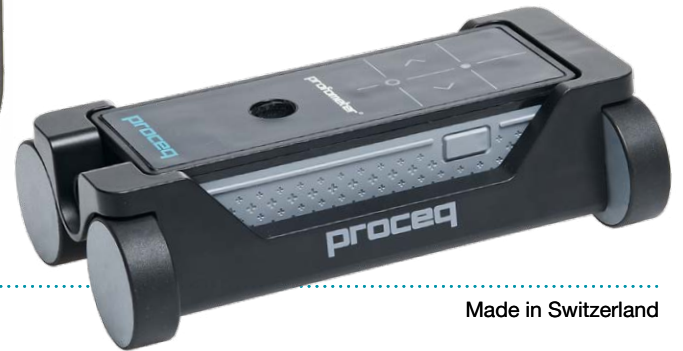


# proceq

profometer®  
Operating Instructions



Design Patent Pending

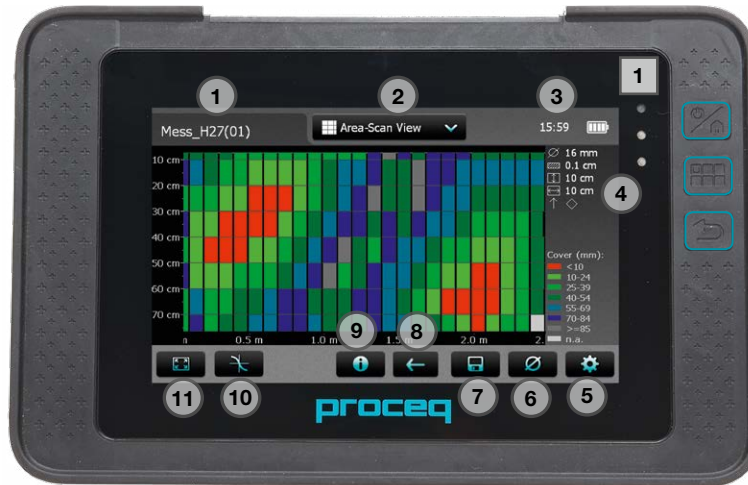
Made in Switzerland

## Scope of Delivery



- A** Profometer Touchscreen Unit
- B** Battery complete
- C** Universal Probe with Cart
- D** Profometer PM-6 probe Cable 1.5 m
- E** Power Supply with cable (USA, UK or EU)
- F** USB Cable 1.8 m (6 ft)
- G** DVD with Software
- H** Documentation
- I** Carrying Strap complete

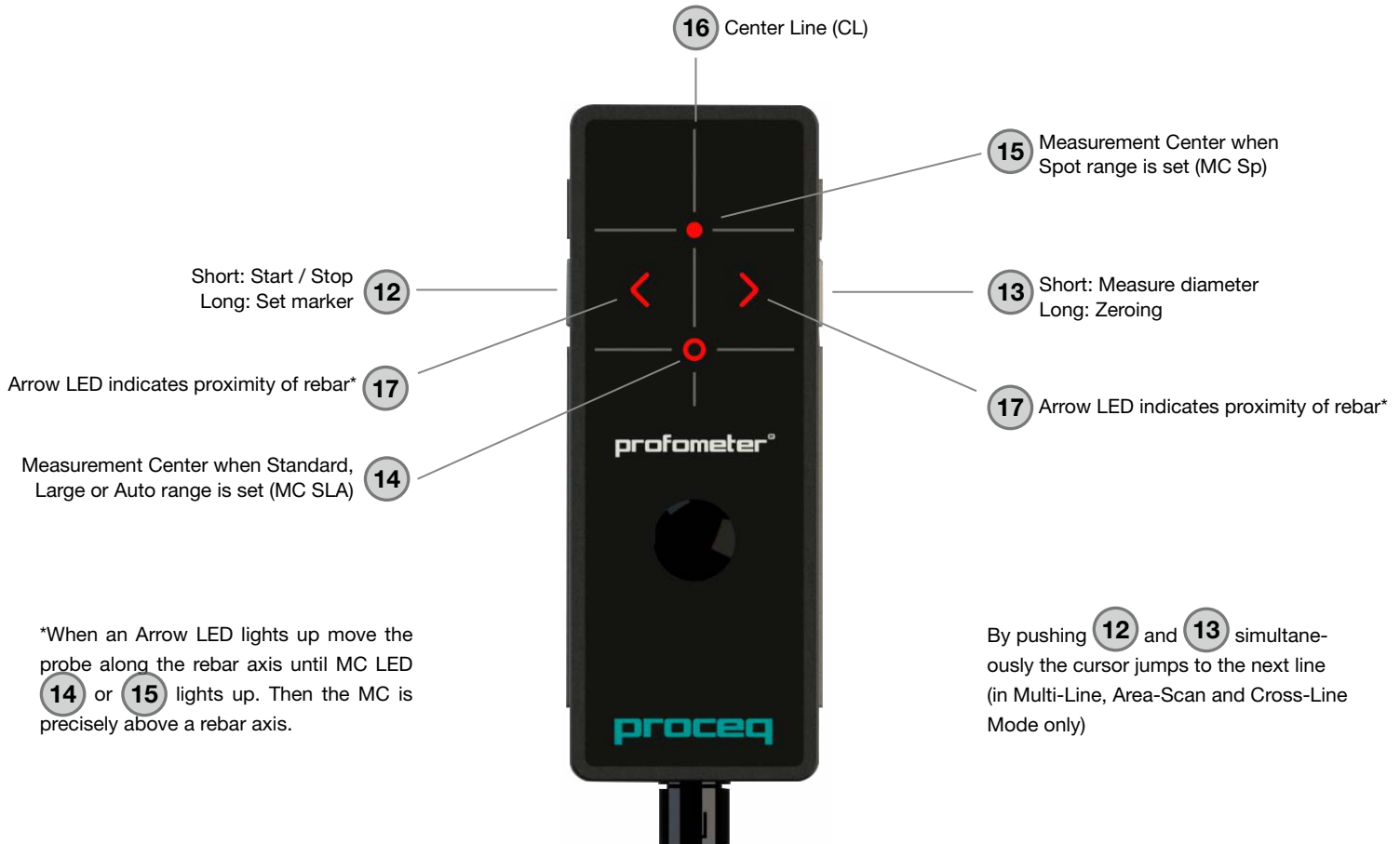
## Overview



Press to power on. To power off press again and tap "X Off" on the screen.

Soft Key – Switches in and out of full screen view.

Back Button – Returns to previous screen.



\*When an Arrow LED lights up move the probe along the rebar axis until MC LED 14 or 15 lights up. Then the MC is precisely above a rebar axis.

By pushing 12 and 13 simultaneously the cursor jumps to the next line (in Multi-Line, Area-Scan and Cross-Line Mode only)

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# 1. Safety and Liability

## 1.1 General Information

This manual contains important information on the safety, use and maintenance of the Profometer PM-6. Read through the manual carefully before the first use of the instrument. Keep the manual in a safe place for future reference.

## 1.2 Liability

Our “General Terms and Conditions of Sales and Delivery” apply in all cases. Warranty and liability claims arising from personal injury and damage to property cannot be upheld if they are due to one or more of the following causes:

- Failure to use the instrument in accordance with its designated use as described in this manual.
- Incorrect performance check for operation and maintenance of the instrument and its components.
- Failure to adhere to the sections of the manual dealing with the performance check, operation and maintenance of the instrument and its components.
- Unauthorised modifications to the instrument and its components.
- Serious damage resulting from the effects of foreign bodies, accidents, vandalism and force majeure

All information contained in this documentation is presented in good faith and believed to be correct. Proceq SA makes no warranties and excludes all liability as to the completeness and/or accuracy of the information.

## 1.3 Safety Instructions

The equipment is not allowed to be operated by children or anyone under the influence of alcohol, drugs or pharmaceutical preparations. Anyone who is not familiar with this manual must be supervised when using the equipment.

- Carry out the stipulated maintenance properly and at the correct time.
- Following completion of the maintenance tasks, perform a functional check.

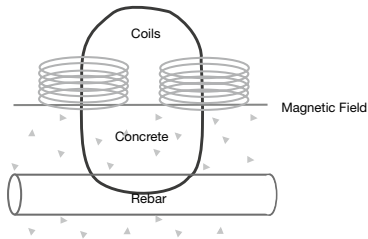
## 1.4 Correct Usage

- The instrument is only to be used for its designated purpose as describe herein.
- Replace faulty components only with original replacement parts from Proceq.
- Accessories should only be installed or connected to the instrument if they are expressly authorized by Proceq. If other accessories are installed or connected to the instrument then Proceq will accept no liability and the product guarantee is forfeit.

## 2. Measuring Principle

### 2.1 Measuring Principle

The Profometer PM-6 uses electromagnetic pulse induction technology to detect rebars. Coils in the probe are periodically charged by current pulses and thus generate a magnetic field. On the surface of any electrically conductive material which is in the magnetic field, eddy currents are produced. They induce a magnetic field in the opposite direction. The resulting change in voltage can be utilized for the measurement.



**Figure 1:** Measurement principle

The Profometer PM-6 uses different coil arrangements to generate several magnetic fields. Advanced signal processing allows locating a rebar as well as measuring of cover and rebar diameter.

This method is unaffected by all non conductive materials such as concrete, wood, plastics, bricks etc. However any kind of conductive materials within the magnetic field (sphere of approx. 200 mm / 8 inch radius) will have an influence on the measurement.



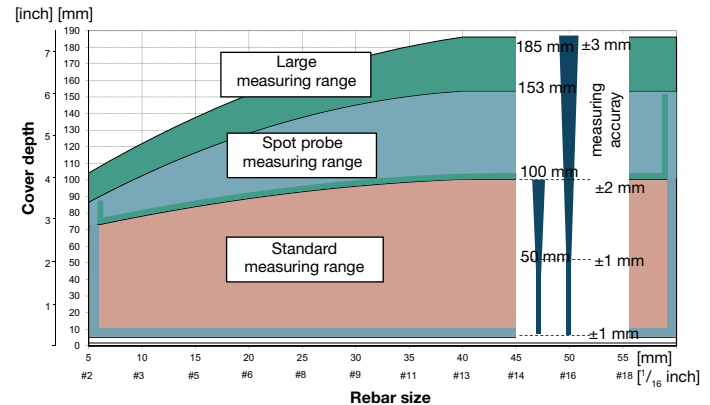
**NOTE!** Remove all metallic objects such as rings and watches before you start measuring.

### 2.2 Calibrated Measuring with Profometer PM-6

The Profometer PM-6 is calibrated to measure on a normal rebar arrangement; which is an arrangement of non-stainless steel rebars fastened with binding wires only e.g. when measuring on welded mesh wires the cover and diameter readings must be corrected (see “3.7 Practical Hints”). The following information on accuracy, measuring ranges and resolutions refer to measurements on normal rebar arrangements.

### 2.3 The Measuring Range

The measuring range is dependent on the bar size. The expected accuracy of the cover measurement is indicated in the graphic below. It complies with BS1881 part 204, for a single rebar with sufficient spacing.



Up to the indicated limits the cover is measured and displayed.

In the Locating Mode a rebar is shown. In the Single-Line Mode the cover curve is shown but a rebar is only set up to 90 % of the maximum cover.

**Figure 2:** Measuring ranges and accuracy

## 2.4 Resolution

There is a limit to the minimum spacing of bars depending on the cover depth and rebar diameter. It is impossible to distinguish between individual bars above these limits.

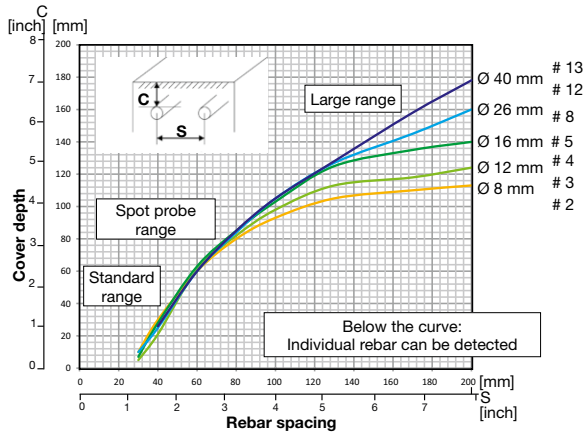
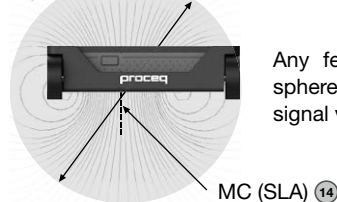


Figure 3: Resolution

## 2.5 Sphere of influence by Ferromagnetic Material

Sphere of influence: Diameter 400 mm / 16 inch



Any ferromagnetic material within the sphere may have an influence on the signal value (e. g. during a reset)

Figure 4: Influence sphere



NOTE! This effect can be reduced by the neighboring bar correction implemented in the Profometer PM-6.

## 3. Operation

### 3.1 Getting Started

#### Battery Installation

To install the Battery (B) into the Profometer Touchscreen Unit (A), lift the stand as shown. Insert the battery and fasten in place with the screw.



Figure 5: Insert Battery

There are two status LEDs **1** and above them a light sensor. The upper LED is red while charging and turns to green when it is fully charged. The other LED is application specific.



NOTE! Only use the power supply provided.

- A complete charge requires <9h (Instrument not operating)
- Charging time is much longer if the instrument is in use.
- An optional quick charger (Part No. 327 01 053) can be used to charge a spare battery or to charge the battery outside of the instrument. In this case it takes <5.5 h for a complete charge.



Connect the Universal Probe (C) to one of the sockets on the upper side of Profometer Touchscreen Unit (A) using the Probe Cable (D).



#### USB Host:

Connect a mouse, keyboard or USB stick.

#### USB Device:

Connect application specific probes and PC.

#### Ethernet:

Connection for firmware upgrades.

#### Power Supply:

Connect the power supply through this connection.



Figure 6: Top and left views

### 3.2 Main Menu

On start up the main menu is displayed. All functions may be accessed directly via the Touchscreen. Return to the previous menu by pressing the back button or the return icon (arrow) at the top left of the Touchscreen.

- Measurement: Application specific measurement screen.
- Settings: For application specific settings.
- Explorer: File manager functionality for reviewing measurements saved on the instrument.
- System: For system settings, e. g. language, display options.
- Information: For device information and remaining storage capacity.
- Off: Power off.

### 3.3 Settings



NOTE! The settings must be checked prior to each measurement.

Scroll up and down the screen by dragging your finger up or down the screen. The current setting is displayed on the right hand side. Tap on an item to adjust it.

- 1) For the scanning in Y-direction in the Cross-Line Mode the diameter, respectively spacing for rebars running in X-direction can be set in addition.
- 2) Settings can be changed in files already stored.

#### Measuring Range

Select between **Standard**, **Large** or **Auto** ranges (see Figure 2).



NOTE! The range cannot be changed during the measurement. To change the range, store the data first and open a new file.

The **Standard** range setting is the default setting and the most accurate. **Auto** range setting automatically switches between **Standard** and **Large** range; it is only available when in the Locating Mode. **Spot** range setting should be selected for measurements of small areas, in corners and where the distance between reinforcing bars is small. The Large range setting should be selected when the concrete cover is deeper, to provide a more accurate results.

#### Rebar Diameter Scan-X / Rebar Diameter Scan-Y <sup>1) 2)</sup>

Select the **Rebar Diameter** (6 to 40 mm / #2 to #12, see Appendix A1), either determined from the drawing or as measured.

### Neighboring Rebar Correction Spacing for Scan-X / Scan-Y <sup>1) 2)</sup>

It mitigates the influence of neighboring rebars. By setting the spacing to the rebars running parallel to the rebar on which the measurement is taking place, the diameter and the cover are automatically corrected. This is possible for rebar spacing from 50 to 130 mm / 2.00 to 5.20 inch (see Appendix A2).

### Unit <sup>2)</sup>

Select **Metric**, **Metric Japanese**, **Imperial** or **Imperial Diameter**, **Metric Cover** and **Distance**.

### Minimum Cover <sup>2)</sup>

A **Minimum Cover** value from 10 to 142 mm / 0.40 to 5.56 inch can be set in 1 mm / 0.04 inch steps (see Appendix 3). In the Single-Line, Multi-Line and Cross-Line Mode/View rebars with less cover than minimum cover will be shown in red color. In the Single-Line View and Statistical View a horizontal, respectively vertical dotted line in red indicates the Minimum Cover value set.



NOTE! To get smooth color intervals the Minimum and Maximum Cover should be set in 5 mm / 0.20 inch steps.

### Maximum Cover <sup>2)</sup>

A **Maximum Cover** value from 20 to 190 mm / 0.80 to 7.48 inch can be set in steps of 1 mm / 0.04 inch (see Appendix A3). In the Single-Line, Multi-Line and Cross-Line Mode/View rebars with cover more than Maximum Cover will be shown in grey color.



NOTE! The Maximum Cover must be at least 10 mm / 0.40 inch higher than the Minimum Cover. If not, the instrument will correct it automatically.

The Maximum Cover should also be set for different files measured on the same surface to get the same color range for comparison purpose.

### Cover Offset <sup>2)</sup>

When a **Cover Offset** value is set the measured cover will be reduced by this value; e. g. when a wooden or plastic plate is used to measure with the probe cart on rough surfaces (see “3.7 Practical Hints”). In this case the plate thickness must be set as Cover Offset value). A value from 1 to 50 mm / 0.04 to 1.92 inch can be set.

### Display Inclined Rebar

By setting this feature the inclined rebar is displayed in the Locating Mode when all four wheels of the cart have passed over the inclined rebar. In the Single-Line and Multi-Line Modes it is only shown in the cart symbol.



NOTE! In areas with small rebar spacing this feature may not work properly.

### Sharpen <sup>2)</sup>

With this setting the signal strength color spectrum of the Multi-Line and Cross-Line Views can be sharpened.

### Display Curve <sup>2)</sup>

Select **Cover Value**, **Signal Strength** or **None**. The respective curve or no curve is displayed in Single-Line View.

### Align Rebar Positions <sup>2)</sup>

When measuring in the Multi-Line or Cross-Line Mode along at least two lines of at least 55 cm / 22.00 inch length, the rebar positions of the last line are aligned to the rebar positions of the two previous lines.



NOTE! This feature should only be set, if the rebars are running parallel to the Start line (X- or Y-line). It is not activated during the measurements (activated only when storing the data).

### Return to start on new line

With this feature set, the cursor jumps back to the start line when changing line in the Multi-Line and Cross-Line Modes.

### Line Height (in Y-direction)

The line height must be set in the Multi-Line, Area-Scan and Cross-Line Modes. It determines the spacing between the measuring rows. A height 5 to 203 cm / 2.00 to 80.00 inch can be set.

### Grid Width (in X-direction)

The grid width must be set in the Area-Scan and Cross-Line Modes. A width from 5 to 203 cm / 2.00 to 80.00 inch can be set.

## 3.4 Measurement Screen

The standard measurement screen is shown on page 3. All settings are directly accessible from the measurement screen.



**Zoom in** by placing thumb and index finger together on the screen and spreading them apart. This can be used in both the horizontal and vertical directions when making a measurement.



**Zoom out** by placing thumb and index finger apart on the screen and pinching them together.

**Pan** the image from left to right by dragging.

## Measuring screen controls (see page 3)

- 1 **File name:** Enter the file name and tap return. Saved measurements will be stored with this file name. If several measurements are made under the same filename, a suffix increments after each measurement and follows the file name.
- 2 **Measurement Mode:** Select the type of measurement to be carried out (see “3.5 Measurement Modes and Storage of Data”).
- 3 The top right hand corner of the display shows the current time, the battery status and a warning triangle for zeroing the probe: after 5 minutes in orange, after 10 minutes in red.



NOTE! Tap on the triangle to perform zeroing.

- 4 **Display** of selected Settings and Screen Mode:
  - Measuring Range
  - Rebar Diameter
  - Neighboring Rebar Correction
  - Cover Offset
  - Line Height (for Multi-Line, Area-Scan & Cross-Line Mode only)
  - Grid Width (for Area-Scan and Cross-Line Mode only)
  - Probe Direction X: Undefined direction
    - ^, v, <, >: On vertical wall, probe head towards up, down, left, right
    - ↔: On horizontal surface, on soffit
- 5 **Settings:** Switches to the settings menu (see “3.3 Settings”).
- 6 **Rebar Diameter:** Measuring or change setting of rebar diameter
- 7 **Start:** Measurements or store measured data
- 8 **Restart** with measurements and reposition cursor to the start line. (All data of current measurements are deleted)

- 9 **File Info** or delete, Cursor to Start line in Multi-Line and Area-Scan Modes
- 10 **Zoom** in to cursor position (for Single-Line Mode only)  
**Set cursor** to line below or above (for Multi-Line Mode only)
- 11 **Zoom to fit** During measurement: Goes back to standard view  
Stored file: Complete measuring area is displayed.  
In the Modes/Views “Zoom to fit” does not show all the details for scanning distance > 10/30 meters (> 32.8/98.4 feet).

### 3.5 Measurement Modes and Storage of Data

When Measurement Mode is selected for the first time after switching on the instrument, zeroing of the probe is performed. Confirm it and wait for the button assessment window. Wait or tap anywhere on the screen. The Measurement Modes available are shown at 2 on the measuring screen.

	Locating	Single-Line	Multi-Line	Area-Scan	Cross-Line
PM-600	•				
PM-630	•	•		•	
PM-650	•	•	•	•	•



**NOTE!** Valid for all Measuring Modes: In case measuring data shall be stored create a folder in the Explorer (see “4. Explorer Document Handling”) and check if the correct folder is active. Stored files can be reopened to continue with the measurements.

### Locating Mode

PM-600

PM-630

PM-650



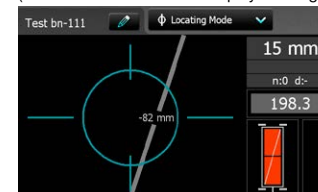
**NOTE!** The Locating Mode is the default mode because all measurements should start with this mode.

- Enter the setting menu by tapping on 5. Set the correct settings, especially Measuring Range and Display Inclined Rebar (on or off)
- Hold the probe cart with the CL 16 parallel to the assumed direction of the rebar to be scanned. Then scan perpendicular to the CL until the probe cart crosses a rebar. The display shows (only if probe is fixed on the cart):

Approaching a rebar



Rebar is inclined to the CL (minimum inclination for a display is 6 degrees).



When the Center Line 16 is precisely over the rebar (red LED of probe center is lit) it shows:



- Actual Cover
- Distance to next rebar
- Nos./Meas. diameter
- Signal strength
- Both rectangles Green: Ideal probe position: Both coils maximum signal strength and green
- Bad probe position: Coil rectangles of different size and red
- A rebar is shown only within the cover ranges indicated in Figure 2.

**Figure 7:** Screens of Locating Mode



NOTE! The probe position indication refers always to MC (SLA), even the Spot Range is set.

In most cases the rebars of the first and second layers are fixed in a rectangular mesh (e. g. vertical and horizontal rebars in a wall).

In case an inclined rebar is displayed, one has to find out the exact rebar direction.

- For this purpose locate the rebar as described below, but first remove the probe from the cart.
- Once the MC (14) / (15) is above the rebar axis mark the position of the MC on the surface at CL (16) at the upper edge of the probe and on either side of the MC.
- Position the CL point at the lower edge of the probe precisely at the marked center point.
- Turn the probe around this center point until the maximum signal is displayed. (Placing a set square with one corner at the center point facilitates the turning of the probe).

The CL (16) runs parallel to and above the rebar axis, when the signal strength reaches the maximum and the MC (14) / (15) lights up.

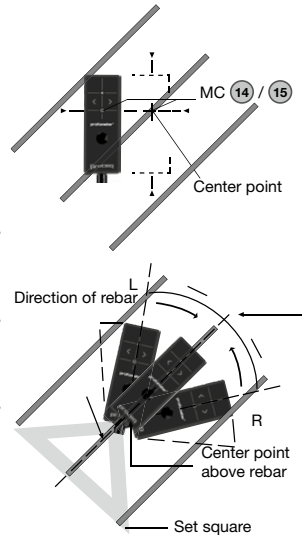


Figure 8: Finding the rebar direction

Whenever possible start with locating the rebars of the first layer, e. g. on a column the horizontal stirrups.

- Holding the CL (16) horizontally, move vertically up or down until the Arrow LED lights up and then move back until the MC LED lights up.
  - After having located the first layer rebars continue with locating the second layer rebars.
  - Position the MC (14) / (15) at the mid line of the first layer rebars, e. g. on a column hold the probe with the CL running vertically and move the probe cart vertically until both rectangles in the probe symbol are green and of equal, minimum size.
  - Now move the probe cart horizontally until one of the Arrow LEDs (17) lights up and then move back until MC LED (14) or (15) lights up.
  - At this position you may also measure the diameter either by pushing (13) on the right side of the probe or (6) on the Touchscreen (e. g. when the probe is fixed to the telescopic extension rod).
  - If the spacing of parallel rebars is between 5 and 13 cm (2.00 to 5.20 inch), set the respective Neighboring Rebar Correction value first.
- If the cover is too small for diameter measurement “too close” is displayed.
- In this case place a wooden or plastic board on the surface and set the board thickness as Cover Offset to measure the diameter.
- Finally the measured diameter must be set. The cover reading will be corrected according to the diameter set.



NOTE! For more details about diameter measurement see “3.7 Practical Hints”.

- Tap (7) to store the diameter and cover measurement.
- Repeat this procedure at each rebar.

The saved data can be seen in the Snapshot and Normal Statistics View (see “3.6 Review of Data”).



NOTE! Cover values are only saved for later viewing, if the diameter was measured and saved.

## Single-Line Mode

PM-630

PM-650



NOTE! It is advisable to locate the first and second layer rebars with the Locating Mode to find the optimum line position prior to measuring with the Single-Line Mode.

The Single-Line Mode is mainly used if cover must be shown along one line on a rather long distance (e.g. in a tunnel). Therefore the measurements are made across the first layer rebars.

The maximum scan length is 999 m / 3'280 feet in each direction (to the right and to the left from the zero line).

- Enter the setting menu by tapping on **5**. Set the correct settings, especially Rebar Diameter, Unit, Minimum Cover and Display Curve.

In case Single-Line scanning is done over rebars of different diameters and/or of different spacing measure each diameter.

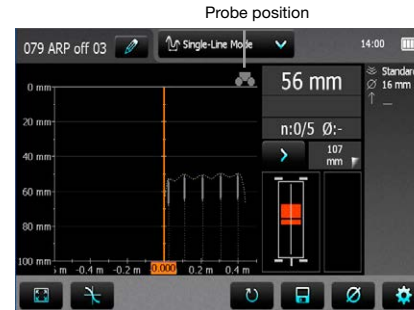
- Position the probe cart at the start line in an optimum position (the MC **14** / **15**) at the mid line of the rebars running parallel to the moving direction, both rectangles in the probe symbol are of equal minimum size.
- In case **7** is shown at **7** tap on it and **8** will be shown.
- Start with the measurement if the cursor is at the start line. If not perform a reset **8**.
- Move the probe cart with constant speed crosswise over the rebars, not exceeding the maximum speed (speed bar half filled in green).
- Above each rebar, when the red LED of MC **14** / **15** lights up, you may measure the rebar diameter and on completion, it will be displayed in blue. The measured diameter may be deleted within 5 seconds by tapping on **6**.

- In case the spacing between the rebars is in the range of 5 to 13 cm (2.00 to 5.20 inch), set the respective Neighboring Rebar Correction value first (see Figure 29).

The cursor position can be adapted in two ways to changed cart position:

- Tap on the cursor and wait until it becomes white and orange. Move the cursor to the desired position (even left to the zero line is possible). Be aware: Scanning is not anymore possible between the new cursor position and the zero-line. Already scanned rebars cannot be removed by a new scanning but you may scan again on the left of the first rebar or on the right of the last rebar. To delete the already scanned rebars tap **9** and **Yes**.
- Tap on **107 mm** and set the required displacement distance. In case you must jump due to an obstacle like a column, move the cart until the right wheels touch the column, set the displacement distance (column width + 107 mm / 4.20 inch for the cart width) and reposition the cart with the left wheels touching the column. Tap on **10** / **11**.

At the end when stopped scanning a marker (dotted blue line) is set.



Red indicates rebars with insufficient cover, others with sufficient cover.

Red dotted is the minimum required cover. Blue number indicates measured diameter.

Either the Cover, Signal Strength or None curve can be displayed by tapping on **12** and changing "Display Curve".

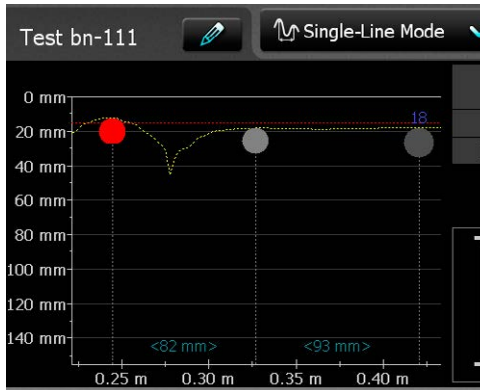
To see the actual cursor position short tap on the cursor and the position is shown in white on the X-axis. **13** The actual position is shown in a resolution of  $\pm 3$  mm / 0.12 inch.

The rebars are displayed to scale depending on the diameter  
The cover curve is shown (if selected) within the cover ranges indicated in Figure 2 but a rebar will only be shown up to 90 % of those limits.

To display a rebar as a circle zoom the horizontal and vertical axis to the same scale.

The spacings of the rebars are shown in blue.

The distances from the start line to the first rebar and from the end line to the last rebar are shown in white color. If the figures are not shown, zoom in.

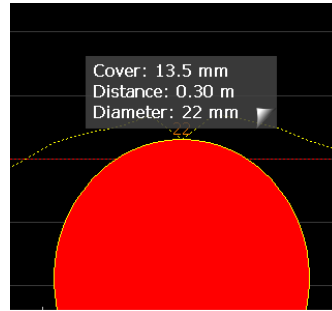
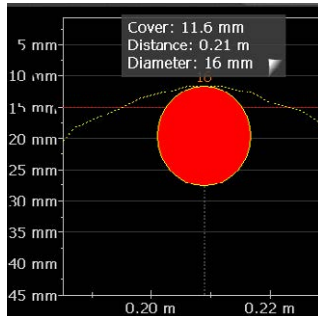


Spacing between rebars (in blue)

**Figure 9:** Screen of Single-Line Mode with cover curve

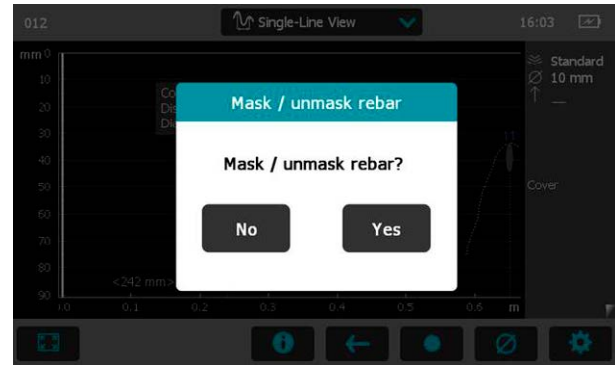
- To change a diameter tap on the rebar. A window opens.
- Tap on the window and change diameter. To erase set diameter to zero.

The new diameter is set and shown in orange. The cover changes accordingly but the cover curve remains except above the rebar axis.



New set diameter shown in orange


**Figure 10:** Single-Line View zoomed, showing change of rebar diameter



**Figure 11:** Single-Line option to mask a rebar by double-tapping on it

When utilizing the Single-Line Mode, the user has the option to display the Cover curve, Signal Strength curve or no curve. The Signal Strength curve is used to confirm the presence of reinforcing bars. Local effects such as metallic elements present below the surface (metallic wire, anchorage, etc.) or changes in testing speed when obtaining the data can result in an “apparent” reinforcing bar appearing on the screen. It is possible to hide the “apparent” reinforcing bar by double tapping on the corresponding dot when in Single-Line Cover or Signal Strength View and selecting the “Mask” option. The corresponding cover values will not be taken into account in the Statistical View (refer to Section “3.6 Review of Data”).

The path length measurement accuracy depends on the test surface. The accuracy of measurements done on a smooth concrete surface (concrete poured in metallic shuttering) is shown in the specifications, see “6. Technical Specifications”. On rougher surfaces the measured length may be reduced or checked at certain intervals by setting markings on the test surface and comparing with marks set on the display (long push on 12).

After storage (tap ) , the data can be seen in the Statistics View, the Single-Line View and also in the Snapshot View if at least one diameter was measured (see “3.6 Review of Data”).

## Multi-Line Mode

PM-630


PM-650



NOTE! It is advisable to locate the first and second layer rebars with the Locating Mode to find the optimum line position prior to measuring in the Multi-Line Mode.

The Multi-Line Mode is often used if cover, rebar location and rebar diameters of mainly rectangular areas of different sizes must be shown (see “3.6 Review of Data”), thus mainly for the first layer rebars.

In one measuring sequence a maximum of 62 lines can be scanned and stored in one file.





- Enter the settings menu by tapping .
- Set the correct settings as for the Single-Line Mode. Additionally set the Line Height. If desired, set also “Align Rebar Position” and “Return to start on new line”.





NOTE! “Align Rebar Position” should only be set, if all rebars are running parallel to the start line (Y-axis).









NOTE! For larger areas it is advisable not to set “Return to start on new line” and to measure the lines alternatively start to end, back from end to start.

- Position the probe cart at the first start line in a optimum position (the MC  /  at the mid line of the rebars running parallel to the moving direction, both rectangles in the probe symbol are green and of equal, minimum size) and tap on reset  followed by tapping on .




- Move the probe cart crosswise over the rebars. Above each rebar, when the red LED of MC  /  lights up, you may measure the rebar diameter and on completion, it will be displayed. If the spacing between the rebars is in the range of 5 to 13 cm (2.00 to 5.20 inch), set the respective Neighboring Rebar Correction value first.

At the end of the first line a marker (dotted blue line) is set.

To proceed with the next line tap  or push  and  simultaneously on the probe. The cursor jumps to the next measuring row, either to the start line or remains at the end line, depending on whether “Return to start on new line” is set or not.

Changing the cursor position works like in the Single-Line Mode. Additionally one can change to another line within the displayed area (which also can be changed as described in “3.4 Measurement Screen”). However, to delete the already scanned rebars of one line set the cursor to the zero line and tap . By tapping on  and  all measured data of all lines would be deleted.

At the start of each line you may change the probe direction (e. g. when measuring on a wall along the bottom line close to the slab).

- Tap on . The arrow in the probe cart symbol changes from . For the next line you may change back to .

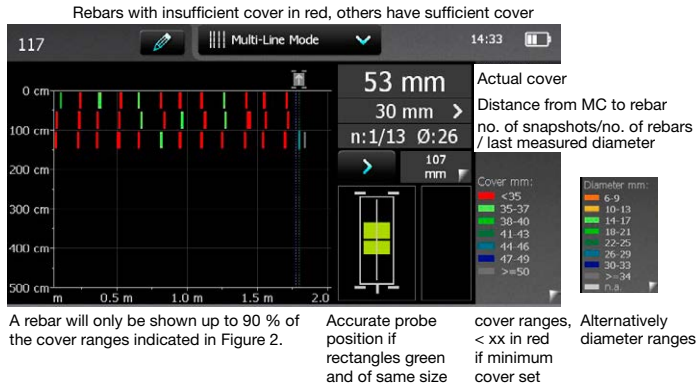


NOTE! By changing the setting “Line Height” during the measurements the height of all lines including the ones already measured will change and hence, also the line positions. Change the line height only if it was previously wrongly set.

At each rebar you may measure the rebar diameter. At the end, set one common diameter, normally the smallest one (see “3.7 Practical Hints”).



Figure 12 shows the rebars in a plan view in different colors depending on the measured cover. Red means the cover is smaller than the minimum set.



**Figure 12:** Screen of Multi-Line Mode

Alternatively the diameter can be displayed in different colors by tapping on the cover spectrum. Rebars of which the diameter was not measured or set are shown in white. Diameters measured are shown in the respective color. Diameters set in the Single-Line View are shown additionally with an orange cross bar in the middle of the rebar (see Figure 23).

After storage (tap 7), the data can be seen in the Statistics View, the Single-Line View, the Multi-Line View and also in the Snapshot View if at least one diameter was measured (see “3.6 Review of Data”).

In the Multi-Line View the signal strength spectrum can be seen in addition to the cover and diameter, see “3.6 Review of Data”.

## Area-Scan Mode

PM-630

PM-650



**NOTE!** It is advisable to locate the first and second layer rebars with the Locating Mode to find the optimum line position prior to measuring in the Area-Scan Mode.

The Area-Scan Mode is mainly used to show the first layer rebar covers on large areas, e.g. of concrete slabs in car parks. The measuring procedure is the same as for the Single-Line, respectively Multi-Line Mode. The Area-Scan Mode is best suited for a combination with potential field measurements; e.g. combined with Canin+ measurements. But in this case the line height and grid width must be the same for both measurements (square grid required by Canin ProVista).

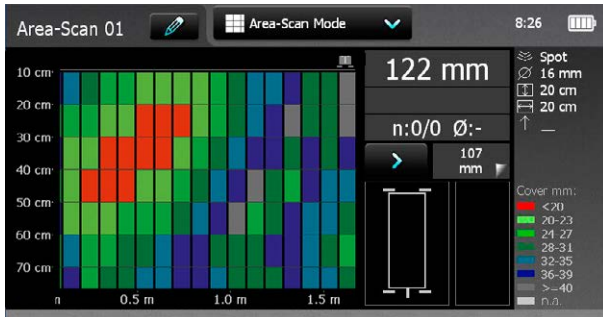
- Enter the settings menu by tapping 5.
- Set the correct settings as for the Single-Line and Multi-Line Mode. Additionally the grid width must be set. It must be about 1.1 times larger than the maximum rebar spacing of the first layer rebars. This guarantees at least one rebar located within one grid.



**NOTE!** Since the Area-Mode is used on rather large areas, “Return to start on new line” should not be set.


The measuring procedure including turning the probe cart and changing cursor position is the same as for Multi-Line Mode.

Figure 13 is a plan view, where the cover values are shown as rectangles of different colors. Red means the cover is smaller than the minimum set.



A cover will only be shown up to 90 % of the cover ranges indicated in Figure 2.

**Figure 13:** Screen of Area-Scan Mode

After storage (tap ) , the data can be seen in the Statistics View, the Multi-Line View and also in the Snapshot View if at least one diameter was measured (see “3.6 Review of Data”). Erroneous or non valid readings can be deleted simply by double tapping on the corresponding field and choosing the “Mask” option; a cross will appear into the masked fields and the corresponding cover values will not be taken into account in the Statistical View.



**Figure 14:** Area-Scan option to mask a field by double-tapping on it

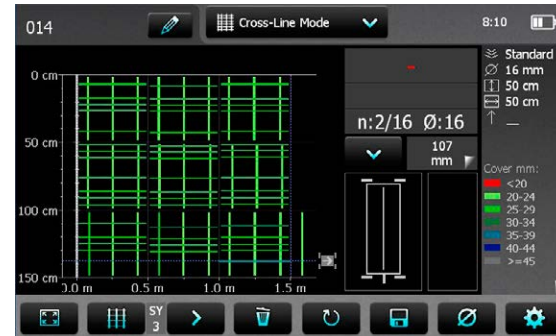
## Cross-Line Mode



PM-650



**NOTE!** It is advisable to locate the first and second layer rebar with the Locating Mode to find the optimum line position prior to measuring in the Cross-Line Mode.

The Cross-Line Mode is mainly to display the rebars of the first and second layer arranged in a rectangular mesh. The measuring procedure including turning the probe cart and changing cursor position is the same as for Multi-Line Mode. In fact it is a Multi-Line scanning in X- and Y-direction. In addition to the Multi-Line settings the grid width to define the space among the Y-lines must be set. If “Align Rebar Positions” is set, it will affect the Cross-Line views Cover and Diameter only. The view of Signal Strength remains unchanged.



To change from SX- to SY-scanning tap on  , vice versa tap on 

**Figure 15:** Screen of Cross-Line Mode



NOTE! By changing the setting “Line Height” or Grid Width”during the measurements the height or width of all lines including the ones already measured will change and hence, also the line positions. Change the line height or width only if it was previously wrongly set.

To show the rebars of the first layer above the ones of the second layer, scan first the second layer in X-direction.


Alternatively the diameter or the cover of the rebars can be displayed like for the Multi-Line Mode, thus for rebars running in X- and Y direction.



In the Cross-Line View the signal strength spectrum can be seen in addition to the cover and diameter, thus for both (SX- and SY) scanning directions, see ”3.6 Review of Data”.

In the Snapshot View the data are shown in a chronological sequence from left to right. Therefore in the Cross-Line Mode you should collect the complete data of one layer prior to change the scanning direction from SX to SY or vice versa.

### 3.6 Review of Data



NOTE! Each View can be changed in a measuring mode in order to add data. Tap on . Set the cursor to the new starting position and continue with the measurements (see ”3.5 Measurement Modes and Storage of Data”). All data will be stored in the reopened file.

Measured data can be displayed in six different views: Snapshot, Statistics, Single-Line, Multi-Line, Area-Scan and Cross-Line View. All the settings stored with the measurements can be changed afterwards. The views will change accordingly. To store the measuring series with the changes tap . To return to the initial settings tap .

### Snapshot View

PM-600

PM-630

PM-650

The Snapshot View can be displayed if at least one diameter was measured and stored in one of the measurement Modes.

The cover values are shown as vertical bars to scale and the diameter as a figure, both in the unit set. The Minimum Cover is not displayed in the Snapshot View.

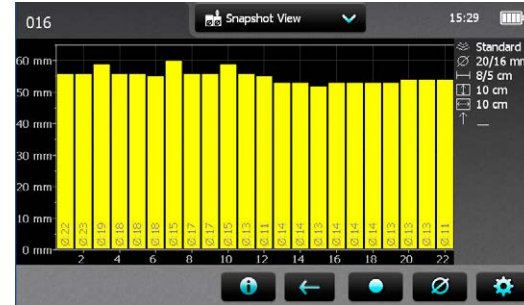


Figure 16: Snapshot View

### Statistics View

PM-600

PM-630

PM-650

The Statistics View can be displayed for measurements done and stored in one of the measurement Modes. It shows the statistical calculation of the cover values measured.

For measurements with the Cross-Line Mode the statistical evaluation of the cover readings is done for each layer independently. Hence there is a Statistical View each for the scanning in the X- and Y-direction.

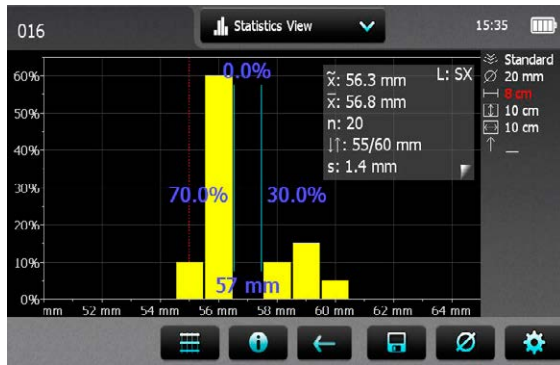


NOTE! In practice only the cover values and statistical evaluation of the 1st layer rebars (closer to the surface) is of interest.

On the horizontal axis the cover values in the unit set are displayed. The vertical bars show the percentage of the respective cover values measured and stored. The vertical cursor bar can be moved to any cover value. The figure on the left of the cursor bar shows the percentage of measured cover values smaller than the cursor position. The value on the right shows percentage of measured cover values larger than the cursor position. The cover value is displayed at the bottom of the cursor bar and at the top the percentage of measured covers for that cover is shown. Minimum required cover is shown as a vertical dotted line in red (if set). Covers below the minimum are shown as red bars, covers above the minimum as yellow bars.

There are two different Statistics Views, the **Normal** (see Figure 17) and the **DBV-Evaluation** (see Figure 18). Tap on the statistical values windows to switch from Normal to DBV.

Statistics values box "Normal" showing Median, Mean, Number of covers measured, lowest/highest, Standard Deviation.

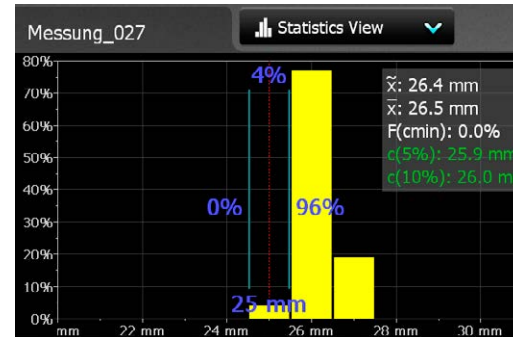


Change from X- to Y-direction view (for Cross-Line Mode data only) by tapping on / . The actual window is shown on top right (either of scan direction SX or SY)

**Figure 17:** Statistics View Normal

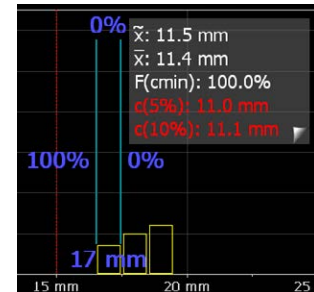
The DBV-Evaluation is an evaluation of the cover readings according to the German Concrete and Construction Association DBV (Deutscher Beton- und Bautechnik Verein). It is also recommended by RILEM. The DBV-Evaluation requires at least 20 cover readings. The distribution function  $F(c_{min})$  as well as the threshold values  $c(5\%)$  and  $c(10\%)$  are calculated. The  $c(x\%)$ -values are displayed in green when the measuring series is accepted, respectively in red if not.

Statistics values box DBV:



Above the measuring series is accepted, below not.

Cover values above the calculated upper boundary are not considered and shown as bars with a yellow frame only (see on the right side bars at cover values 17 mm, 18 mm and 19 mm).



**Figure 18:** Statistics Views DBV-Evaluation

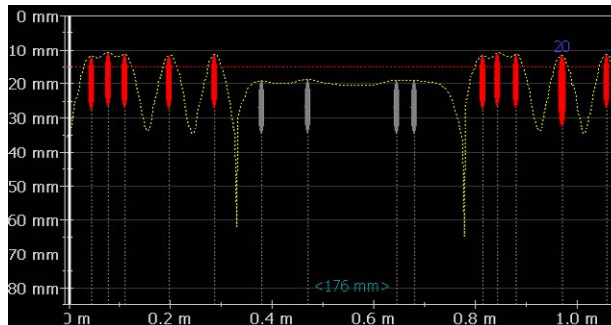
For more details of the DBV-Evaluation please refer to the Info sheet “Statistics according to DBV-Evaluation” available as pdf-file on the Proformet Touchscreen under Information/Documents and in the download section of [www.proceq.com](http://www.proceq.com).

### Single-Line View

PM-630

PM-650

The Single-Line View can be displayed if measurements have been done and stored in the Single-Line, Multi-Line or Cross-Line Mode (not from Area-Scan Mode). It shows the rebar positions in a cross section. The rebars are shown to scale depending on the diameter set. To show them as a circle zoom the horizontal and vertical axis to the same scale. However, for measurements over a long distance, like in a tunnel the scale of the horizontal axis will be much smaller and the rebars shown as vertical bars.

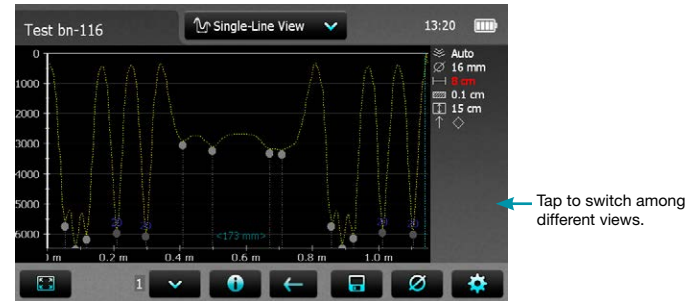


**Figure 19:** Single-Line View with cover curve

Figure 19 shows a Single-Line View with Metric Unit, Minimum Cover (dotted horizontal line in red) and Cover Curve (dotted curve in yellow). In case a diameter was measured its value is shown in blue above the rebar in the unit set. In case the diameter was manually set it is shown in orange.

Figure 20 shows a Single-Line with the Signal Strength Curve (dotted curve in yellow) set. The vertical axis shows the signal strength; hence the Minimum Cover line is not shown.

It is a Single-Line View from measurements done in the Multi-Line View, because at position ⑩ the 1 refers to the measuring row displayed. Tap on ⑩ to display the Single-Line View of the next row.



**Figure 20:** Single-Line View with Signal Strength Curve

The spacing among the rebars as well as the distance from the start line to the first rebar and from the last rebar to the end line are displayed as figures in the unit set, but only if the spacing on the screen is large enough. If not shown zoom in until the figures appear.

For more details like changing a diameter or masking a rebar refer to Single-Line Mode in chapter “3.5 Measurement Modes and Storage of Data”. To set a new diameter you may have to measure it first at the particular location of the structure in the Locating Mode and set it manually.

## Multi-Line View

PM-630

PM-650

The Multi-Line View can be displayed only if measurements have been done and stored in the Multi-Line or Area-Scan Mode. It is a plan view, in most cases of the first layer rebars. A Multi-Line View of the second layer – main layer in columns and girders – may also be of interest. Rebars can be masked and unmasked in the corresponding Single-Line View (see “3.5 Measurement Modes and Storage of Data”); masked rebars will be displayed in dark grey with a dotted line and their cover values will not be taken into account in the Statistical View.

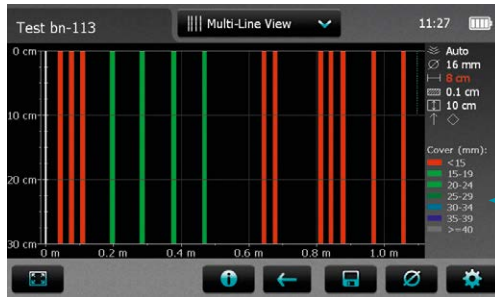


Figure 21: Multi-Line View with cover values displayed



Figure 22: Multi-Line View with masked rebars

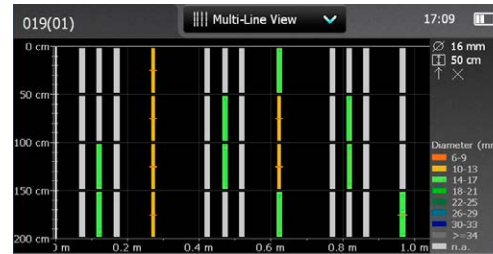


Figure 23: Multi-Line View with diameter values displayed (if measured)



To sharpen the color spectrum set “Sharpen”  
By changing the O- and G-slider positions the color spectrum can be changed (see Cross-Line View).

Tap to switch among different views.

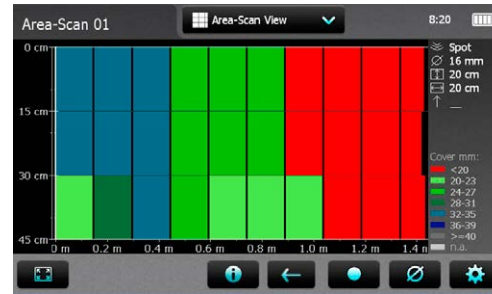
**Figure 24:** Multi-Line View with Signal Strength color spectrum

### Area-Scan View

PM-630

PM-650

The Area-Scan View is in fact a simplified Multi-Line View which only shows the lowest cover values in a predefined grid. It is mainly used in combination with potential field measurements; e.g. combined with Canin+ measurements. Erroneous or non valid readings can be masked and unmasked (see “3.5 Measurement Modes and Storage of Data”); a cross will appear into the masked fields and the corresponding cover values will not be taken into account in the Statistical View.



**Figure 25:** Area-Scan View (X- and Y-axis with different scale)

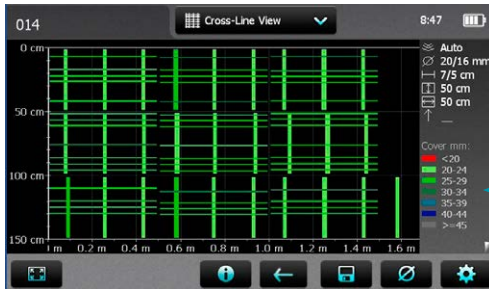


**Figure 26:** Area-Scan View (zoomed to show X- and Y-axis in the same scale)

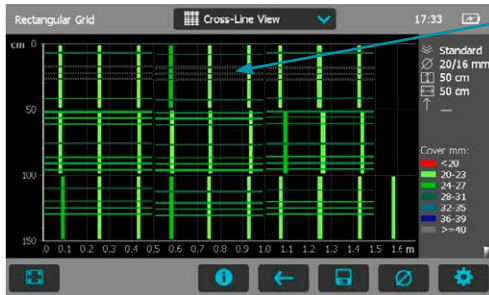
## Cross-Line View

PM-650

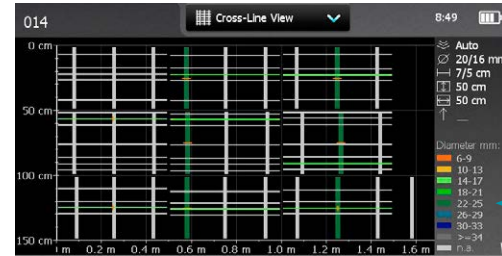
The Cross-Line View can be displayed only if measurements have been done and stored in the Cross-Line Mode. It is a plan view of the first and second layer rebars. Rebars can be masked and unmasked in the corresponding Single-Line View (see “3.5 Measurement Modes and Storage of Data”); masked rebars will be displayed in dark grey with a dotted line and their cover values will not be taken into account in the Statistical View.



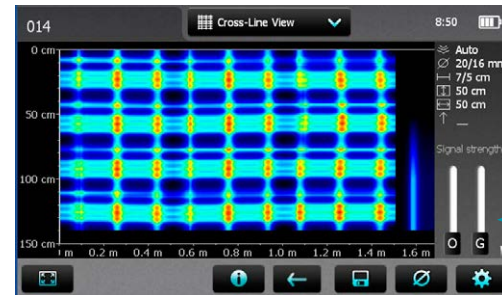
Tap to switch among different views.



Masked rebars



Tap to switch among different views.



Two diameters and two NRC-spacings (if set) are shown. Left of / it's the value of the SX (scanning in X-direction of the rebars running in Y-direction), right of / it's the value of the SY (scanning in Y-direction of the rebars running in X-direction).

Either cover, diameter or signal strength spectrum is displayed.

Tap to switch among different views.

Tap on to change the global diameter of the active layer (SX or SY)

### Figure 27: Cross-Line Views: Cover, Diameter, Signal Strength

In the signal strength spectrum view two sliders are shown on the right.

- With the O-slider (Offset) the signal strength range is set (from full actual signal strength range to higher strength only).
- With the G-slider (Gain) the signal strength resolution is set. The signal strength is accordingly displayed in colors from full color spectrum to part of it only, e. g. blue to violet only.



Three demo files are stored on the Profometer PM-6 Touchscreen in the explorer under Demo Files and the document “Profometer PM-650 Demo Files Tutorial.pdf” under Information\Documents.

Try out different slider positions to get familiarized with the display of the signal strength color spectrum, e. g. the extreme positions:

- O-** and **G**-slider lowest position: Full color spectrum, full Signal Strength range (of actual measurements)
- O-** and **G**-slider highest position: Full color spectrum, highest Signal Strength (shallower re-bars) only
- O-** highest, **G**-slider lowest position: Blue/violet only, highest Signal Strength (shallower re-bars) only
- O-** lowest, **G**-slider highest position: Only grey color displayed, Signal Strength beyond actual one

To sharpen the color spectrum set “Sharpen”.

### 3.7 Practical Hints

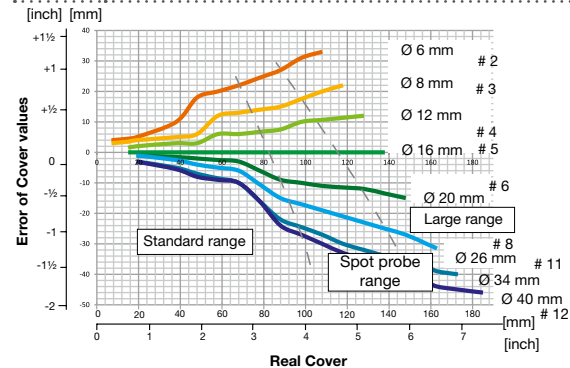
#### Effect of Setting Incorrect Bar Diameter

The accuracy of the cover measurement is also dependent on setting the correct bar diameter.

The following chart gives an estimation of the error of the cover reading for different rebar sizes if a default size of 16mm / #5 is set.



**NOTE!** The correct diameter can be set any time prior to and after storage of data, see “3.5 Measurement Modes and Storage of Data”.



**Figure 28:** Error of cover measurement with diameter 16mm / #5 set.

## Factors Affecting the Diameter Measurement

Two factors affect the determination of the rebar diameter. One is the cover depth. The second is the spacing between neighboring bars. For accurate determination of the diameter, the spacing between the rebars must be greater than the limits shown in the drawing below with reference to the MC 14 / 15.



NOTE! Diameter can be determined for rebars with cover not exceeding 80 % of the standard range (63 mm, 2.50 inch).

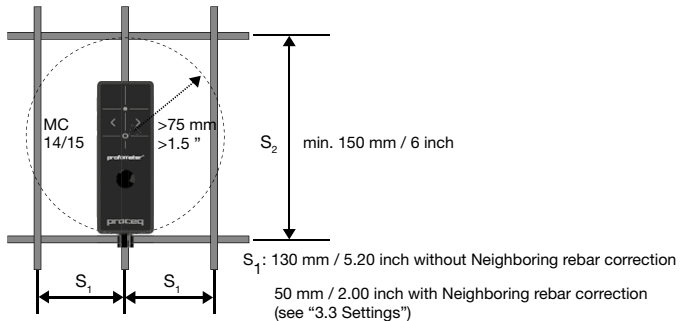


Figure 29: Minimum rebar spacings for correct readings

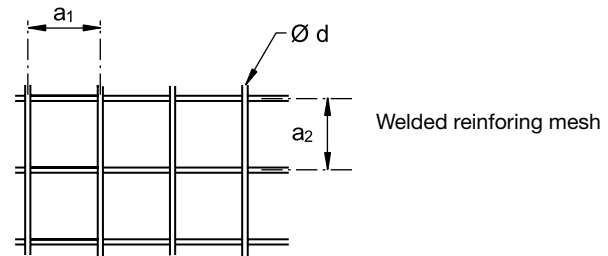
## Rebar Orientation

The strongest signal results when the Center Line (CL) of the probe is parallel to a bar. The CL 16 of the Profometer PM-6 probe is the longitudinal axis of the probe. This property is used to help determine the orientation of the rebars (see Locating Mode in "3.5 Measurement Modes and Storage of Data").

## Welded Meshes

The instrument cannot detect whether the rebars are welded to one another or connected with binding wires. The two reinforcement types with the same dimensions however create different signals.

The setting of the bar diameter must be slightly higher than the actual diameter of the mesh rebar. The input depends on the bar diameter and on the mesh width. This input value should be determined by means of a test measurement on an open system with specific rebar mesh wire arrangements. Measure on each arrangement with different covers to find out the diameter setting at which the correct cover is indicated.



$a_1$ [mm]	$a_2$ [mm]	current d [mm]	d to be set [mm]
100	100	5	8
150	150	6	7

Figure 30: Examples for diameter settings at welded meshes to measure correct cover values



NOTE! The “Standard Range” must be selected. With the “Large Range” or “Spot Range” selected, locating of the rebars may be completely wrong.

### Diameter Measurements on welded Reinforcement Meshes

In most cases a diameter can be measured but the displayed value is far too large and cannot be used. The only way to determine the diameter is by an inspection hole.

### Measure Rebar Diameter

In case the rebar diameter is not known, the Profometer PM-6 can accurately determine the diameter of a rebar under certain conditions.



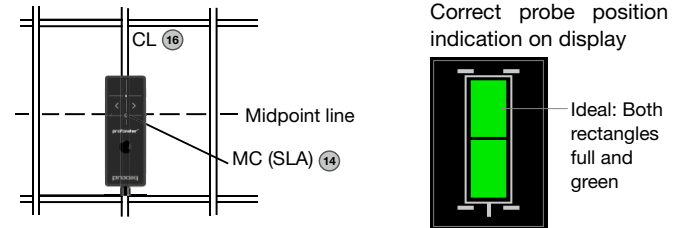
NOTE! The Determination of the rebar diameter with Profometer PM-6 is limited to a maximum cover of about 63 mm (2.50 inch).

The tutorial chapter on the pulse induction principle describes the limitations of the technology and clearly outlines the conditions whereby accurate readings of rebar diameter CANNOT be made if there is too much interference from neighboring rebars or other metallic objects within the sphere of influence.



NOTE! In any case, it is advisable to expose at least one first layer rebar of each rebar arrangement to measure the real diameter. The obtained diameter values can then be compared and if necessary corrected with the measured real diameter.

- Step 1** Locate and mark a rebar grid of the first and second layer rebars as described under Locating Mode in “3.5 Measurement Modes and Storage of Data”.
- Step 2** Select one rebar that has the largest spacing from neighboring rebars.
- Step 3** Use a ruler and confirm that the spacing is at least as indicated in Figure 29. If not, redo Steps 1 and 2 until a rebar is located with the required spacing to a neighboring rebar.
- Step 4** Place the MC ⑭ or ⑮ of the Profometer PM-6 over the rebar at the centerline of the rebars running crosswise to the rebar under test and measure the diameter.



**Figure 31:** Correct Probe positioning for diameter measurements

The diameter displayed for the settings “Metric”, “Imperial” and “Japanese” are shown in Appendix A1.



NOTE! When measuring a diameter on rather old structures set the unit “Metric” and convert the displayed diameter from Millimeter to the “Imperial” or “Japanese” bar size if necessary.

### Rebar diameter determination in rather thin slabs:

In thin slabs the rebar mesh of the opposite side may be too close and will affect the rebar diameter measurements. In those cases the measured diameter is too high.

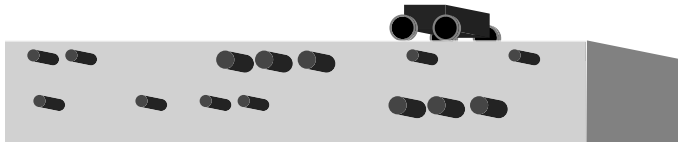
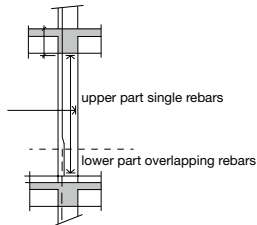


Figure 32: Rebar diameter measurements on thin slab

### Line-Scanning on Different Rebar Arrangements

Single-Line, Multi-Line and Area-Scanning are mainly done to measure and show the cover values along a long line, respectively on a large area. However, for accurate cover readings the diameter must be measured first, thus on each different rebar arrangement. The measured diameter is to be set prior to scanning the cover. Therefore it is advisable to open for each area of different rebar arrangement a separate test file and to scan over rebars only with the same measured rebar diameter.



For example: To scan a wall of a cut and cover tunnel section at least two test files must be opened. One for the lower part with overlapping vertical rebars with a larger diameter measured, one on the upper part with single vertical rebars, (see Figure 35).

Figure 33: Line scanning on different rebar arrangements

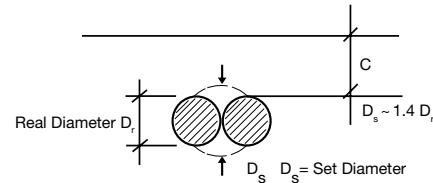


Figure 34: Measured diameter  $D_s$  at overlapping areas

In case the diameter cannot be measured the rebars should be exposed in one area. The diameter to be set is in general 1.4 times the real diameter of a single bar.

### Scanning on Small Surfaces and Near to Edges

On small areas and near edges you may have to place a cover sheet for scanning with the probe cart.



For correct cover measurements the sheet thickness must be set as Cover Offset value.



In this case no Cover Offset value must be set

Figure 35: Scanning near to the edge

## 4. Explorer Document Handling

From the main menu select Explorer to review saved files.

If folders have been created as suggested in the first note of “3.5 Measurement Modes and Storage of Data” the folders are shown in the first lines from top (see following figure).

Name of folder (in the main level only \ is shown)

	Name	Date & Time	Size	
<input type="checkbox"/>	Folder	Inclined Rebar	21/07/2014 12:51	-
<input type="checkbox"/>	Folder	SLV Duct Cases A and B	10/07/2014 09:59	-
<input type="checkbox"/>	Folder	079 ARP o#ff 01	21/07/2014 12:48	39 kB
<input type="checkbox"/>	File	075	09/07/2014 14:02	5 kB
<input type="checkbox"/>	File	074	09/07/2014 12:07	1 kB
<input type="checkbox"/>	File	069	09/07/2014 10:53	5 kB

- Tap on a saved file to open it.
- Return to the Explorer list by pressing the back button.
- To delete a file tap in the check box to the left of the file and delete it.

- Tap on to access the files stored in it.
- To create a new folder tap on , write the name and tap on .
- To cut/copy a file/files tap on  to the left of the file(s) to become  and tap on / .
- To insert/copy a file tap on  to open the folder and tap on .

The cut and insert functions are useful in case a file is/files are stored in the wrong folder or a specific folder was only created after the files have been stored in the main level.

Below the subfolder “Inclined Rebar” is open

	Name	Date & Time	Size	
<input type="checkbox"/>	Folder	..	-	
<input type="checkbox"/>	File	031	01/07/2014 09:30	18 kB
<input type="checkbox"/>	File	024	03/06/2014 16:00	38 kB

- Tap on the first with the name “..” to go back to the upper folder

Download measuring files to an USB stick:

- Connect the USB-stick to the USB Device plug on the left side of the Profometer Touchscreen

<input checked="" type="checkbox"/>	File	079 ARP o#ff 01	21/07/2014 12:48	39 kB
<input type="checkbox"/>	File	075	09/07/2014 14:02	5 kB

- Click on the checkbox of each file to be downloaded and click on .
- The name of the downloaded file is “PM-Product version\_Year\_Month\_Day\_Time”

Upload pdf-files from an USB-stick:

- Create the folder “PQ-Import” in the main directory of the USB-stick (not as a subfolder in another folder) and fill it with all the pdf-files to be uploaded to the Profometer Touchscreen
- Go to Information/Documents
- Connect the USB-stick to the USB Device plug on the left side of the Profometer Touchscreen
- Click on and confirm with click on

The uploaded pdf-files appear on the bottom of the document list.

## 5. Ordering Information

### 5.1 Units

Part No.	Description
392 10 001	Profometer PM-600 consisting of Profometer Touchscreen, universal probe with probe cart, probe cable 1.5 m (5 ft), power supply, USB cable, chalk, DVD with software, documentation, carrying strap and carrying case
392 20 001	Profometer PM-630 consisting of Profometer Touchscreen, universal probe with probe cart, probe cable 1.5 m (5 ft), power supply, USB cable, chalk, DVD with software, documentation, carrying strap and carrying case
392 30 001	Profometer PM-650 consisting of Profometer Touchscreen, universal probe with probe cart, probe cable 1.5 m (5 ft), power supply, USB cable, chalk, DVD with software, documentation, carrying strap and carrying case

### 5.2 Upgrades

Part No.	Description
392 00 115	Software Upgrade from Profometer PM-600 to PM-630
392 00 116	Software Upgrade from Profometer PM-630 to PM-650

### 5.3 Parts and Accessories

Part No.	Description
392 40 020	Profometer PM-6 Universal probe
392 40 030	Profometer PM-6 Scan cart complete
327 01 050	Profometer PM-6 Probe cable 1.5 m (5 ft)
392 40 040	Profometer PM-6 Telescopic extension rod 1.6 m (5.3 ft) with probe cable 3 m (10 ft)
327 01 063	Profometer PM-6 Probe cable 3 m (10 ft)
327 01 068	Profometer PM-6 Probe cable 10 m (33 ft)
392 00 004S	Profometer PM-6 Self-adhesive protective film for probe (set of 3)
325 34 018S	Chalk (set of 10)
327 01 045	Carrying strap complete
327 01 033	Battery complete
327 01 053	Quick charger
351 90 018	USB-cable 1.8 m (6 ft)
327 01 061	Power supply
711 10 013	Power supply cable USA 0.5 m (1.7 ft)
711 10 014	Power supply cable UK 0.5 m (1.7 ft)
711 10 015	Power supply cable EU 0.5 m (1.7 ft)

## 6. Technical Specifications

### Instrument

Cover Measuring Range	Up to 185 mm (7.3 inch), see Figure 2
Cover Measuring Accuracy	$\pm 1$ to $\pm 4$ mm (0.04 to 0.16 inch), see Figure 2
Measuring Resolution	Depending on diameter and cover, see Figure 3
Path Measuring Accuracy on smooth Surface	$\pm 3$ mm (0.12 inch) + 0.5 % to 1.0 % of measured length
Diameter Measuring Range	Cover up to 63 mm (2.50 inch), Diameter up to 40 mm (# 12)
Dia. Measuring Accuracy	$\pm 1$ mm ( $\pm$ # 1)
Display	7" colour display 800x480 pixels
Memory	Internal 8 GB Flash memory
Regional Settings	Metric and imperial units and multi-language supported
Power Input	12 V +/-25 % / 1.5 A
Dimensions	250 x 162 x 62 mm
Weight (of display device)	About 1525 g (incl. Battery)
Battery	Lithium Polymer, 3.6 V, 14.0 Ah
Battery Lifetime	> 8h (in standard operating mode)
Max. Altitude	3000 m above sea level
Humidity	< 95 % RH, non condensing
Operating Temperature	0°C – 30°C (Charging*, instrument on) 0°C – 40°C (Charging*, instrument off) -10°C – 50°C (Non-charging)
Environment	Suitable for indoor & outdoor use

IP Classification	Touchscreen IP54, Probe IP67
Pollution Degree	2
Installation Category	2
Standards and Guidelines	BS 1881 part 204, Din 1045, SN 505262, DGZfP-guideline B2, CE certification

\*charging equipment is for indoor use only (no IP classification)

### Power Supply

Model	HK-AH-120A500-DH
Input	100-240 V / 1.6 A / 50/60 Hz
Output	12 V DC / 5 A
Max. Altitude	3000 m above sea level
Humidity	< 95%
Operating Temperature	0°C - 40°C
Environment	Indoor use only
Pollution Degree	2
Installation Category	2

## 7. Maintenance and Support

### 7.1 Maintenance and Cleaning

To guarantee consistent, reliable and accurate measurements, the instrument should be calibrated on a yearly basis. The customer may however, determine the service interval based on his or her own experience and usage.

Do not immerse the instrument in water or other fluids. Keep the housing clean at all times. Wipe off contamination using a moist and soft cloth. Do not use any cleaning agents or solvents. Do not open the housing of the instrument yourself.


### 7.2 Support Concept

Proceq is committed to providing a complete support service for this instrument by means of our global service and support facilities. It is recommended that the user register the product on [www.proceq.com](http://www.proceq.com) to obtain the latest on available updates and other valuable information.

### 7.3 Standard Warranty and Extended Warranty

The standard warranty covers the electronic portion of the instrument for 24 months and the mechanical portion of the instrument for 6 months. An extended warranty for one, two or three years for the electronic portion of the instrument may be purchased up to 90 days of date of purchase.

### 7.4 Disposal

 Disposal of electric appliances together with household waste is not permissible. In observance of European Directives 2002/96/EC, 2006/66/EC and 2012/19/EC on waste, electrical and electronic equipment and its implementation, in accordance with national law, electric tools and batteries that have reached the end of their life must be collected separately and returned to an environmentally compatible recycling facility.

## 8. PM-Link Software

### 8.1 Starting PM-Link



Locate the file “PM-Link Setup.exe” on your computer or on the DVD and click on it. Follow the instructions on the screen.



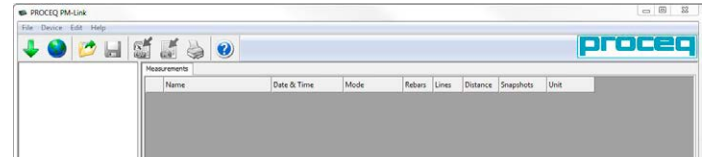
Make sure that the “Launch USB Driver install” tick is selected.

The USB driver installs a virtual com port which is needed to communicate with the Profometer Touchscreen Unit.



Double click on the PM-Link Icon on your desktop or start the Link via the start menu.

The Link starts with a blank list.




### Application Settings

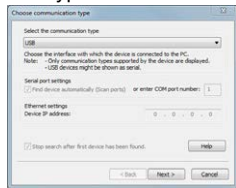
The menu item “File - Application Settings” allows the user to select the language, the date and time format and the color scheme of the displayed results (suggested background preference: black background when viewing on the monitor and white background when the results are to be printed).



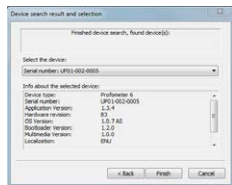
## Connecting to a Profometer Touchscreen Unit

Connect the Profometer Touchscreen Unit to a USB port, then select  to download data from the Profometer Touchscreen Unit.

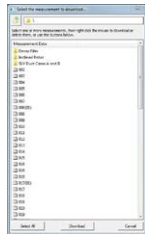
The following window will be displayed: Select “USB” as the communication type. Click on “Next >”.



When a Profometer Unit has been found its details will be displayed on screen. Click on the “Finish” button to establish the connection



Click on “Next >”. When a Profometer Touchscreen Unit has been found its details will be displayed on screen. Click on the “Finish” button to establish the connection.



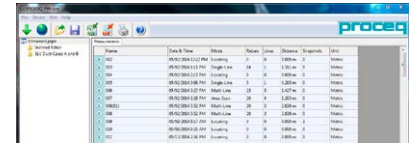
Measurement files stored on the device will be displayed as shown on the left.

Select one or more measurements and click “Download”.

## Viewing Data

The selected measurements on your Profometer Touchscreen Unit will be displayed on the screen:

- Click on a folder to access the files stored in it or to paste-in other files.



- Click on the double arrow icon in the first column to see more details. By clicking on the respective colored words one can switch:

- Among Views **Snapshot**, **Statistics**, **Single-Line**, **Multi-Line**, **Area-Scan** and **Cross-Line View**.

- In Statistics View, results are displayed either for the Scan-**X** or Scan-**Y** (when measurements done in the Cross-Line Mode).

- In Single-Line View, when measurements are obtained in the Cross-Line, Multi-Line and Area-Scan Mode, the Scan-**X** and Scan-**Y** results are displayed separately for each scan performed. Additionally the Cover curve, Signal Strength curve or no curve can be selected. When viewing the results with the Cover curve or Signal Strength curve, the rebar number, cover, traversed distance and diameter of the individual rebar can be displayed by setting the cursor on the rebar. By right clicking on the rebar, the user can Mask/Unmask or change the set diameter.

- In Multi-Line and Cross-Line Views among Display Measurement **Cover**, **Diameter** and **Signal Strength**. When Signal Strength is set, you may click on **Sharpen** and adjust the color spectrum with the **O-** and **G-** sliders.

- Between Statistics **Normal** and **DBV**.

Settings can be changed except the ones used for measurements like Measuring Ranges, Display Inclined Rebars, Return to start on new Line, Line Height and Grid Width.

Rebars	Lines	Distance	Snapshots	Unit
0	0	0.000 m	0	Metric
14	1	1.311 m	0	Metric
0	0	0.000 m	0	Metric
5	1	0.925'	0	Imperial
25	5	4.682'	0	Imperial
20	4	4.144'	0	Imperial
20	3	9.311'	0	Imperial
20	3	9.311'	0	Imperial
0	0	0.000 m	3	Metric
0	0	0.000 m	0	Metric
0	0	0.000 m	0	Metric

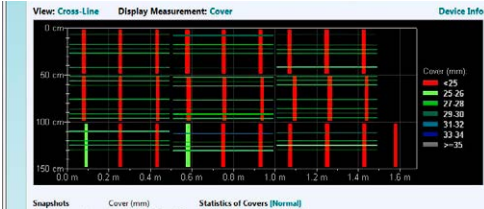
By right click with the cursor in a marked cell of the column “unit” the unit can be changed for the marked measurements.

By holding the cursor on **Device Info** the information about, hardware, software and probe is displayed.



NOTE! Click on “Add” to attach a comment to the object.

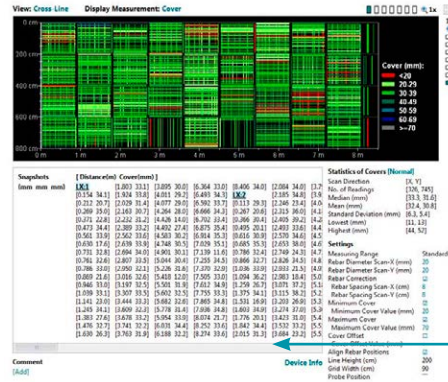
### Sample of Cross-Line View, Cover



To paste or delete measurements select one or more rows then right click the mouse and choose one of these options: “Cut/ Copy” or “Delete”. To paste in another folder click on it and right click paste.

Name	Date & Time	Mode	Rebars	Lines	Distance	Snapshots	Unit
002	05/02/2014 12:22 PM	Locating	0	0	0.000 m	0	Metric
003	05/02/2014 1:11 PM	Single-Line	14	1	1.311 m	0	Metric
004	05/02/2014 2:13 PM	Locating	0	0	0.000 m	0	Metric
005	05/02/2014 3:08 PM	Single-Line	5	1	0.925 m	0	Metric
006	05/02/2014 3:27 PM	Multi-Line	25	5	4.682 m	0	Metric
007	05/02/2014 3:28 PM	Area-Scan	20	4	4.144 m	0	Metric
008(01)	05/02/2014 3:52 PM	Multi-Line	20	3	9.311 m	0	Metric

### Sample of View with very large numbers of measurements



To see more data, drag the slider to the right.

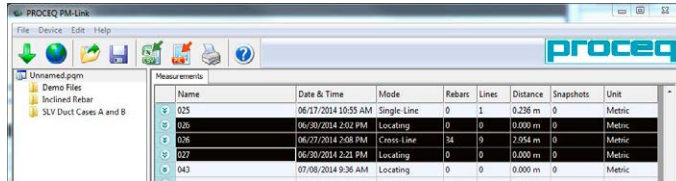
### Adjusting date and time

Right click in the “Date & Time” column.

The time will be adjusted for the selected series only.

## 8.2 Exporting Data

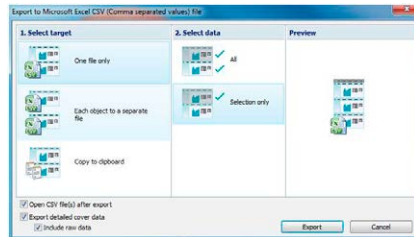
PM-Link allows you to export selected objects or the entire project for use in third party programs. Click on the measurement object you wish to export. It will be highlighted as shown.



Name	Date & Time	Mode	Rebars	Lines	Distance	Snapshots	Unit
025	06/17/2014 10:55 AM	Single-Line	0	1	0.236 m	0	Metric
036	06/20/2014 2:02 PM	Locating	0	0	0.000 m	0	Metric
038	06/27/2014 2:08 PM	Cross-Line	34	9	2.954 m	0	Metric
027	06/20/2014 2:21 PM	Locating	0	0	0.000 m	0	Metric
043	07/08/2014 9:36 AM	Locating	0	0	0.000 m	0	Metric



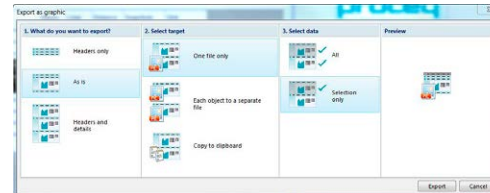
Click on the “Export as CSV file(s)” icon. The data are exported as a Microsoft Office Excel comma separated file or files. The export options may be chosen in the following window:



Select “Export detailed cover data” to export the entire calculated concrete cover curve values and not only individual cover values over reinforcing bars. When “Include raw data” is selected, the exported data will include the raw values as measured by the two coils within the probe in addition to the calculated cover curve data.



Click on the “Export as graphic” icon to open the following window which allows the various export options to be chosen.



In both cases, the preview window shows the effects of the current output selection.

Prior to export data set the appropriate

- View: “Snapshot”, “Statistics”, “Single-Line”, “Multi-Line”, “Area-Scan” or “Cross-Line”
- Unit: “Metric”, “Metric Japanese”, “Imperial” or “Imperial Diameter, Metric Cover and Distance”
- Curve: either “None” or “Cover Curve”



**NOTE!** In Multi-Line View one can switch between Cover and Diameter, in Statistics between Normal and DBV.



**NOTE!** In normal cases the Curve should be set to “None”, especially when exporting huge files to an Excel-sheet because the cover and distance of the curve are copied each in one cell, thus in distance intervals of 2.7 mm only.

- Set the appropriate View, Display Measurements, Display Curve.
- Finish by clicking on export to select the file location, name the file and in the case of a graphical output to set the output graphic format: .png, .bmp or .jpg.

### Sample of an exported CVS-file

PM-Link Version	1.0.2.0	Statistical Data (mm)		Snapshots	Rebars	Cover Data(mm)		
Device Information		No. of Readings	0	36		Line 1	Line 2	Line 3
Product Name	PM-630	Median	0	26.3		Rebar	Rebar	Rebar
Serial Number	UP01-000-0008	Mean	0	27		823	0	26.3
Software Version	1.0.9.0	Standard Deviation	0	2.2		85.2	0	36.4
OS Version	1.0.3	Lowest	0	26		93.5	35.5	0
Hardware Revision	33	Highest	0	34		129.2	0	25.8
Probe Type	PM630_Univ	Total Distance				142	0	35.8
Probe Serial Number	PL000-000-0003					140.2	35.9	0
						175.9	0	36.2
						186.9	36.3	0
						373.6	0	37.4
						383.1	0	27.5
						385.9	37.5	0
						420.6	0	36.5
						426.1	0	26.3
						498.8	36.4	0
						467.3	0	26
						472.8	0	25.8
						466.6	25.8	0
						511.3	0	36.2
						536.8	0	26.2
						530.6	36.2	0
						633	0	34.1
						638.5	0	33.9
						692.3	33.8	0
File Data (mm)		Rebars						
File Name	2	No. of Readings	27					
Time	27.02.2014 10:01:29	Median	26.2					
Comment		Mean	26.2					
Measurement Mode	Multi-Line	F(0min)	0.00%					
Diameter	16	CSI%	25.8					
Rebar Spacing	0	CI10%	25.9					
Cover Offset	0	Snapshot Data (mm)						
Minimum Cover	22	Line	Distance	Cover	Diameter			
Line Height	100	1	761	29	15			
Grid Width		1	913	28	19			
Probe Position	Unknown	2	74	29	15			
		2	772	29	15			

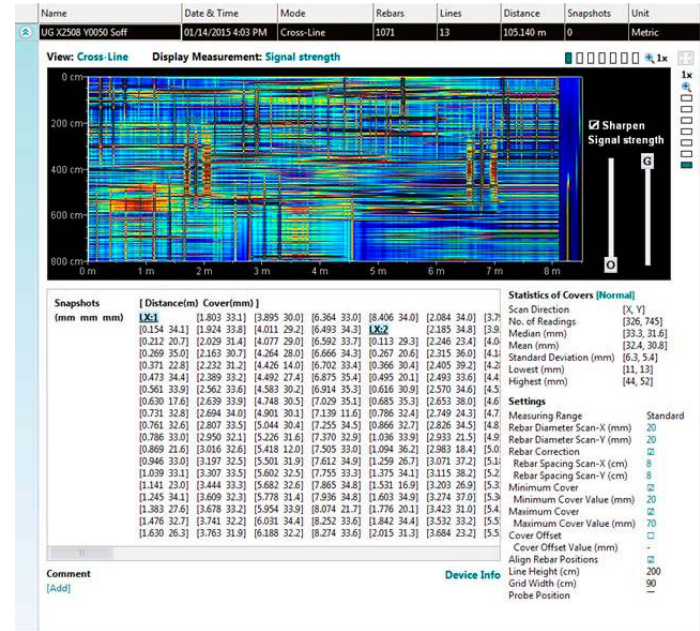
All Data (starting with PM-Link Version to Statistic Data up to Cover Data) are written in the first columns starting with column A.

The Cover data of X- and Y-scan measured in the Cross-Line Mode are shown in different blocks.

The diameters set in the Single-Line Mode are not shown.

### Sample of an exported Graphics-file

#### Cross-Line View Signal Strength Sharpen On



### 8.3 Deleting Data

The menu item “Edit – Delete” allows you to delete one or more selected series from the downloaded data.



NOTE! This does not delete data from the Profometer Touch-screen Unit, only data in the current project.

The menu item “Edit – Select all”, allows the user to select all series in the project for deletion, exporting etc.

### 8.4 Further Functions

The following menu items are available via the icons at the top of the screen:



“PQUgrade” icon - Allows you to upgrade your firmware via the internet or from local files.



“Open project” icon – Allows you to open a previously saved .pqm project.



“Save project” icon – Allows you to save the current project.



“Print” icon – Allows you to print out the project. You may select in the printer dialog, if you want to print out all of the data or selected readings only.

## 9. Appendices

### 9.1 Appendix A1: Rebar Diameters

Following rebar diameters can be selected:

Metric		Imperial			Japanese	
Bar size	Diam. (mm)	Bar size	Diam. (inch)	Diam (mm)	Bar size	Diam. (mm)
6	6	#2	0.250	6	6	6
7	7	#3	0.375	10	9	9
8	8	#4	0.500	13	10	10
9	9	#5	0.625	16	13	13
10	10	#6	0.750	19	16	16
11	11	#7	0.875	22	19	19
12	12	#8	1.000	25	22	22
13	13	#9	1.125	29	25	25
14	14	#10	1.250	32	29	29
...	...	#11	1.375	35	32	32
35	35	#12	1.500	38	35	35
36	36				38	38
37	37					
38	38					
39	39					
40	40					

## 9.2 Appendix A2: Neighboring Bar Correction

Following rebar spacings can be selected:

Metric, Imperial cm, Japanese		Imperial inch	
5	cm	2.0	inch
6	cm	2.4	inch
7	cm	2.8	inch
8	cm	3.2	inch
9	cm	3.6	inch
10	cm	4.0	inch
11	cm	4.4	inch
12	cm	4.8	inch
13	cm	5.2	inch

## 9.3 Appendix A3: Minimum / Maximum Cover

Following covers can be selected:

Metric, Imperial mm, Japanese		Imperial inch	
10	mm	0.40	inch
11	mm	0.44	inch
...	mm	...	inch
141	mm	5.52	inch
142	mm	5.56	inch
up to 190	mm	up to 7.48	inch

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