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Operating Instructions

Rebar Detector and Covermeter

proceq

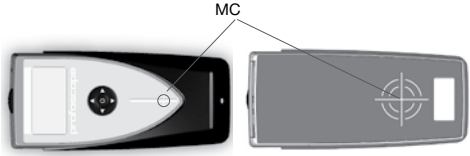
...more than 50 years of know-how you can measure!

Getting Started

A start-up test kit is provided with the packaging to help you familiarize yourself with the instrument.

> **First time user:** Complete the tutorial OR see a demo by a qualified Proceq representative.

1. Verify that there are no metal items on hands, fingers, or in the vicinity of test area, (metal trolleys etc.)
2. Power on: Press the ON/OFF button on the top panel.
3. Reset the instrument.
4. Check the location of the Measurement Center (MC) which indicates the center of the probe.



5. Check the operation with the start-up test kit and confirm:
   - The location and orientation of the rebars
   - The position between two rebars
   - Cover depths 15mm / 0.59” and 60 mm / 2.36”
   - Diameter 16 mm / #5

Congratulations! Your new Profoscope is fully operational and you can now continue with your measurements.

Performing a Reset

The pulse induction measuring principle is liable to drift with temperature and other external influences. Performing a reset corrects for any drift and ensures accurate measurements. We recommend a reset every 5 minutes or so.

On power on, the Profoscope reminds the user to perform a reset.

Hold the Profoscope in free space (no metal within a 40cm / 16” sphere) and press the reset key. The display rotates for approximately 2.5s while the reset is carried out.

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Table of Contents

Getting Started		**2**
Overview of the Profoscope		**3**
The Profoscope Display		**4**
1	**Safety and Liability**	**6**
1.1	Safety and Usage Precautions	6
1.2	Liability	6
1.3	Safety Instructions	6
1.4	Labelling Used in the Manual	6
2	**Tutorial**	**7**
2.1	The Measurement Principle	7
2.2	The Measuring Range	8
2.3	Factors Affecting the Measurement	9
3	**Real Tests**	**14**
3.1	Preparation	15
3.2	Locate a Rebar	15
3.3	Measure Cover Depth	20
3.4	Measure Rebar Diameter	22
4	**General Settings**	**24**
4.1	Navigating	24
4.2	Regional Setting	24
4.3	Bar Diameter	25
4.4	Measuring Range Selection	25
4.5	Audio Setting	26
4.6	Minimum Cover	26
4.7	Neighboring Bar Compensation	26
5	**Technical Specifications**	**27**
6	**Part Numbers and Accessories**	**28**
7	**Maintenance and Support**	**28**
7.1	Replacing the Protective Cover	28
7.2	Support Concept	28

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1 Safety and Liability

1.1 Safety and Usage Precautions

This manual contains important information on the safety, use and maintenance of the Profoscope. 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 Sale 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.
- Unauthorized structural 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 instrument 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 instrument.

1.4 Labelling Used in the Manual

i **Note:** This symbol indicates important information.

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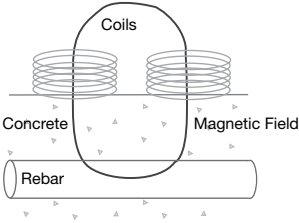
2 Tutorial

2.1 The Measurement Principle

The Profoscope 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 opposite direction. The resulting change in voltage can be utilized for the measurement.



The Profoscope uses different coil arrangements to generate several magnetic fields. Advanced signal processing allows

1. Localization of a rebar
2. Localization of the mid-point between rebars
3. Determination of the cover
4. Estimation of the bar 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 (approx. 400 mm / 16” sphere) will have an influence on the measurement.

> **Note:** Remove all metallic objects such as rings and watches before you start measuring.

* Some concrete types and other structural materials may have metallic content.

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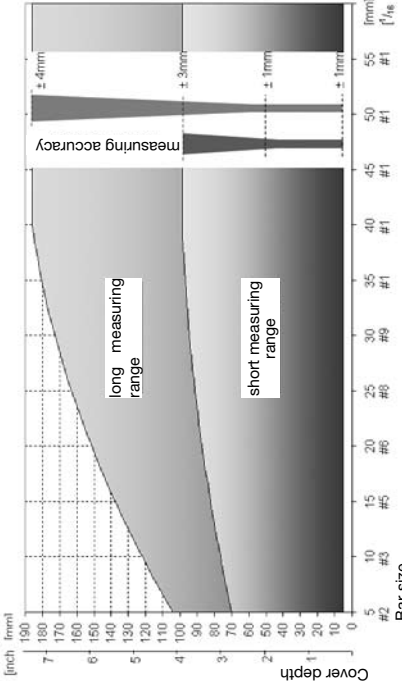
2.2 The Measuring Range

The pulse induction principle used by Profoscope has a defined range of operation.
The measuring range is dependent on the bar size. The expected accuracy of the cover measurement is indicated in the graphic below. (Complies with BS1881 part 204, for a single rebar with sufficient spacing).



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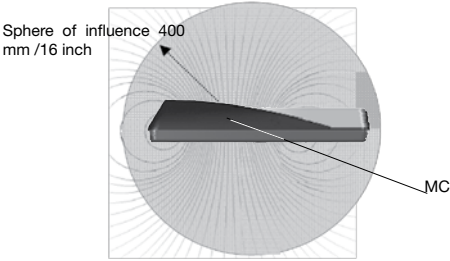
2.3 Factors Affecting the Measurement

2.3.1 Errors due to Neighboring Bars

All rebars within the sphere of influence affect the reading.

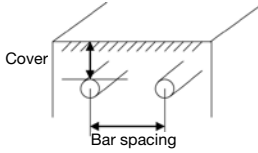


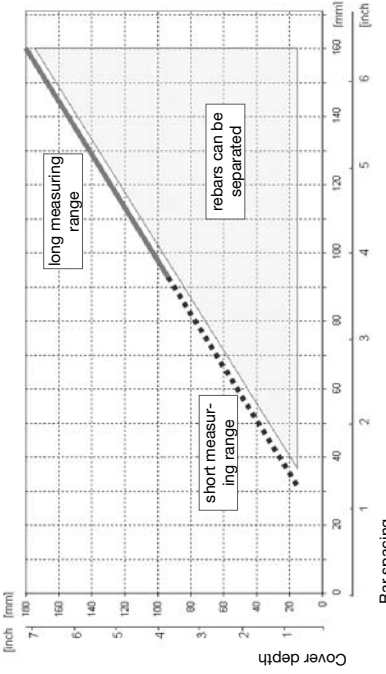
Neighboring bars close to the target bar result in an underestimated cover value and an overestimated bar diameter.

Note: This effect can be reduced by the neighboring bar correction implemented in the Profoscope.

2.3.2 Resolution

There is a limit on the minimum spacing of bars depending on the cover depth. It is impossible to distinguish between individual bars below these limits.
(For the depth at which bars of different sizes can be detected at all – see 2.2)





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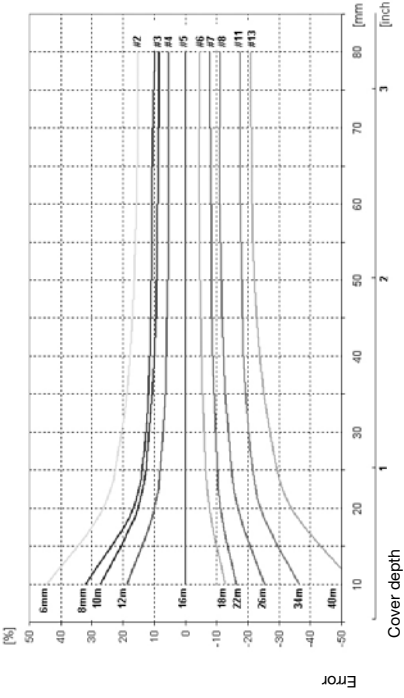
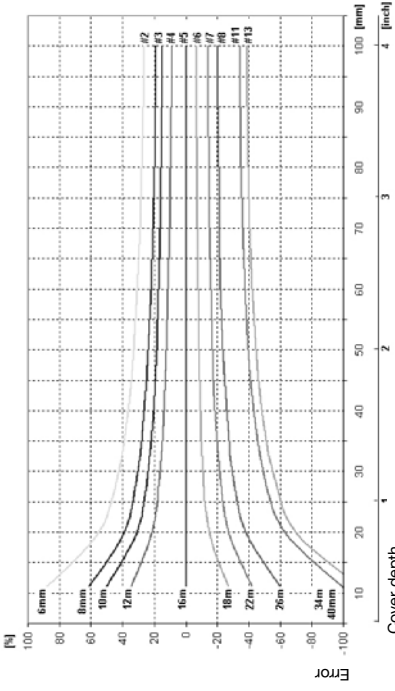
2.3.3 Effect of Setting Incorrect Bar Diameter

The accuracy of the cover measurement is also dependent on setting the correct bar diameter.
The following two charts give an estimation of the error in percentage of the cover reading for different rebar sizes if a default size of 16mm (#5) is set.

For the short range:



For the long range:



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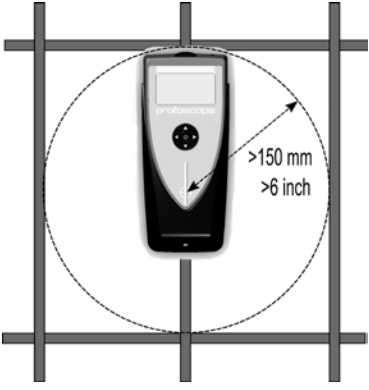
2.3.4 Factors Affecting Diameter Determination

Two factors affect the determination of the rebar diameter. One is the cover depth. Diameter can be determined for rebars with cover not exceeding 80% of the small range. (64 mm, 2.5”)

The second is the separation between neighboring bars. The separation between the bars must be greater than the limits shown in the drawing below (with reference to the MC) for accurate determination of diameter.

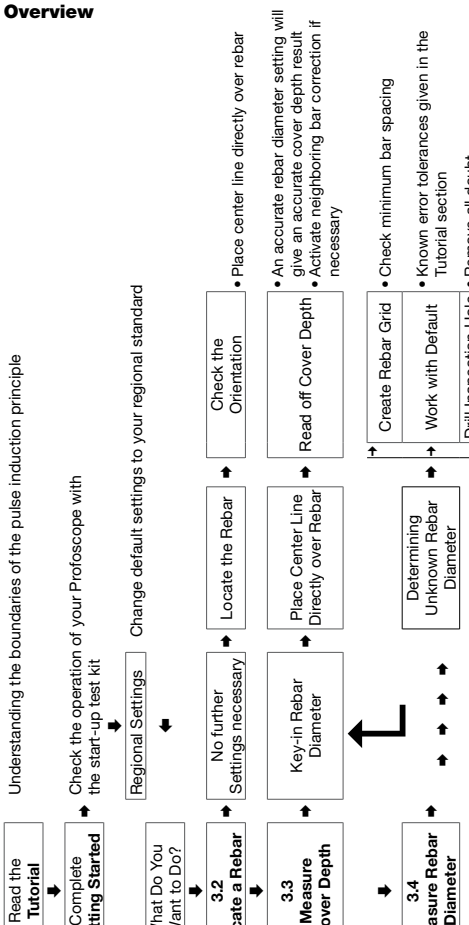


2.3.5 Orientation

The strongest signal results when the center line of the probe is parallel to a bar. The center line in the Profoscope is the long axis of the instrument. This property is used to help determine the orientation of the rebars.

3 Real Tests

Overview



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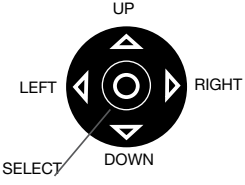
3.1 Preparation

See chapter 4 for advice on selecting your regional setting and on navigating around the menus.

Measuring Screen Short Cuts



Pressing the up arrow will switch the back-light on/off.

Pressing the right arrow toggles between measuring ranges.

3.2 Locate a Rebar

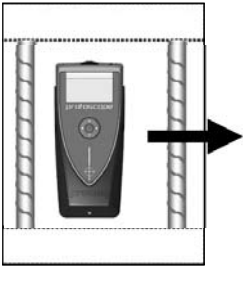
☺ Switch on the Profoscope and perform a reset as explained in “Getting Started”. The Profoscope can immediately be used to locate a rebar.

Note: The Profoscope is able to locate a rebar and also the mid-point between two rebars. It is important to be able to recognize which is which.

3.2.1 Finding a Rebar

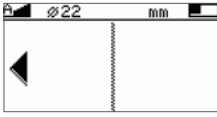
Step 1 – Place the Profoscope on the test surface and move it slowly in a chosen direction. The Profoscope reacts differently depending on its orientation relative to the rebars. There are three scenarios.

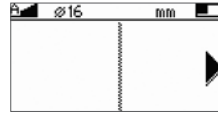
Scenario A)
Sweeping Parallel to the Rebars



☺ Try it out on the start-up test kit.

Arrows indicate proximity of rebars off screen.



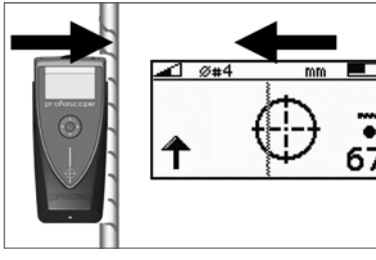


Continue sweeping in the chosen direction.
As you get closer, the rifle scope indicates either:

- The presence of a rebar beneath the instrument or,
- The mid-point between two rebars beneath the instrument.

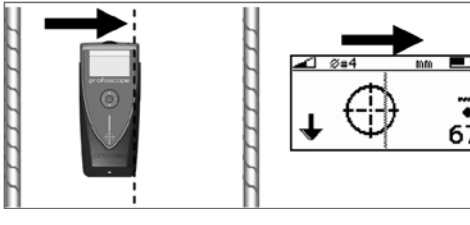
It is very simple to differentiate between the two.

Approaching a Rebar



Rifle scope moves in opposite direction to the Profoscope.
The signal strength is increasing ⬆ as the rifle scope moves towards the center line.

Approaching a Mid-point



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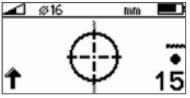
Rifle scope moves in the same direction as the Profoscope.
The signal strength is decreasing ⬇ as the rifle scope moves towards the center line.

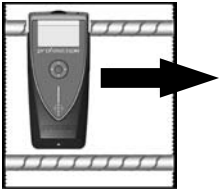
Confirm that you are approaching a rebar.

Continue sweeping until the rifle scope is in the center of the screen. When it is centered exactly, the LED indicator will light. (If the acoustic signal is activated it will sound as long as the LED is lit). The rebar is directly beneath the measurement center.



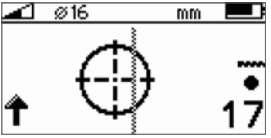
Rebar centered

Scenario B)
Sweeping Perpendicular to the Rebars



☺ Try it out on the start-up test kit.

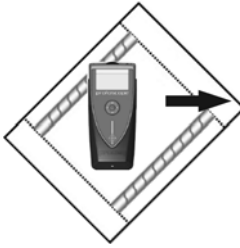
If there are rebars within range, the rifle scope will remain close to the center of the screen and move very little.



Little or no movement of the rifle scope.

In this case turn the Profoscope by 90° and continue sweeping as described in the previous section.

Scenario C)
Sweeping at an Angle to the Rebars



☺ Try it out on the start-up test kit.

The response on the screen will be similar to the case when you are sweeping parallel, but the movement of the rifle scope will be slower.

3.2.2 Check the Orientation

Step 2 – Once you have located the rebar, you need to check the orientation of the bar by rotating around the measurement center.

☺ Try it out on the start-up test kit.

> **Note:** Ensure that the rifle scope remains centered as you rotate.

Rotate until you get the minimum cover value and the LED indicator is lit.

> **Note:** The signal strength arrow ⬆ can also be used as an aid here. The signal strength will increase as you rotate towards the correct orientation and decrease as rotate away.

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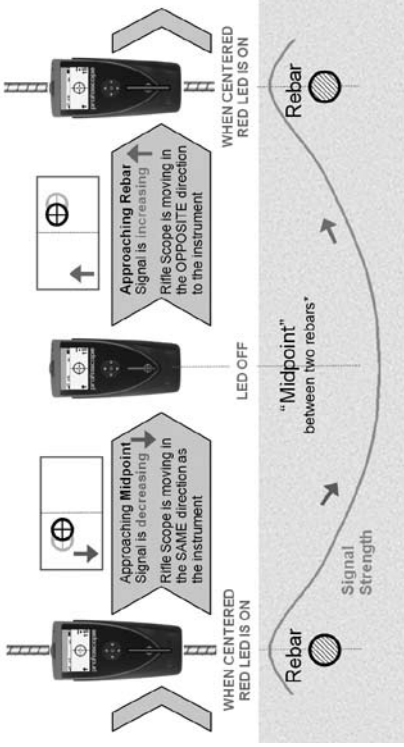
The center line of the Profoscope is now directly above the rebar and pointing in the same direction. Mark at either end of the instrument with chalk or similar.

3.2.3 Verification

Step 3 – Verify by moving the Profoscope in the direction of the rebar and observe that the cover depth reading displays a constant value.

3.2.4 Distinguishing between a rebar and a midpoint



3.2.5 Map out the Rebar Grid

Step 5 – “Reset” the Profoscope again and then start the process once more to locate further rebars.
Sweep in one direction first and then at 90° to build up the grid.
You will soon have a good representation the rebar configuration to help you begin drilling or to conduct further measurements of cover depth and rebar diameter and so forth.

3.2.6 Advanced Settings (Measuring Range)

short, auto (short), auto (long)

This symbol in the top left corner of the screen indicates the measuring range set. Toggle between ranges with the short cut describe in chapter 3.1.

The range can also be set in the main menu by selecting the following icon.

The automatic setting will automatically toggle between the short range and the long range.

If you want to avoid a large sphere of influcence (long range) choose manually the short range to accurately detect rebars that are embedded closer to the concrete surface.

3.3 Measure Cover Depth

Once the rebar grid has been located the cover can be measured.

3.3.1 Set the Rebar Diameter

☺ An accurate knowledge of the rebar diameter will also give best cover depth results.

The default reference rebar diameter set in the instrument is 16 mm or #5. This can be seen in the status row at the top of the display screen.

Step 1 - If you already know the actual rebar diameter, select the icon in the menu to set this as the reference.

Note: If you DO NOT know the rebar diameter, then proceed to chapter 3.4.

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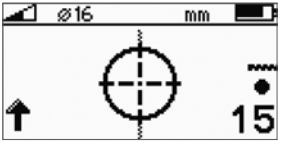
3.3.2 Read the Cover Depth

Step 2 - Place the centre line of the Profoscope directly over the rebar and read off the cover depth.



e.g.
Cover depth = 15 mm

Note: Ensure that the measurement centre is not placed over a horizontal/vertical intersection in the rebar grid.

3.3.3 Advanced Settings (Neighboring Rebar Correction)

As described in the tutorial neighboring rebars that are within the sphere of influence will also be detected by the Profoscope and will affect cover depth and diameter estimation results. The effects of neighboring rebars can be mitigated by keying-in a correction value.

Note: This works for rebars of the same layer running in parallel to the rebar under test.

Measure the distance from the rebar under test to a neighboring rebar. (See 3.2.5)

Enter the settings menu, select the icon and input this value. Verify that neighboring rebar correction symbol is active in the status line at the top of the display. Repeat step 2.

3.3.4 Advanced Settings (Minimum Cover Alert)

This is particularly useful for detecting insufficient concrete cover depth when conducting large scale checks on structures after removing the formwork or large scale building inspections and so forth.

Enter the settings menu, select the icon and set the required cover depth limit. Verify that minimum cover alert symbol is active in the status line at the top of the display.
Move the Profoscope over the test surface. Whenever the cover depth is less than the programmed minimum the LED indicator will light and if it is enabled, an acoustic alarm will be given.

Note: In this mode the LED will not light to indicate that a rebar has been located.

3.4 Measure Rebar Diameter

3.4.1 Determining Unknown Rebar Diameter

☺ The Chapter “Getting Started” shows that under the right conditions the Profoscope can accurately determine the diameter of a rebar.

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.

We present 3 working methods which are recommended to obtain the best results.

3.4.2 Create a Rebar Grid

Method 1 ➡ To map out a rebar grid on a test surface and then to select one rebar from the grid that has sufficient spacing from other rebars.

Step 1 - Create a rebar grid as described in chapter 3.2.5.

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 150 mm (6”). If not, redo Steps 1 and 2 until a rebar is located with at least 150 mm (6”) spacing to a neighboring rebar.

Step 4 - Place the centre line of the Profoscope over the rebar and click the function key on the left side.

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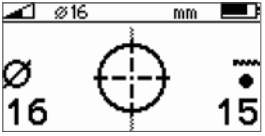


The measured rebar diameter replaces the signal strength arrow.

Note down the rebar diameter.

☺ Try it out on the start-up test kit.

3.4.3 Work with a Default Value

Method 2 ➞ The purpose of this approach is to work with a default value with known error tolerances.

From the menu item “Bar diameter” select the default value 16mm or #5 for the diameter.

Use the chart in section 2.5 of the tutorial to understand the errors that can be expected in the cover readings if the actual rebar diameters differ from the reference value.

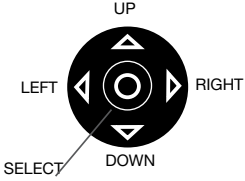
3.4.4 Drill Inspection Hole

Method 3 ➞ The purpose of this approach is to accurately determine the rebar diameter through destructive means.

If neither of the methods 1 and 2 are feasible for whatever reason and you are still in doubt (this could be the case when rebars are bunched too close together or are too small in diameter), then drill an inspection hole wide enough to allow the use of a caliper to measure the rebar diameter. Program this value into the Profoscope and proceed.

4 General Settings

4.1 Navigating



The settings menu can be entered by pressing the select button. Use the navigation keys to select the desired menu icon and press the select button afgain.

Scroll within the menus to the setting you wish to make and press the select button to implement it. Exit the main menu by pressing either the reset or function button.

Each menu item is described in detail below.

4.2 Regional Setting

The Profoscope supports 4 regional settings. This setting affects all other displays and should be done prior to making other selections.

Metric	Cover and bar diameters in mm according to table in 4.3
ASTM inch	Cover in inch, bar diameters according to table in 4.3
ASTM mm	Cover in mm, bar diameters according to table in 4.3
Japanese	Cover in mm, bar diameters according to table in 4.3

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4.3 Bar Diameter

Based on the regional setting, the bar diameter menu supports following bar dimensions.

Metric		ASTM			Japanese	
Bar size	**Diam. (mm)**	**Bar size**	**Diam. (inch)**	**Diam. (mm)**	**Bar size**	**Diam. (mm)**
5	5	#2	0.250	6	6	6
6	6	#3	0.375	10	9	9
7	7	#4	0.500	13	10	10
8	8	#5	0.625	16	13	13
9	9	#6	0.750	19	16	16
10	10	#7	0.875	22	19	19
11	11	#8	1.000	25	22	22
12	12	#9	1.125	29	25	25
14	14	#10	1.250	32	29	29
16	16	#11	1.375	35	32	32
18	18	#12	1.500	38	35	35
20	20	#13	1.625	41	38	38
22	22	#14	1.750	44	41	41
25	25	#15	1.875	48	44	44
28	28	#16	2.000	51	48	48
32	32	#18	2.250	57	51	51
36	36				57	57
40	40					
44	44					
50	50					

4.4 Measuring Range Selection

Select according to the depth of the rebars. Whenever possible, choose the short range.

	Auto Short*	< 80 mm	< 3 inch
	Auto Long*	< 180 mm	< 7 inch
	Short	< 80 mm	< 3 inch

*Automatic switch from short to long if no signal in short range

4.5 Audio Setting

The device can give an audible tone when a key is pressed, to assist in location or to give an alarm when minimum cover alert is activated.

-	No audio signals, silent
Centre	Key pressed. Tone when rebar is centered. Minimum cover alert.

4.6 Minimum Cover

If a minimum cover is selected, the LED is lit when the cover is below this limit. If audio is on, an audio signal is given.

Metric, ASTM mm, Japanese			ASTM inch	
-	mm		-	inch
5	mm		0.20	inch
6	mm		0.24	inch
7	mm		0.28	inch
...			...	
179	mm		7.04	inch
180	mm		7.08	inch

4.7 Neighboring Bar Compensation

Cover and bar diameter measurements are influenced by neighboring bars. This can be compensated by selecting the bar spacing.

Metric, ASTM mm, Japanese			ASTM inch	
-	mm		-	inch
50	mm		2.0	inch
60	mm		2.4	inch
70	mm		2.8	inch
80	mm		3.2	inch
90	mm		3.6	inch
100	mm		4.0	inch
110	mm		4.4	inch
120	mm		4.8	inch
130	mm		5.2	inch

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5 Technical Specifications

Power supply	
Power source	2 x 1.5 V AA (LR6) batteries
Voltage range	3.6 V to 1.8 V
Current Consumption	
Power on, backlight off	~ 50 mA
Power on, backlight on	~ 200 mA
Sleep mode	~ 10 mA
Power off	< 1 µA
Battery Lifetime	
Backlight off	> 50 h
Backlight on	> 15 h
Time Outs	
Sleep mode	90 s
Auto shut down	120 s
Environmental Conditions	
Temperature range	-10° to 60° C (14° to 140° F)
Humidity range	0 to 100% rH
IP classification	IP54
Conformity	CE, RoHS and WEEE
Standards and Regulations Applied	
BS 1881 part 204	
DIN1045	
SN 505 262	
DGZfP B2 (recommendation)	

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6 Part Numbers and Accessories

Part Number	Item
391 10 000	Profoscope incl. standard accessories (Packaging with integrated start-up test kit, batteries, canvas bag, carrying strap, chalk and product documentation).
Standard Accessories Delivered	
391 80 100	Canvas bag
350 74 025	Battery type AA
391 80 110	Carrying strap
Optional Accessories	
391 10 121S	Self-adhesive protection covers (Set of 3)
390 00 270	Calibration test block
325 34 018S	Chalk (Set of 10)
Extended Warranty	
391 88 001	Additional 1-year warranty *
391 88 002	Additional 2-year warranty *
391 88 003	Additional 3-year warranty *
* An extended warranty of one, two or three years for be purchased at time of order or within 90 days thereafter.	

Standard Warranty:
- Electronic portion of the instrument: 24 months
- Mechanical portion of the instrument: 6 months

7 Maintenance and Support

7.1 Replacing the Protective Cover

In order to prevent abrasion the instrument is protected by a self-adhesive protective cover. It is recommended to check and replace this cover periodically.

7.2 Support Concept

Proceq is committed to providing a complete support service for this instrument. It is recommended that the user register the product on the www.proceq.com to obtain valuable information on available updates and other useful information.

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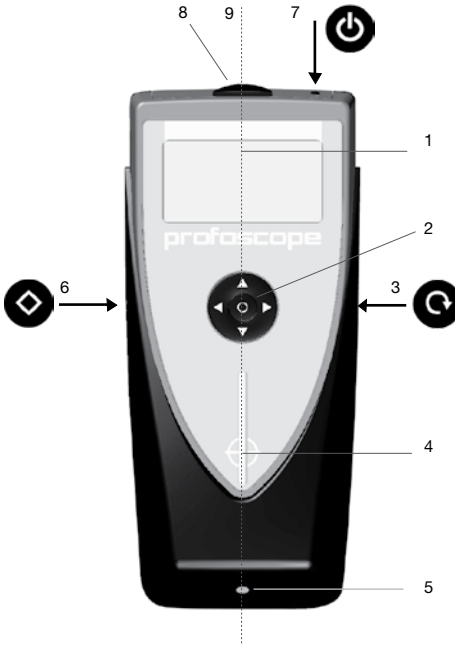
Overview of the Profoscope



1 Display
2 Navigation
3 Reset key
4 Measurement center
5 LED indicator
6 Function key
7 On/Off button
8 Battery compartment
9 Center line

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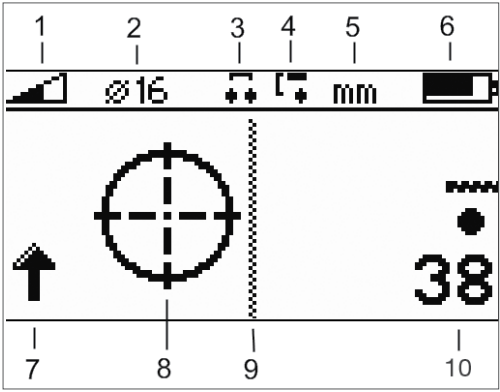
The Profoscope Display



1	Measuring range (short, auto)
2	Reference rebar diameter
3	Neighboring rebar correction active
4	Minimum cover alert active
5	Measuring unit
6	Battery status
7	Signal strength (increasing / decreasing)*
8	Rifle scope
9	Center line
10	Measured cover depth

* The signal strength arrow is replaced by the measured bar diameter:

e.g.

when the function key ◇ for bar diameter is pressed.

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