



PHD PRO2

High-voltage DC pinhole/porosity detector kit

Quick Start Guide

Please read this manual before using the equipment

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Safety Warnings



IMPORTANT: We strongly advise that individuals with pacemakers, cochlear implants, or trans-dermal electronic implants - e.g., glucose monitors do not use our high-voltage test equipment under any circumstances.



IMPORTANT: This product must not be used in combustible atmospheres or ATEX Hazardous Areas, such as fuel stations or in proximity to any combustible gas (and/ or oxygen concentrations exceeding normal atmosphere).



All high-voltage testing equipment must be operated by suitably trained, responsible, authorised personnel only.



IMPORTANT: This product can cause radio interference and caution must be taken when operating in sensitive environments such as hospital roofs.



IMPORTANT: This instrument must be connected to an appropriate earth (ground) before a high voltage is applied.



Observe all safety precautions; operators will be exposed to high voltages when using this instrument. Avoid contact with live components.



This instrument creates sparks in use, which cause the formation of ozone (O₃). Ozone is a known irritant and therefore - particularly when using the instrument in confined spaces - the user must ensure adequate ventilation so that established workplace exposure limits are not exceeded.



Safety Warning: DO NOT USE this equipment in the event of it being immersed in water. It must be immediately returned to Buckleys for service, calibration and/or repair.

A high voltage will always take the easiest route to earth. The risk of electrical shock is inherent when operating high-voltage equipment and extreme caution must be taken at all times.

The output voltage of this equipment is derived from a high-impedance source and is current limited. However, when the equipment is in use, should the operator accidentally contact the test electrode they will receive an electric shock. If this situation is unavoidable, we recommend that suitable rubber or plastic insulating gloves be worn. Furthermore, the operator should be in good health and - in particular - not suffer from any cardiac condition.

During testing, a static charge may accumulate on the surface under test. If the operator is walking on the surface, they may also become 'charged- up'. When discharged to earth, this charge could result in a static electric shock, such as may be experienced in the home under certain weather conditions.

Whilst such a shock does not normally present any danger to the user, it can be unpleasant. In most cases, the operator can avoid this by wearing the blue electrostatic discharge wristband supplied and ensuring it is connected by the blue cable to the grounding terminal (4mm socket) on the test probe handle, or the earthing terminal on the instrument's enclosure. In all cases it is essential to ensure that the instrument is correctly earthed

EC Declaration of Conformity

We, Buckleys (UVRAL) Ltd., as sole manufacturer of the apparatus listed below, declare that the product **PHD Pro2** is manufactured in conformity with the following directives: **2014/30/EU, 2014/35/EU, 2015/863/EU** and **2011/65/EU (RoHS)**.

Date: 01/07/2021

Authorised by:



J P Hoveman

CEO, Buckleys (UVRAL) Ltd.



UKCA Declaration of Conformity

We, Buckleys (UVRAL) Ltd., as sole manufacturer of the apparatus listed below, declare that the product **PHD Pro2 Pro2** is manufactured in conformity with the following UK legislation: **Electronic Compatibility Regulations 2016, The Electrical Equipment (Safety) Regulations 2016** and **Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**.

Date: 01/07/2021

Authorised by:



J P Hoveman

CEO, Buckleys (UVRAL) Ltd.



Specifications

- Output voltage range:
 - 6kV models: 500V - 6kV
 - 30kV models: 0.9kV - 30kV
 - 40kV models: 0.9kV - 40kV
- Max. output current: <1mA (continuous)
- Alarm sensitivity range: 10µA to 450µA (factory-set to 200µA)
- Recommended coating thickness range (using NACE SP0274):
 - 6kV models : 4µm - 576µm
 - 30kV models : 13µm - 14.4mm
 - 40kV models : 13µm - 25.6mm
- Built-in test standard compliance: NACE SP0274/ NACE SP0490/NACE SP0180/ASTM D5172/ASTM G62/ISO 21809-2†
- Unit: 1.64kg, 172mm x 85mm x 235mm
- Handle: 720g, 290mm x 85mm
- When packed:

	Dimensions:	Weight:
Basic kit:	580 x 440 x 250mm	9.4kg
Standard/Pipeline kit:	580 x 440 x 250mm	11.4kg
Complete kit:	510 x 250 x 630mm	13.6kg
- Battery type: 4 x D-cell/LR20
- Meter accuracy: <10kV: +/- 10V. >=10kV +/- 100V
- Current meter FSD: 450µA
- Maximum relative humidity: 80% non-condensing
- Working altitude: <2000m
- Temperature range: 0°C - +40°C

Output voltage range:

Model	Low Range	Increment	High Range	Increment	Polarity	Battery Life
PHD Pro2 (6kV)	500V-6kV	10V	N/A	N/A	Positive	16 hours
PHD Pro2 (30kV)	0.9kV-10kV	10V	10.1kV-30kV	100V	Positive	10 hours
PHD Pro2 (40kV)	0.9kV-10kV	10V	10.1kV-40kV	100V	Positive	8 hours

Note: Due to ongoing technical developments, all stated information is typical and is subject to change without notice or obligation.

* Test conducted in accordance with BS EN50356. Test units fitted with 10,000mAh NiMH rechargeable cells. Instrument output voltage set to maximum.

† These standards are pre-programmed and are provided for convenience. However, it is the user's responsibility to ensure that the correct settings are chosen for the intended application of this unit.

Maintenance

The PHD Pro2 is designed for minimum maintenance by the user, however the following periodic checks/actions are recommended:

The exterior of the unit should be cleaned regularly. Stubborn dirt may be removed with a moistened cloth (99% water +1% mild detergent). Mild solutions may be used to remove greasy dirt. Do not allow cleaning fluid to enter the unit. The use of other cleaning agents may lead to damage to the detector's surface areas.

Our service team will ensure your detector's performance is within our strict tolerances and carry out a thorough inspection of the entire kit; advising you of any repairs required.

It is advisable to remove the batteries and keep them fully charged when the unit is not in use.



NOTE: The PHD Pro2 requires annual calibration by an approved provider. For more details, visit: www.buckleysinternational.com/repairs

Register Your Product

Please register this product via Buckleys' website and download the Warranty Registration Certificate.

Once your product is registered, you will receive the following benefits:

- Annual service & calibration reminders by email
- Latest industry news relating to your product
- Be the first to hear about our new products

We strive to improve the quality of our products and service. By registering your product, you can help us monitor overall quality of our products, service and dealer network. Additionally, if we ever need to contact you regarding your product, we are able to do so immediately.

To register your product, simply visit:

www.buckleysinternational.com/registration

... complete the online form and click on '**SUBMIT**'

Useful Advice

Instrument sensitivity

Several variables including the test material itself, temperature, solar load and electrode type and size will impact the sensitivity setting required. The detector will show a low-level current draw in micro-amps (μA) as the electrode is passed over a coating. A sensitivity setting around $100\mu\text{A}$ above the displayed current draw is often suitable; although attention should be given to verify the effectiveness of the sensitivity setting; too low may cause false-alarms and too high could cause faults to go undetected.

It may not always be possible to determine a suitable sensitivity setting. In such cases, increasing the sensitivity until the detector switches to 'Spark Only' mode prevents the alarm from triggering unless a direct connection to ground is made. A higher test voltage may

be required to compensate for current drawn as the electrode passes over the coating. This method is less precise and will not detect weak or thin areas as readily.

This new generation instrument is capable of detecting flaws much more rapidly than previous models. As a result of this, it is possible to get multiple alerts for a single flaw, which may be inconvenient or distracting for the operator. In this case, the Alarm Suppression may be adjusted – a setting of zero indicates no suppression, and higher settings will progressively reduce the likelihood of multiple alerts.

We recommend using the lowest comfortable setting as this reduces the chances of missing a second flaw close to one detected first.

Kit Contents

Upon delivery of your PHD Pro2, please take the time to ensure that the kit is complete, and all components shown below are present and undamaged:

Item	Description	PHD Pro2 Basic Kit	PHD Pro2 Standard Kit	PHD Pro Complete Kit
A	Main detector unit	✓	✓	✓
B	Test probe handle and nosecone	✓	✓	✓
C	Interconnecting lead	✓	✓	✓
D	Electrostatic discharge wristband	✓	✓	✓
E	Calibration certificate	✓	✓	✓
F	150mm stainless steel drum brush electrode	✓	✓	✓
G	5m earth cable on reel	✓	✓	✓
H	Trailing earth lead	-	✓	-
I	D-cell batteries	✓✓✓✓	-	-
J	D-cell rechargeable batteries	-	✓✓✓✓	✓✓✓✓
K	Battery charger with mains power adaptors and in-car charger*	-	✓	✓
L	Mid-section extension rod	-	✓	✓✓
M	End-section extension rod	-	✓	✓
N	Straight phosphor-bronze brush electrode	-	250mm	450mm
O	Test voltage calculator	-	✓	✓
P	Pair of knurled locknuts	-	✓	✓
Q	Rolling spring electrode claw	-	✓	-
R	Pointed probe electrode	-	-	✓
S	Padded carry bag with shoulder strap	✓	✓	✓
T	50m earth extension cable on reel	-	-	✓
U	Robust black transit case	✓	✓	-
V	High-visibility transit case with CNC router cut insert	-	-	✓
W	150mm straight angled rubber electrode	-	-	✓

* For details of the battery charger, please refer to the manual included with the charger.



Risk Assessment

It is the user's responsibility to complete a risk assessment before using Buckleys equipment. The following points offer some guidance but must not be assumed to be complete or sufficient.

Personal safety

- Have all users been trained in the correct and safe use of the instruments?
- Are they aware that the instrument produces high voltages, and can give electric shocks if used incorrectly?
- Is the instrument in good condition, undamaged? Is the instrument dry? Are the accessories similarly in good condition, dry and undamaged?
- Is it possible to ensure that persons with pacemakers, cochlear implants or transdermal implants of any kind are sufficiently far from the instrument & test site to be safe?
- Ozone is an irritant gas which will be produced when the instrument produces sparks – is the test outdoors, or is there sufficient, suitable ventilation in place to ensure that this is not hazardous?
- Is the access route to the area of the test safe? Is fall protection necessary? If so, is it in place?
- Has the instrument been properly grounded to a metallic grounding point?
- Should you use the anti-static wristband to prevent static charge build-up?

Explosion & Fire Risk

- Buckleys high-voltage instruments will produce sparks - Are you certain that there is no risk of an explosive atmosphere?
- Have all easily-ignited and/or flammable materials been removed from the area to be tested?

EMC & RFI

- Buckleys high-voltage instruments will produce sparks which may create interference in nearby electronic apparatus, particularly communication and computer equipment.
- Are you certain that there is no risk of such interference causing a danger to others – particularly medical or life support equipment?
- Are you sure that there is no risk of such interference causing costs or inconvenience to others – e.g. industrial processes, measuring equipment, scientific apparatus, domestic radio and TV?

Other Risks

- Have you checked that there are no ongoing processes in the area (e.g. below the roof you're working on) that may be dangerous – X-ray machines, other radiation?
- Are you certain that the instrument has not been immersed, dropped or otherwise damaged in a way that is not obvious?
- Have you verified that the ground connection is actually grounded?
- Is the person responsible for site safety aware of / fully understanding the testing you are going to do, and has it been reviewed in line with the site procedures?

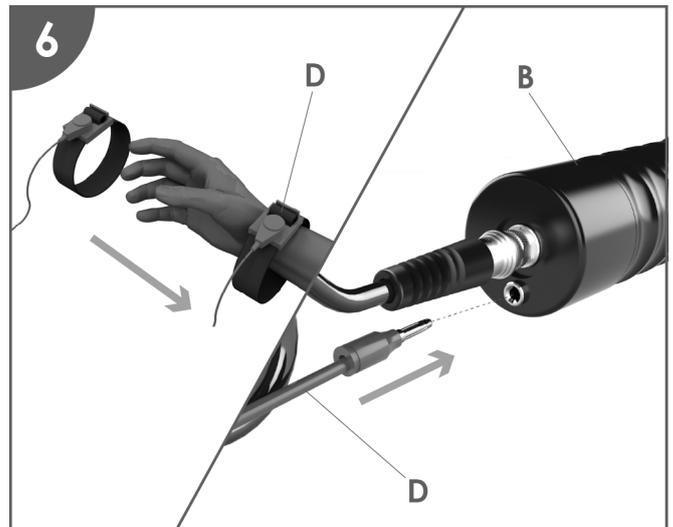
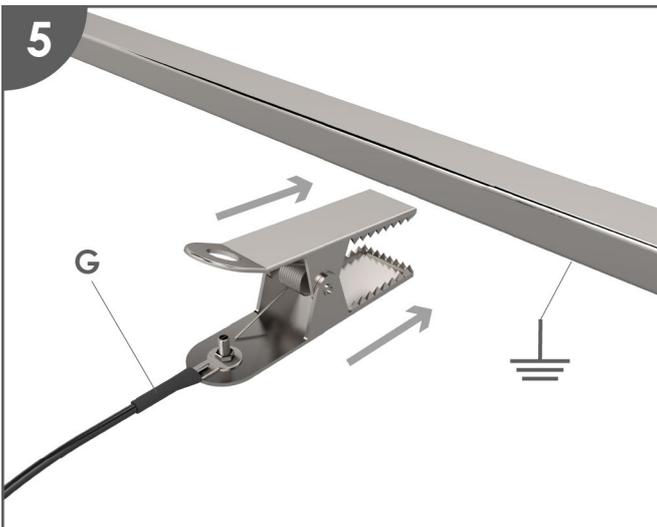
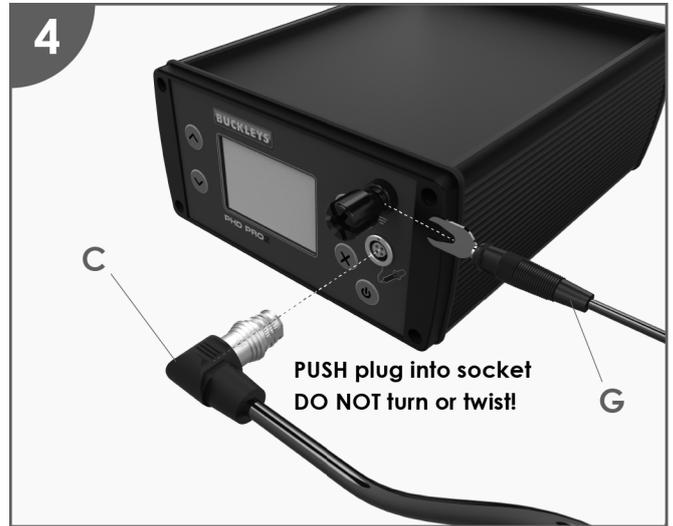
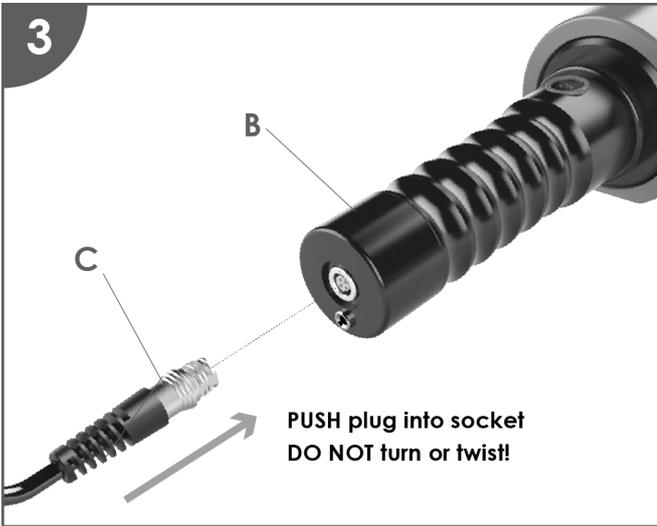
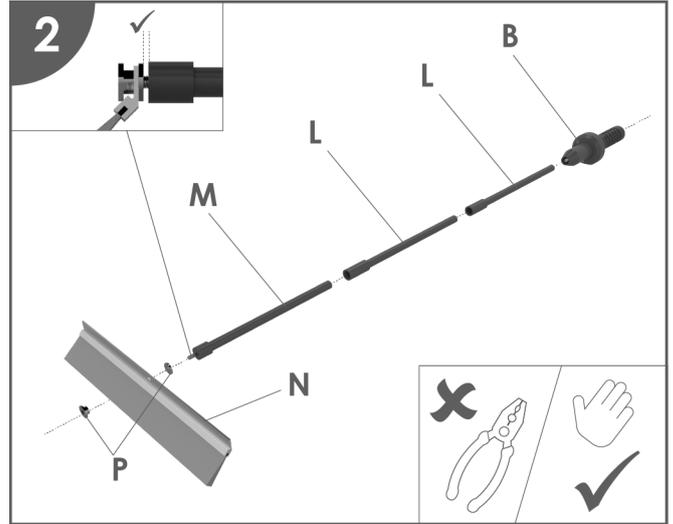
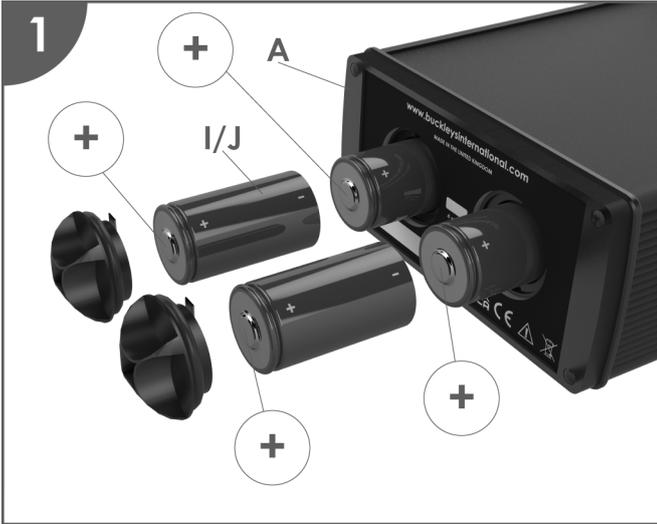
NOTE: Wherever you are intending to use equipment of this type, on your site or on a customer's, always obtain clearance from the company safety officer.

Factory Settings

In order to use the PHD Pro2, you will need to adjust the instrument settings to suit your specific application – see page 9. The following is a summary of the settings as set in the factory:

Output voltage:	10kV
Alarm suppression:	0
Testing standard:	Manual
Sensitivity:	200µA
Alarm volume:	5
Screen contrast:	5

Setup



Setup (continued)

**Instrument settings**

Switch the instrument on by pressing **a**. The screen displays the following information (see fig.8):

- a** Battery level indicator
- b** Menu symbol
- c** Voltage currently applied to electrode
- d** Current draw at electrode
- e** Output lock ON/OFF
- f** Sensitivity threshold
- g** Set test voltage
- h** Sensitivity threshold graph
- i** Handle temperature

Setting interface language

Press **✓** to access the main settings menu and press **▲** or **▼** to scroll to **Set Language** and press **✓**. Press **▲** or **▼** to scroll to the desired language and press **✓**. Press **✕** to return to the main display screen.

Setting the output voltage

Press **✓** to access the main settings menu and press **▲** or **▼** to scroll to **Adjust Voltage** and press **✓**. Press **▲** or **▼** until the display shows the desired voltage and press **✓**. Press **✕** to return to the main display screen.

Setting the sensitivity threshold

Press **✓** to access the main settings menu and press **▲** or **▼** to scroll to **Adjust Sensitivity** and press **✓**. Press **▲** or **▼** until the display shows the desired number and press **✓**. Press **✕** to return to the main display screen.

Setting the Alarm Suppression

Press **✓** to access the main settings menu and press **▲** or **▼** to scroll to **Alarm Suppression** and press **✓**. Press **▲** or **▼** until the display shows the desired number and press **✓**. Press **✕** to return to the main display screen. Refer to page 5 for more information on sensitivity settings.

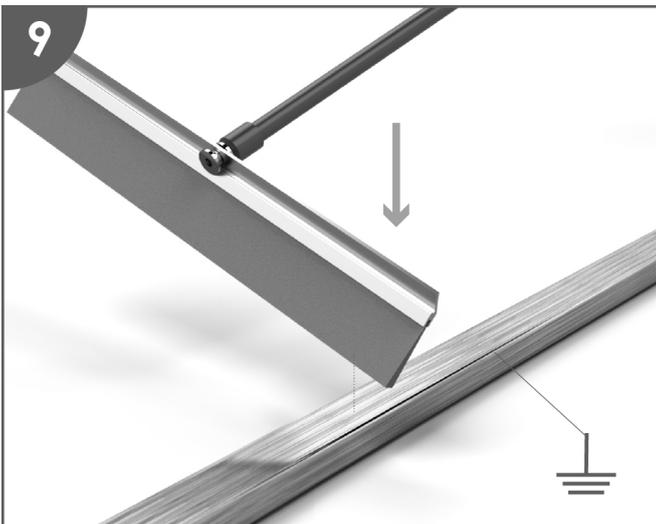
Setting test thickness via a standard

Press **✓** to access the main settings menu and press **▲** or **▼** to scroll to **Test Standard** and press **✓**. Press **▲** or **▼** to scroll to the desired test standard and press **✓**. Press **✕** to return to the main display screen.

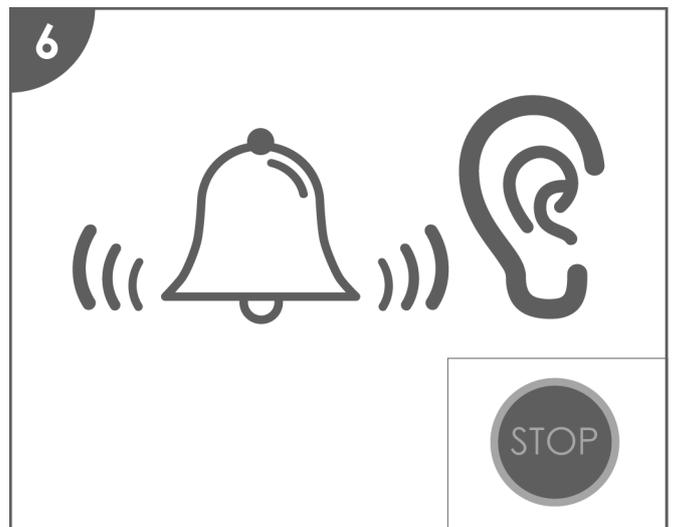
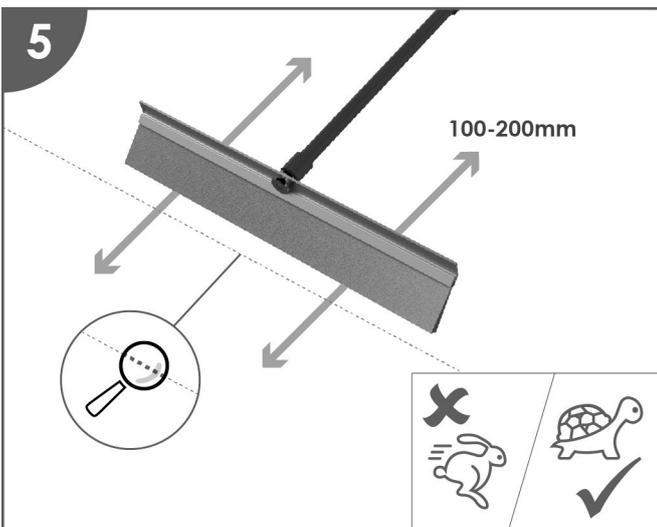
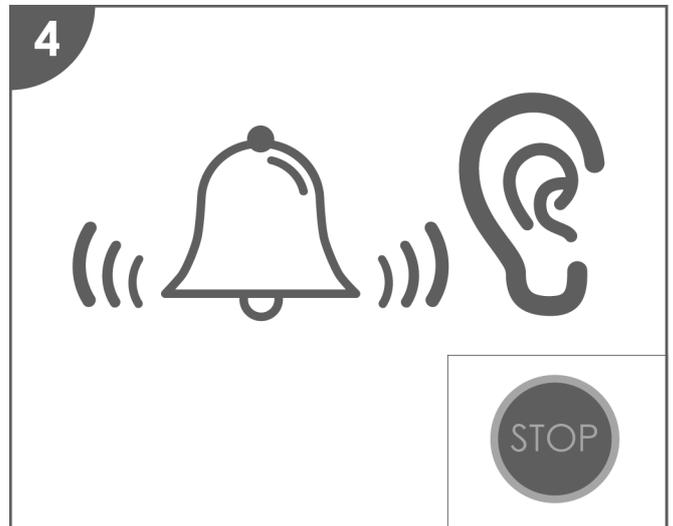
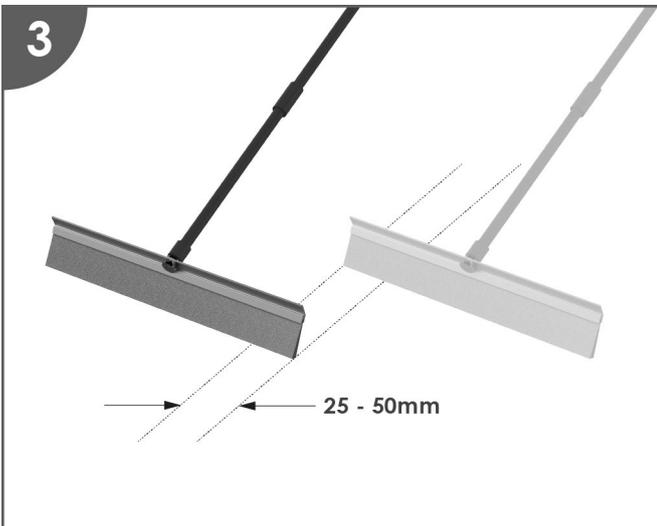
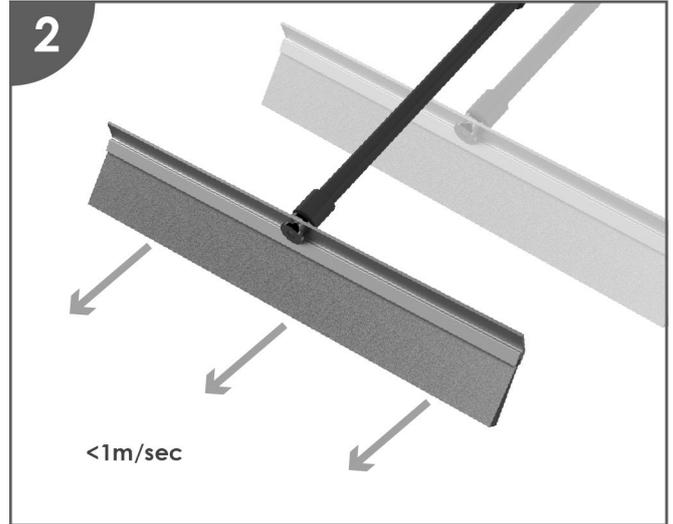
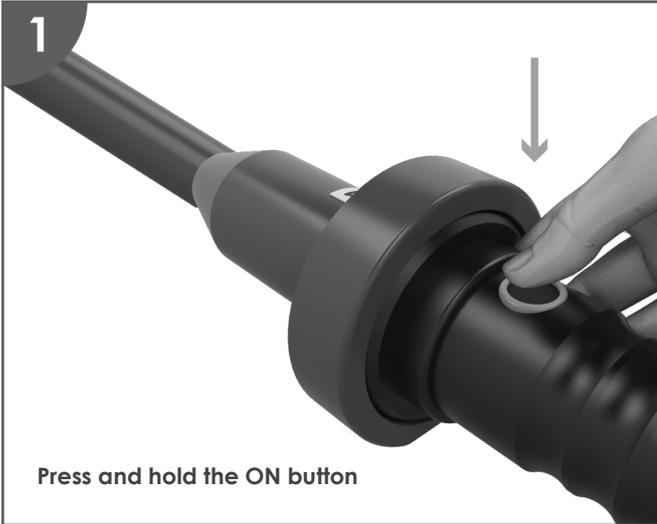
Press **▲** or **▼** to input the thickness of the test material. The calculated test voltage is displayed below the set test thickness.

When all settings are correct, test the instrument by holding down the ON button on the test probe handle and briefly placing the electrode in contact with a suitable conductive, grounded item. The alarm system should trigger (See Fig.9).

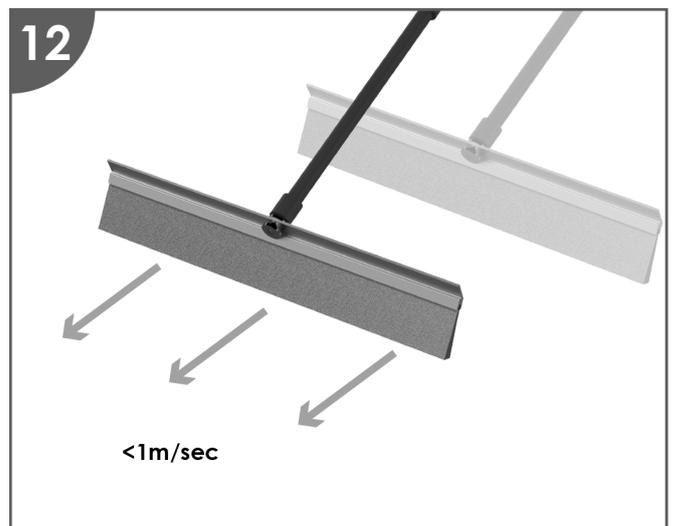
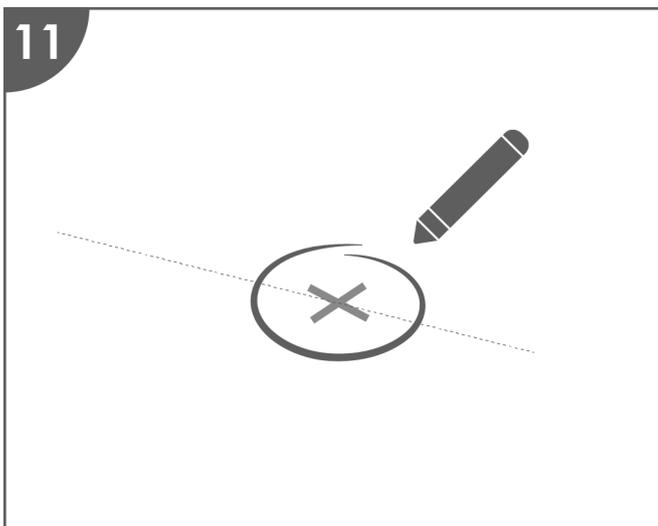
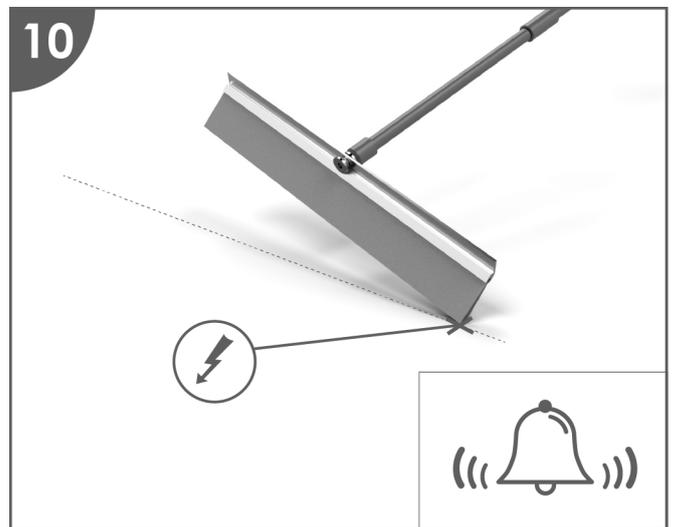
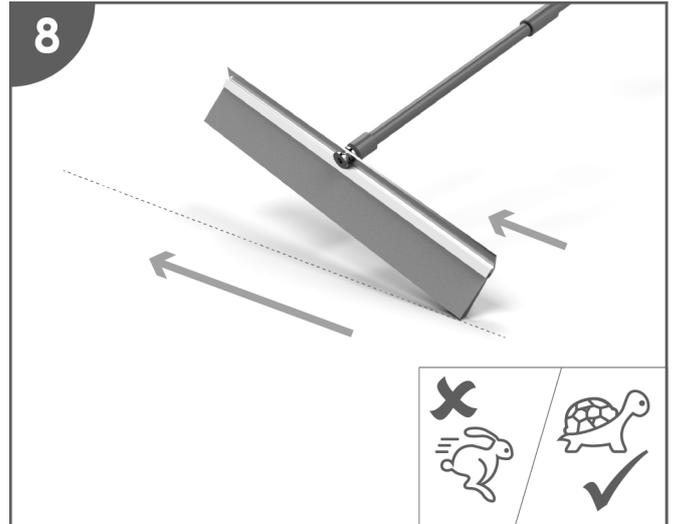
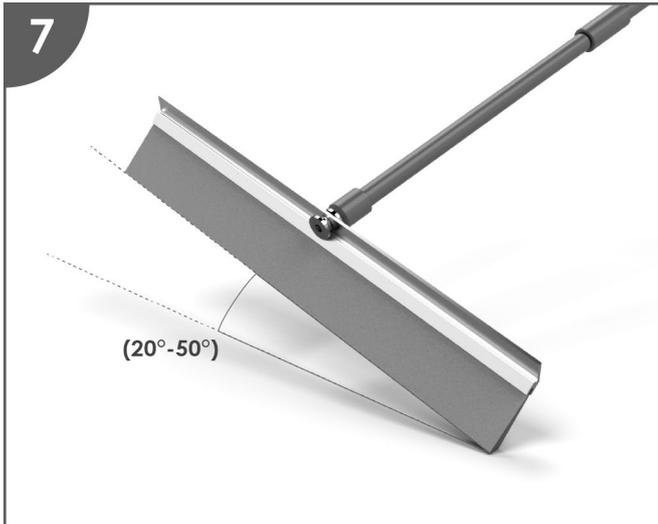
The user should establish, in conjunction with their client, and having regard for the material being tested, appropriate test conditions to be applied. In the absence of a customer specification, Buckleys has found NACE SP0274 to be a useful general-purpose standard, however, it remains the user's responsibility to establish safe and reliable testing conditions.



Basic Testing



Basic Testing (continued)



Contact Details

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