selection of the menu item Average the curve, the following dialog box will appear:

![Average the curve dialog box](image)

You may fix the number of values to be averaged either in the case or by means of the scroll box. The Preview button serves for showing the curve without closing the dialog box. If the averaged curve meets your requirements, press the OK button to confirm the modifications and to close the dialog box.
8.3.3.6 Start annual ring analysis (B-Tools Pro only)

This function serves for measuring the annual rings and subsequently exporting the data. Upon selection of this menu item, the following dialog box will appear in the top left corner of the active measurement:

![Annual ring analysis dialog box](image)

When the mouse cursor is moved above the curve, a marker will appear. Please position this marker on the first annual ring and press the left mouse button to fix the start position. The dialog box will show the start value. Now you may highlight all annual rings (left mouse button). The dialog box will show the annual ring number, the start and end positions, and the width of the annual ring. If you want to delete the last marking, press the Delete button in the dialog box. If you want to quit the annual ring analysis, press the Quit button.

Before you quit the annual ring analysis, you should, however, save your data by pressing the Save... button. Upon pressing this button, the same dialog box as described in section 8.3.1.6 Export... will appear. The selection box Type of file serves for selecting either 'ASCII file' or 'measuring table file'.

The ASCII format serves for saving the data of the annual ring analysis in the text format so that you may import them into another application (e.g. Excel®). The data of the individual annual rings start in line 37.

The export filter Measuring table file (*.MST) serves for saving the annual ring analysis in the MST format. This file may be opened and processed by means of the software T-Tools or T-Tools Pro.

To ensure accuracy, the annual ring analysis should be carried out in enlarged view (factor 20, cf. section 8.3.4.4)!
8.3.4 Menu Item View

8.3.4.1 Normal

Select this view to get an overall view of the measurement. The curve and all relevant data will be displayed.
8.3.4.2 Divided

This view serves for dividing the curve into two parts. The upper part shows the drilling curve up to half of the overall drilling depth of the instrument and the lower part shows the other half of the curve. This stretching of the curve results in a higher resolution in x direction.
8.3.4.3 *Maximize* (**B-Tools Standard only**)

Select this menu item to obtain a full screen view of the curve. The curve having thus been stretched in y direction, its peak differences are more clearly recognizable.
8.3.4.4  **Zoom** *(B-Tools Pro only)*

This menu item contains a submenu with various factors of enlargement. Depending on the factor, the width of the curve will be more or less enlarged. You may scroll through the curve by means of the scroll bar at the bottom of the window (except in case of factor 1). Instead of the scroll bar, you may use the arrow keys to shift the curve to the right and to the left:

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⇐</td>
<td>Shift curve to the left by 1 mm</td>
</tr>
<tr>
<td>⇒</td>
<td>Shift curve to the right by 1 mm</td>
</tr>
<tr>
<td>↑</td>
<td>Shift curve forward by 1 cm</td>
</tr>
<tr>
<td>↓</td>
<td>Shift curve backward by 1 cm</td>
</tr>
<tr>
<td>Pos1</td>
<td>Start of the curve</td>
</tr>
<tr>
<td>End</td>
<td>End of the curve</td>
</tr>
</tbody>
</table>

Shifting of the curve by means of the keys is only possible if no marker is displayed.

8.3.4.5  **Mirror curve**

This menu item serves for mirrored representation of the curve. The curve will be represented from the left to the right instead of from the right to the left.

8.3.4.6  **Subsidiary lines**

This menu item contains the submenus *x axis* and *y axis*. These functions allow activating and deactivating the subsidiary lines of the *x* axis and the *y* axis. You may use the subsidiary lines to adapt the sectioning of the different views to your personal requirements.

8.3.4.7  **Assessment**

This menu item contains the submenus *Top* and *Bottom*. They serve for activating and deactivating the coloured markings of the assessment.
8.3.4.8 Amplitude

This menu item contains the submenus Normal, Twice and Triple. These functions serve for modifying the calibration of the curve, which corresponds to the modification of the amplitude in the electronic unit (Amp. key on the drilling instrument).

8.3.4.9 Averaged curve (B-Tools Pro only)

This menu item contains the submenus Show and Show only. The submenu Show serves for showing and hiding the averaged curve. If this menu item is activated, the averaged curve may be shown exclusively in the diagram by selecting the menu item Show only.

8.3.4.10 All windows

This menu item serves for transferring the view of the active window to all other opened measurements. This is helpful in case several measurements are represented side by side or one above the other and you want to adapt the views of all measurements to the active measurement.

8.3.4.11 Toolbar

This menu item serves for showing and hiding the toolbar on top of the window. If you do not want to use the toolbar, you may hide it from the screen to obtain a larger space for the representation of the curve.

8.3.4.12 Status bar

This menu item serves for showing and hiding the status bar at the bottom of the window. If you do not want to use the status bar, you may hide it from the screen to obtain a larger space for the representation of the curve.
8.3.5 Menu Item Options

8.3.5.1 IML-Resi type

Upon selecting this menu item, a list of the different types of IML-Resi will appear. Choose from this list the type of drilling instrument you employ, to ensure that the calibration of the drilling curve is adjusted to the drilling length of your instrument.

8.3.5.2 Number format...

After clicking this menu item, a dialog box will appear, where you may select the number format you want the application to use. Upon clicking the OK button, all numbers will be displayed or exported in the format selected.

8.3.5.3 Communication...

This menu item serves for configuring the PC to which the IML-RESI is connected. Upon selection of this menu item, the following dialog box will appear:

![Communication Dialog Box]

Select the port in the upper case and the transmission rate for the serial communication in the lower case. Always set this value to the maximum rate. If there are problems during transmission you may choose a lower rate.
8.3.5.4 Colours...

Upon selection of this menu item, a dialog box will appear, by means of which you may change the desktop colours:

Choose an item in the list field Desktop item. The current colour of the respective item is shown in the box on top on the right side. To change the colour, press the Change button. A dialog box will appear, by means of which you may choose a colour. Upon closing of the dialog box, the colour selected will be shown in the above box. If you want to be shown the modification in advance, press the Preview button. The main window will now be displayed in the current colours. To reset all colours to default, press the Reset button.

8.3.5.5 Assessment...

This menu item serves for modifying the assessment list (cf. section 8.3.3.2 Assessment).
8.3.5.6 *Print-out*

This menu item serves for managing the printing options. The following is a description of the sub-menu items.

8.3.5.6.1 Change footer...

Select this menu item to enter a text which will appear in the footer of the print-out. Here, you may enter for instance the name of your company.

8.3.5.6.2 Colour print-out

If you have connected a colour printer to your PC, you may activate this menu item to have the drilling curve and the data printed out in the desktop colours selected.

8.3.5.6.3 No print-out of file name

If this menu item is activated, the file name will not appear on the print-out.

8.3.5.6.4 Print file name

If this menu item is activated, the name of the measurement (file name) will appear on the print-out.

8.3.5.6.5 Print file name including path

If this menu item is activated, the file name of the measurement, incl. the directory containing the file, will appear on the print-out.
8.3.6 Menu Item Window

8.3.6.1 Cascade

Upon selection of this menu item all opened windows are arranged cascadingly.

8.3.6.2 Tile horizontal

Upon selection of this menu item all opened windows are arranged one above the other:
8.3.6.3 *Tile vertical*

Upon selection of this menu item all opened windows are arranged side by side:

![Image showing arranged windows](image)

8.3.6.4 *Arrange Icons*

Upon selection of this menu item, the icons of the minimized windows are arranged.
Suggestions

Suggestions IML-RESI B-Series:

Suggestions B-Tools / B-Tools Pro:

Have you found any errors in the present manual?

Sender:

Name: ........................................

Company: ......................................

Address: ........................................

Send to: IML Instrumenta Mechanik Labor System GmbH
          Großer Stadtacker 2
          69168 Wiesloch ● Germany

or fax to: (49) 06222-6797-10