PS 20

GB

Operating instructions

PS 20 Detector

This operating instructions contains information on how to use the tool as well as safety notices *(see chapter "Safety notices").*

Please read these instructions carefully before using the tool.
Also place it at the disposal of anyone who is to use the tool.

We recommend keeping the instructions and tool together.

Symbols used

The symbols used in the manual have the following meaning:

Warning:
Operating hazard or health hazard, even death of the operator if disregarded.

Operating hazard or minor health hazard to the operator. May however cause major damage to the equipment and environment. May also cause expensive repairs.

Operator information
Helps in using the equipment properly and more efficiently.

Product ID

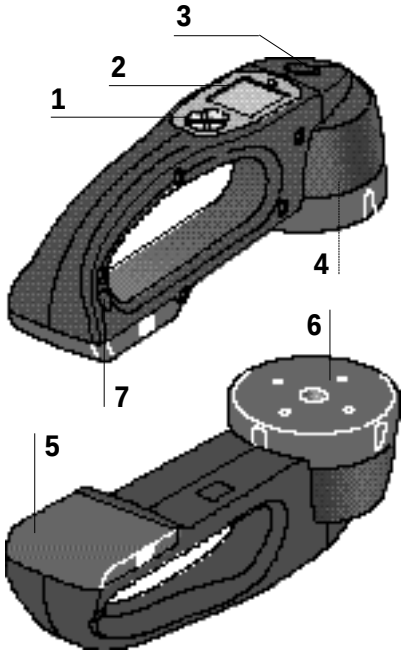
Type and serial number are on the plate on the underside of the tool.
Write this information into the manual and always use it as reference when calling us or our representative for service or other related information.
Type: PS 20

Serial no.: _____

Content PS 20 Detector

1. Product information

1.1 Tool overview



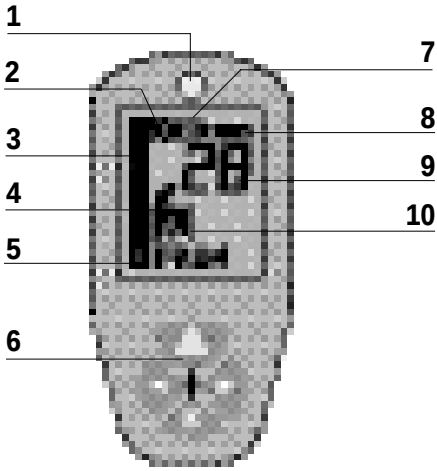
1 Keypad
2 Display
3 Marking hole
4 Sensor head
5 Battery compartment cover (exchangeable)
6 Sensor head cover (exchangeable)
7 Holes for hand strap

The tool is intended for use as a detector. It can detect ferrous metals (E.g. steel reinforcing bars), non-ferrous electrical conductive metals (E.g copper pipe, aluminium) and can detect the presence of an electrical field, making it possible to detect live electrical cable. As well as detecting the position of reinforcing bar accurately, it can also determine the depth of the reinforcing bar. It cannot determine the depth of any other material.
The PS 20 detector can, within certain limitations be used to estimate or localise the position of a live electrical cable using the special live electrical cable detection function.

1.2 PS 20 features

- automatic object recognition and display of detected reinforcement
- Detection of reinforcing bars within a defined minimum depth (ignoring any reinforcement that lie below this depth).
- Adjustment of detected depth for reinforcement containing impurities
- Detection of unshielded, live electrical cable.

1.3 Display and keypad



1 Indication light
2 Acoustic beep indication
3 Signal strength bar
4 Live wire symbol
5 Function menu
6 Keypad
7 Battery low symbol
8 Unit of measure
9 Depth of coverage
10 Non-ferrous metal detection. Typically shows detection of copper or aluminium

1.4 Technical data

Reinforcement detection
All figures based on bar diameter of 12mm (0.5 in), round reinforcing bars, magentic permeability 85-105, concrete surface smooth and flat, reinforcing bars at right angles to direction of scan, no interfering influences.

Depth range for detection
Depth range for detection
0-100mm (0 - 4in)

Depth range for coverage depth measurement 10 - 80 mm

Accuracy of depth of coverage measurements
metric:
from 10-30mm - +/-2mm
from 30-60mm - +/-2mm +/-10% of depth
from 60-80mm - +/-5mm +/-10% of depth
imperial:
from 0.4-1.18 in - +/-0.08in
from 1.18-2.36 in - +/-0.08in +/-10% of depth
from 2.36-3.15 in - +/-0.2in +/-10% of depth

Separation of reinforcement
Min 42mm (1.7 in) bewteen bars or 1:1.12, whichever is greater.

Non-ferrous metal detection
0 - 60 mm with 10 - 30 mm (tube-ø)
(0 - 2.4 in with 0.4 - 1.2 in, (tube-ø)

Localising live electrical cable
Will detect cable 100-240V 50/60Hz. Accuracy to which cable can be localised on the surface depends on a variety of factors such as air humidity, moisture in the material, elements close to the cable.

Smallest unit displayed 1mm (1/32 in)

Power supply and battery
Type: AA (LR6, AM3, Mignon)
Standard: 4 alkaline manganese cells
Optional: rechargeable NiCd, NiMH
Warning symbol when battery charge low
Battery life – 40h continuous operation at 23°C (73°F)

Automatic switch-off
3 minutes after a key press is requested and not carried out.

Operating temperature
–10° C to +50° C (14° F ... 122° F)

Storage temperature
–20° C to +60° C (-4° F ... +158° F)

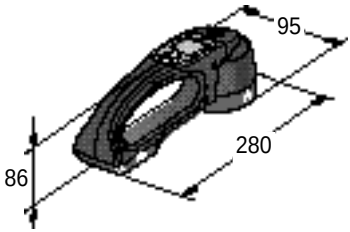
Proofing
Dust and splash proof,
IP 54 in accordance with IEC 529 standards.

Relative humidity
Max. 95% in accordance with IEC 68, DIN EN 60068. Does not apply to live electric cable detection which is adversely affected by high levels of relative humidity. Refer to chapter 4.1 for guidance.

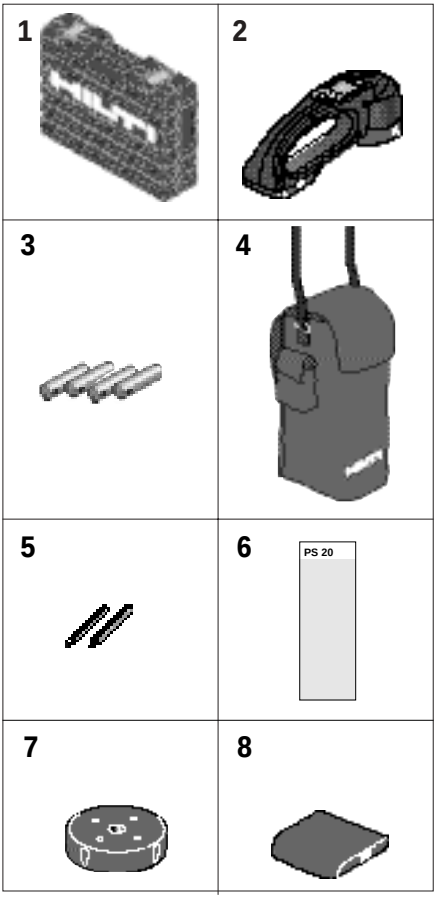
Weight
600 g (1.32 lbs) not including batteries

Dimensions (LxWxH)
280 x 95 x 86 mm (11" x 3.7" x 3.4")

Illustration with dimensions [mm]



1.5 Items supplied at time of purchase



Pos.	Pcs.	Description
1	1	PS 20 case
2	1	PS 20 detector with sensor head cover and battery compartment cover
3	4	AA type batteries
4	1	PS 20 carrying pouch
5	2	Marking pencils
6	1	Operating manual and quick guide
7	1	Replacement sensor head cover
8	1	Replacement battery compartment cover

2. Safety precautions

2.1 Please read now!

These warnings should put PS 20 owners and operators in the position where they can recognize possible danger in advance and avoid it, i.e. prevent it. The owner must make sure all operators understand and follow these warnings.

2.2 Intended purpose

Use as intended

The Hilti PS 20 detector is intended to be used for the following purposes:

- detecting and depth of coverage measurement of steel reinforcement.
- detecting copper tubing and aluminum parts.
- localising live electrical cable.

The PS 20 detects electrically conductive ferrous and non-ferrous metals. The presence of small objects made from such materials or the presence of objects made from other materials cannot be ruled out.

Never attempt to open up the structure without first turning off the power supply.

In order to guarantee reliable results, the tool must not be used during large temperature changes. Allow the tool time to adjust to the surrounding ambient temperature before use.

Measurement and evaluation of the measurements should be performed by properly trained personnel.

They:
- have read and understood the operating instructions
- are aware of the special features and limitations of the measuring principle used
- possess sufficient knowledge of reinforcement technology.

Misuse

- Using the product without following the instructions in the manual.
- Using the product outside of application limits or technical specifications.
- Using the product before checking the minimum depth and offset function settings. When set incorrectly, these will result in misleading or incorrect measurements.
- Using in areas of electromagnetic anomalies. This may result in misleading or incorrect measurements.
- Using in areas where there is a danger of explosions.
- Using in the proximity of medical equipment. Use near such equipment may result in disturbances or failure of it.
- Do not immerse in water or use in very heavy rain.
- Opening parts of the product other than the battery compartment cover.
- Modifying and/or adding parts to the product.
- Using third party accessories not explicitly approved by Hilti.
- Using a damaged product or a product that returns results that are not plausible.
- Measuring with very worn or dirty sensor head cover or battery compartment cover.
- Measuring without sensor head cover or battery compartment cover
- Using without first testing the accuracy.
- Using to detect metal in humans or animals.
- Use of measuring results for purposes relating to safety without control measures and evaluation by qualified specialists. (e.g. civil engineers)
- Drilling very close to or on marked live electric cables or pipes.
- Drilling on marked reinforcement deeper than the depth displayed on the tool, also taking into account depth accuracy specifications.

Continues

Misuse, *Continued*

Possible results of misuse

- Safety hazards to life and limb through faulty measurement results.
- Structural damage,e.g. from drilling into loadbearing reinforcing bars.
- Damage to the PS 20.
- Reduction of measuring accuracy.
- Warranty is null and void.
- Safety hazards to life and limb through falling
- Safety hazards to life and limb through electric shock

2.3 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility means the capability of the PS 20 to function smoothly in an environment of electromagnetic radiation and electrostatic discharges, without causing electromagnetic interference to other equipment.
Interference caused by electromagnetic radiation can cause disturbances in the PS 20.
Although the PS 20 meets the strict regulations and standards which are in force in this respect,

Hilti cannot completely exclude the possibility that interference may be caused to the PS 20 by very intensive electromagnetic radiation, e.g. near welding equipment, diesel generators etc.
Under such conditions, check measurement results for their plausibility.

The PS 20 may cause disturbance in other equipment through electromagnetic radiation.
Although the PS 20 meets the strict regulations and standards which are in force in this respect, Hilti cannot completely exclude the possibility that interference may be caused by the PS 20, e.g. in electronic measuring equipment.

2.4 FCC statement (applicable in U.S.)

WARNING

This equipment has been tested and found to comply with the limits for a Class II digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

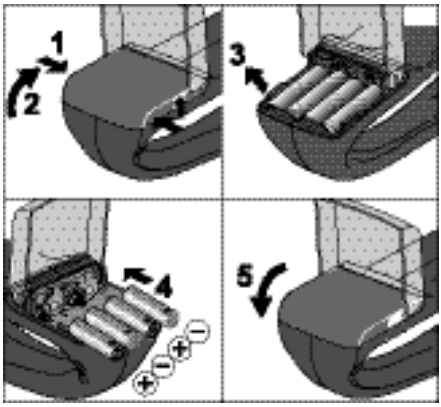
2.5 Disposal

Hilti products are largely manufactured from recyclable materials. A prerequisite for recycling is proper material separation. In many countries Hilti is already able to accept your used unit for recycling. Ask your Hilti representative or the Hilti customer service.

Component/assembly	Main material	Utilization
Plastic case	Plastic	Plastic recycling
Case	Plastic	Plastic recycling
Cable	Copper, elastomer	Scrap metal
Electronic parts or (sensor, charger)	Various	Electronic scrap scrap metal
Screws, small parts	Steel, brass	Scrap metal
Manual	Paper	Waste paper
Battery, rechargeable	Nickel, cadmium	Battery recycling (observe special local regulations)

3. Operation

3.1 Inserting the batteries



1. Press the sides of the cover
2. Tilt it upwards
3. Remove old batteries if present
4. Insert new batteries as shown inside the battery compartment
5. Replace the cover by inserting the tab on the cover into the slot in the tool and clicking down into place.

Batteries will require replacement when the low battery symbol shows on the display

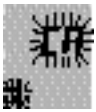
Always replace complete battery set.
- do not mix old with new batteries
- do not use batteries from different manufacturers or of different types.
- only used checked and undamaged batteries.

When using rechargeable batteries only use:
- same brand name and same model.
- of same age and charge level.

Never strike the tool in order to remove the batteries. Always remove them by hand.

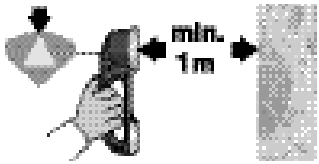
3.2 Switching on/off and calibrating

Press On key, "CA" blinks in the large display and in the function menu display.



Hold the tool at least 1m away from all metallic objects and tools or machines that emit a large electromagnetic field.
(E.g. other PS 20s, power generators etc).

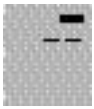
Press the On key again:



- "CA" blinks in the large display and in the function menu display.
  The signal strength bar appears.

Beep

A short beep sound follows calibration (if acoustic beep has not been turned off).
The screen shows:



The tool is ready for use.

4

Continues

3.2 Switching on/off and calibrating,
Continued

Calibration:
- **results in higher measuring accuracy by taking account of the surrounding environment**

An automatic calibration request follows if:
- the temperature changes by ± 3°C
- 6 minutes after the last calibration.

When the request occurs, hold the tool at least 1m away from all metallic objects and machines that produce a large electromagnetic field and press the On key to carry out the calibration. Then carry on working.

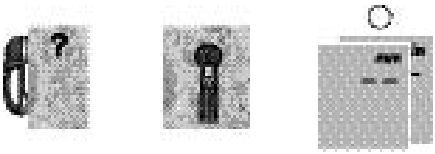
To switch the tool off at any time, press the On and Function keys simultaneously.

4. Working with the PS 20

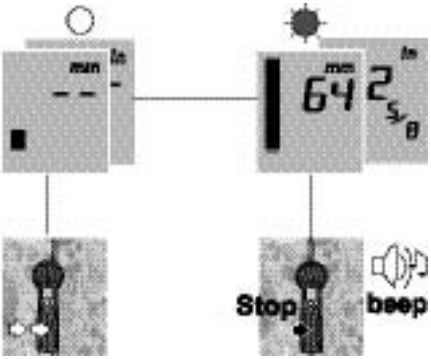
Preconditions:
- tool switched on
- calibration carried out
- Minimum depth of coverage function is inactive

4.1 Detecting reinforcement & non-ferrous, metallic objects

Tool:
- place on surface where materials are to be detected
- move it across the surface with a sweeping motion. Avoid short, jerking movements as this can result in erroneous detection.



Detecting reinforcing bar and other ferrous objects



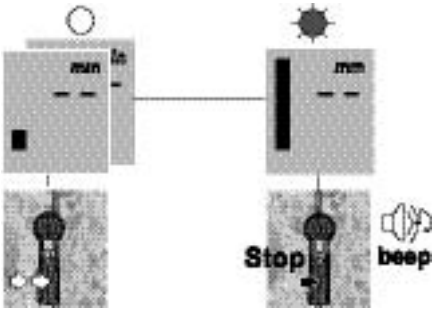
As a reinforcing bar is approached, the signal strength shown on the bar increases steadily.

Determining the center of the reinforcing bar:
- the center indication light illuminates.
- the acoustic beep sounds (if active).
- signal strength bar is at a maximum.
- depth of coverage is displayed in [mm] or [inch]

Mark the position through the hole in the sensor head using a marking pencil supplied.

Note the performance limitations and technical specifications of the tool regarding depth measurement accuracy where depth of rebar is a critical factor (E.g. when anchor setting).

When no depth measurement is possible, "--" is displayed as depth of coverage.



The center, however is detected by the beep sound, the signal strength bar at maximum and the center indication light.
Reasons for inability to calculate depth include:

- Object is too deep to determine depth (deeper than 80mm or 3.15in)
- Object is not a standard reinforcing bar
- Iron contains a high level of impurities

The PS 20 detects electrically conductive ferrous and non-ferrous metals. The presence of small objects made from such materials or the presence of objects made from other materials cannot be ruled out.

4.1 Detecting objects, *Continued*

Retaining the measured depth value on the display

To retain the measured depth value on the display after a rebar has been detected, press and hold the On key. This aids easy reading of the display when working in restricted areas. After releasing the key, the display is reset.

Limitations of rebar detection and depth measurement

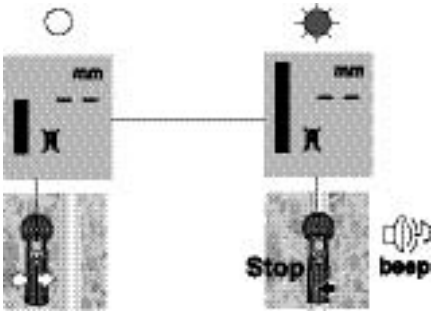
1. Shading

The problem of shading can occur when trying to detect a second layer of reinforcement. The top layer shades the magnetic field. Any reinforcement below the top layer that is shaded will not be detected.

2. Influence of reinforcement mats on depth measurements

Although such a situation rarely occurs, a reinforcing mat that lies up to 60mm deeper than the reinforcing bar can influence the magnetic field produced by the tool and result in an incorrect measurement.

Detecting non-ferrous metallic objects (copper and aluminium)



Determining the center of the pipe:
- the center indication light illuminates.
- the acoustic beep sounds (if active).
- signal strength bar is at a maximum.
- the non-ferrous metal symbol appears on the display

Mark the position through the hole in the sensor head using a marking pencil supplied.

Note that depth cannot be calculated.
Mark the likely area through the hole in the sensor head using a marking pencil supplied.

To return to the metal detection mode, press the On key.

Localising live electrical cable

See chapter 4.2.6

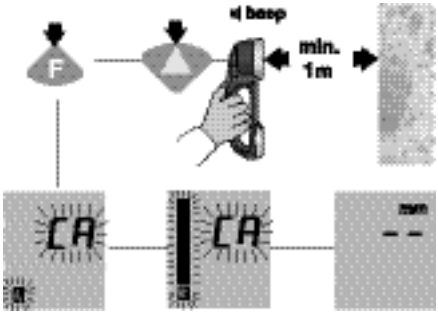
4.2 Menu Functions

4.2.1 Calibration

Calibrating the tool enables it to ensure accuracy regardless of temperature change or surrounding magnetic influences.

Calibration is automatically required when the tool is first switched on. Thereafter it will also automatically be requested either when the temperature in the tool changes by ±3°C (+26/37°F) or 6 minutes after the previous calibration.

You will not be able to carry on working until this calibration is carried out. See chapter *3.2 Switching on and calibrating*.



If you suspect a recalibration is required before it is automatically requested, carry it out by:

1. Press the function key. ”CA” blinks in the main display and in the function menu.

2. Hold the tool at least 1m away from any metal objects.

3. Press the On key to carry out the calibration.

4.2.2 Setting minimum depth of coverage

With the minimum coverage depth set, the tool will only sound the visual and audible alarm when reinforcing bar is detected closer to the surface than the defined minimum depth.

This function is used for checking minimum concrete coverage depth for:
- quality control
- assessment of cover on concrete areas prior to renovation
- check before drilling holes for anchors

To set the minimum coverage depth and activate the function:

2x

1. Select the minimum coverage function from the menu by pressing the function key twice. The minimum coverage icon flashes in the function menu.

2. Press the right arrow key to set the desired depth. Keep the key pressed to quickly scroll to the value you require. Use the left arrow key to descend to a lower value if required. Press both arrow keys together to reset to zero.

3. Press the On key to confirm your choice and return to the detection mode.

The minimum coverage icon is displayed in the function menu, signifying that the function is active. Non-ferrous metals will still be detected in the normal way. This setting is saved when the tool is switched off.

Continues

4.2.2 Setting minimum depth of coverage, *Continued*

To deactivate the function:

1. Repeat step 1 above.

2. Press both arrow key simultaneously to reset the depth to zero.

3. Press the On key to confirm and continue.

The minimum coverage icon disappears, signifying that the function is now inactive. To ensure that the function remains inactive switch the tool off and then back on.

Before use, ensure that the minimum cover setting is still valid for the area you wish to scan. Misleading results may be obtained if this is not done.

4.2.3 Switching back light on/off

To operate in poorly lit areas (e.g. a cellar) switch the back light on.

To switch the backlight on or off:

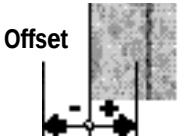
1. Press the function key three times. The back light icon flashes.

2. Use the left or right arrow key to switch the backlight on or off.

3. Press the On key to continue.

This setting is not saved when the tool is switched off.

± 4.2.4 Setting the offset



The PS 20 contains a database of almost all known standard reinforcing bars and their magnetic characteristics. When the reinforcing bar contains too many impurities, a false depth of coverage may be displayed. Such problems usually occur either in older structures or where building standards are not enforced as a matter of practice.
The offset function provides a solution to this problem. However, it does rely on the operator recognising that such a problem exists. A test hole is drilled to the reinforcing bar and the depth measured. Then the PS 20 is used to measure the depth and the difference calculated. The difference will likely remain reasonably constant for all reinforcing bar in the structure. This difference is entered in the PS 20 and is automatically added or subtracted from the measured depth.

To enter the offset and activate the function:

1. Press the function key four times. The offset icon flashes.

2. Press the left or right arrow key to set the desired offset (Maximum ±10mm). Keep the key pressed to quickly scroll to the value you require. Use the left arrow key to descend to a lower value if required.

Press both arrow keys together to reset to zero.

3. Press the On key to confirm your choice and continue.

The offset icon appears in the display signifying that the function is active. This setting is saved when the tool is switched off.

Continues

4.2.4 Setting the offset, *Continued*

To deactivate the function:

1. Repeat step 1 above.

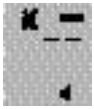
2. Press both arrow key simultaneously to reset the offset to zero.

3. Press the On key to confirm and continue.

The minimum coverage icon disappears, signifying that the function is now inactive. To ensure that the function remains inactive switch the tool off and then back on.

Before use, ensure that the offset setting is still valid for the area you wish to scan. Misleading results may be obtained if this is not done.

4.2.5 Switching the acoustic beep on/off



The acoustic beep signifies either that the centre of a reinforcing bar or non-ferrous object has been reached. To switch the acoustic beep on/off:

1. Press the function key five times. The acoustic beep icon flashes.

2. Use the left or right arrow key to switch the beep on or off.

3. Press the On key to continue.

When switched off, the corresponding symbol appears in the display. This setting is saved when the tool is switched off. To ensure that the function remains inactive switch the tool off and then back on.

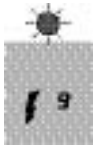
4.2.6 Localising live electrical cable

Live electrical cable is located by first determining that a cable is nearby and then narrowing down the area over which it is detected by reducing the sensitivity of the tool.

Use the Function menu to access the live cable function:

1. Press the function key until the live wire symbol is displayed as below.

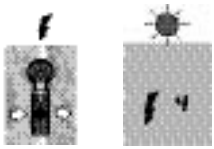
2. Place the detector on the area of interest. If the indication light illuminates, a cable has been found.



3. Reduce the sensitivity level by pressing the left arrow key until the light goes out.

4. Increase the sensitivity by one level so that the light illuminates again and scan the immediately surrounding area.

5. Repeat steps 3 and 4 until the area over which the cable is found is acceptably small.



To return to metal detection, press the On key.

Continues

4.2.6 Localising live electrical cable,
Continued

The following factors must be taken into account and observed:

The cable detection function localises the area in which a live cable lies and gives a most likely position within this area based on the information available.

Shielded cable and cable running in metal conduit cannot be detected or localised. However, metal conduit lying within the detection range of the PS 20 will be detected as metal and shown accordingly on the display.

Moist or damp materials and/or a humid atmosphere act in a similar way to an antenna for the electric field produced by the cable and spread it over a large area. Therefore, live electric cables cannot be localised in damp materials or when the surrounding air is very humid.

If a rough surface is scanned using the live cable detection function on the higher sensitivity levels (i.e. level 9-6), use gentle scanning movements over a small area. Quick, rough movements over a large area may lead to misleading detection of live electric cables.

5. Settings menu

5.1 Set units to mm/in

This setting changes the units used when displaying the depth or reinforcing bar, setting the minimum cover-age depth and setting the offset. The units may be set to millimetres or inches and fractions of an inch. The smallest displayed unit is 1mm or 1/32 inch.

To set the units used:

1. Ensure the tool is switched off.

2. Switch on by pressing the On and function keys simultaneously. The tool switches on in Settings mode and the current unit used is displayed.

3. Use the left or right arrow key to select the desired unit (mm or inch)

4. Press the On and function keys simultaneously to confirm your choice and switch the tool off.

The new settings take effect the next time the tool is switched on.

To avoid confusion, always reset the minimum cover and offset functions to zero after changing units.

5.2 Test the display

All LCD segments in the display may be activated at once to check that all are working properly.

To test the display:

1. Ensure the tool is switched off.

2. Switch on by pressing the On and function keys simultaneously. The tool switches on in Settings mode and the current unit used is displayed.

3. Press the function key to test the display. All LCD segments are activated.

4. Press the On and function keys simultaneously to switch the tool off.

6. Care, storage, transportation

6.1 General care

- clean with soft dry cloth. Only if necessary dampen cloth with pure alcohol or water.

Do not use any other liquids as they may damage the plastic components. Pay attention to the temperature the tool is exposed to, especially in summer when keeping it in a vehicle. (Storage temperatures: -20°C to +70°C / -4°F to +158°F)

When sensor head or battery covers are dirty:
- remove and clean.
- replace if necessary.

Signal holes will appear in the Sensor head cover when it needs replacing. Similarly, replace the battery cover immediately when a hole begins to appear. Delayed replacement may result in irreparable damage to the tool. Worn Sensor head and battery compartment covers can also lead to a degradation of depth measurement accuracy of between -1 to -4mm.

6.2 Storage

Clean and dry the tool. Do not repackage equipment until totally dry Storage temperatures: -20°C to +60°C / -4°F to +140°F .

Take a test measurement after long storage or long transportation period.

Remove batteries when storing tool for a long period of time.

6.3 Transportation

Use the Hilti case when shipping the tool. Always ship without batteries inserted. In this way, any disturbance of vehicle or aircraft systems through unintended activation of the tool are ruled out.

7. Displayed notices

Batteries almost empty.
- replace

Error codes:

E1 **Sensor malfunction**

Measure:
Ensure the calibration conditions have been fulfilled as described in chapter 3.2. Switch off and back on. If error remains, contact Hilti Service

E2 **Temperature outside of safety range**

Measure:
Switch off and allow to adjust to surrounding temperature for one hour. Ensure surrounding temperature is within specifcation. Switch back on. If error remains, contact Hilti Service

E3 **Calibration cannot be carried out**

Measure:
Ensure the calibration conditions have been fulfilled as described in chapter 3.2. Switch off and back on. If error remains, contact Hilti Service

8. Accessories

Replacement parts available from Hilti:

Sensor Head and Battery Covers. (340807)

- 1 replacement Sensor Head Cover
- 1 replacement battery cover

Markers (340806)

12 red markers packaged in a plastic storage tube

9. EU-conformity declaration

Designation:	PS 20
Serial numbers:	00000001 - 50000000
Year of design:	2000

CE-conform

We declare under sole responsibility that this product corresponds to the following standards or standard documents.
EG guideline 89/336/EWG and the corresponding standards DIN EN50081-1 (03.93), DIN EN 50082-2(03.95),authorized certification issued: no. 010b/00-d.

Hilti Corporation

Armin Spiegel
Positioning Systems
Manager
Head of Business Unit

Bodo Baur
Quality Manager
Positioning Systems
Quality Manager of
Business Unit

Positioning Systems 07/2001

10. Warranty

Hilti warrants that the tool supplied is free of defects in material and workmanship. This warranty is valid so long as the tool is operated and handled correctly, cleaned and serviced properly and in accordance with the Hilti Operating Instructions, all warranty claims are made within 12 months from the date of the sale (invoice date), and the technical system is maintained. This means that only original Hilti consumables, components and spare parts may be used in the tool.

This warranty provides the free-of-charge repair or replacement of defective parts only. Parts requiring repair or replacement as a result of normal wear and tear are not covered by this warranty.

Additional claims are excluded, unless stringent national rules prohibit such exclusion. In particular, Hilti is not obligated for direct, indirect, incidental or consequential damages, losses or expenses in connection with, or by reason of, the use of, or inability to use the tool for any purpose.
Implied warranties of merchantability or fitness for a particular purpose are specifically excluded.

For repair or replacement, send tool and/or related parts immediately upon discovery of the defect to the address of the local Hilti marketing organization provided.
This constitutes Hilti's entire obligation with regard to warranty and supersedes all prior or contemporaneous comments and oral or written agreements concerning warranties.

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