



Operator's Handbook
for

Compact

Inspector 10kV and 20kV
POROSITY (HOLIDAY) DETECTORS
PATENT APPLIED FOR

Complies with the requirements of:

ASTM G62-87(1998), NACE RP0274-98,
NACE RP0490-2001, NACE RPO188-99, ASTM D4787-93(1999),
JIS G-3491, JIS G-3492, ANSI/AWWA C214-89,
ANSI/AWWA C213-94 and ISO 2746:1998



CE Marked PCWI Compact Detectors comply with the requirements of EMC Directives 89/336/EEC EMC and its amending directives.

CERTIFICATE OF CALIBRATION



Model : Compact Detector
Manufacturer: PCWI Technology Pty Ltd
Serial No.:
Tolerance.: ±5%

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Conformance: This detector has been tested at a series of voltages from 0 to 60,000 Volts against a Certified Meter and High Voltage Probe, Report Number 209852 / Pulse Crest Meter Report Numbers 01-01851-A, 01-01851-B, 01-01851-C, 01-04258-A, 54019, 54819 and 723 0135/03, using AS 2886-1986 as a guide. The Detector complies with PCWI Standards of Manufacture.

PCWI's Laboratory has also been assessed to AS ISO/IEC 17025-1999 'general requirements for the competence of testing and calibration laboratories'. All calibrations are traceable to National and International Standards.

Note: It is recommended that the unit be periodically checked prior to use with a Certified PCWI Crestmeter.

SIGNED: _____
Laboratory Technician



PCWI Technology Pty Ltd ABN 96 078 337 354

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INTRODUCTION

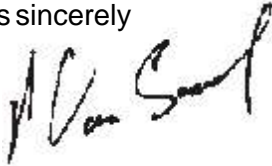
Thank you for choosing the PCWI Compact Inspectors for pre-installation and post installation corrosion detection.

PCWI have designed this instrument with care, to provide ongoing corrosion detection efficiency under a wide variety of coating application conditions and to ascertain Porosity for the many protective coatings currently in use. Under reasonable care in operation, the unit will provide many years of trouble free detection.

To support the unit, PCWI maintain a comprehensive range of Electrodes (probes) - extending the versatility of the Compact from large to small and from accessible to inaccessible surfaces.

PCWI, in a continuing desire to achieve the maximum in corrosion detection competence, welcomes user enquiries and recommendations.

Yours sincerely



Paul Van Gaal

WARNING



This Equipment generates a high voltage and should be used with care. Please consult these operating instructions before use.

1.0 SAFETY PRECAUTIONS:



All hand-held high voltage test equipment should be operated by responsible, trained and authorised personnel.

The unit must be earthed to both the item under test and to ground.

CAUTION



The Detector output can be up to 20,000 volts. Should the operator accidentally make contact with the test electrode, they may experience a mild shock or zap, and in order to avoid this possibility, the wearing of rubber gloves is recommended.

Furthermore, the operator should enjoy good health and not suffer from a cardiac condition. **If the operator has a pacemaker, then they should not use this equipment.**

This equipment should only be used for the purpose for which it was designed, ie: checking the porosity, or electrical breakdown, of dielectric or insulating materials.

It is also recommended that testing should be carried out well clear of personnel not involved in the testing procedure, or in such a position whereby the surprise of receiving an electric shock could cause a related accident, if for example, tests being carried out close to moving or rotating machinery, or in such an unstable position that the operator could fall and injure themselves.

It is recommended that the operator should have an assistant, to ensure that unauthorised personnel are kept well clear of the testing area, and generally assist when necessary with the testing procedure. It is also recommended that the Detector not be operated within close proximity of sensitive electronic apparatus, such as computer equipment.

DANGER

Do not use the test equipment in any combustible or flammable atmosphere, as a test voltage can cause an arc or spark to be generated and an explosion could result.

Always consult the plant or safety officer before carrying out a test procedure.

When testing tank internals, be certain the tank does not contain solvents remaining from the painting procedure.

2.0 OPERATION

Connect the probe and earth leads to the unit. Connect the earth clamp to the metallic substrate of the item to be tested – substrate should be earthed to ground. Select the probe best suited for the test and attach to the probe handle.

Fit the Fuse (if not already fitted).

Turn the unit on.

Test the batteries to ensure that they are charged.

Turn the voltage control clockwise to the required test voltage.

Note: If the neon is in place allow an additional 200v.

Place the probe near the metal substrate.

A spark should occur (if not re-check all leads and connections).

The unit should now be ready for use.

Re-check the output – adjust if necessary.

Place the probe on the coated surface and move at approximately one metre per four seconds.

A fault is indicated by:

A spark at the probe – this can usually be seen and heard.

A light flashes on the front panel of the unit.

An audible sound – buzzer is mounted inside the unit.

Digital test voltage drops drastically.

The neon in the probe flashes.

Alarm sensitivity can be adjusted to suit after locating a flaw.

Note: A definite flaw should be made in the coating and located with the designated test voltage, therefore proving that the unit is locating the type of fault you wish to find.

Probes must be kept in full contact with the surface, gaps in or between the probe and the coating may result in flaws going undetected.

Wire brushes, rubber and coil spring probes should all be kept in good condition.

Probes other than fine wire brushes may require higher voltages.

Wet and contaminated coatings should not be tested until dry and clean (see also troubleshooting pages).

Coating Thickness Range

Applied coats should be cured, thickness tested, visually inspected and accepted – before high voltage porosity testing is carried out. Coating thickness should be above 150µm; coatings below this **thickness should be tested with a wet sponge unit.**

3.0 SPECIFICATIONS

Test Voltage (two models):	to 10kV (using 9V Battery) to 20kV (using 12V external Batt)
Output test current:	up to 100 μ A
Operating temperature:	-20 to +50°C
Power supply:	Battery (9V internal) Battery (12V external for extended use)
Unit Dimensions:	210 x 75 x 35mm (excl brush) 8.25" x 3.1" x 1.5"
Unit Weight:	460g (excl probe)
Shipping Weight:	1.5kg 2.1kg (with extended-use power-pack)
Optional brushes available:	See accessories pages

Storage

The Detector should be stored in a dry place. Leads should not be wound tightly.

Earthing

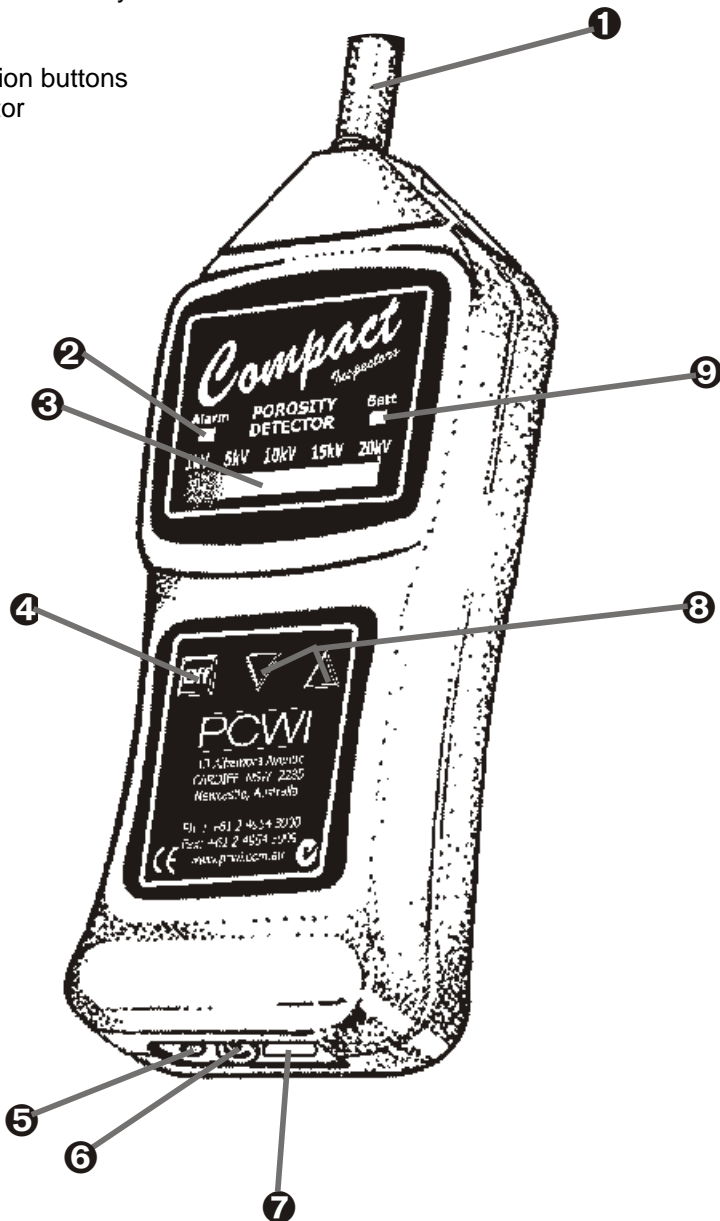


Where the item to be tested is not earthed to ground, a ground spike **must** be attached.

The unit should always be switched off before removing and repositioning the earth lead. After the earth is repositioned, the probe should always be flashed on the substrate to prove a good contact has been made.

4.0 CONTROL PANEL LAYOUT

- 1 Probe
- 2 Visual alarm
- 3 Voltage indicator
- 4 Off switch
- 5 DC input/External battery connector
- 6 Earth socket
- 7 Audible Alarm
- 8 Voltage selection buttons
- 9 Battery indicator



5.0 VOLTAGE RECOMMENDATIONS

AS 3894.1 recommends minimum voltages for testing specified thickness of film of various Coating Products

Tables 1 and 2 below provide guidance for determination of minimum voltage for high voltage porosity testing of the indicated generic types of coating products, at the indicated dry film thicknesses which may contain residual solvents.

Table 1. Determination of the coating film factor (F) from coating type and volume solids content.

Generic Type of Coating Volume Solids %(V/V)	Volume Solids %(V/V) Factor (F)	Factor (F)
Chlorinated rubber, Vinyl	15 to 39	4
Low Build Epoxy, some Tar Epoxy	40 to 59	3
High Build Epoxy, some Tar Epoxy	60 to 79	2
Polyester/Vinyl esters, Solventless Epoxy, Fusion-bonded Epoxy	80 plus	1

Table 2. Determination of the minimum test voltage (V) from dry film thickness (T) and coating material factor (F).

Nominal dry film thickness in microns	Minimum Test Voltage (kV)			
	F=1	F=2	F=3	F=4
150	3.00	1.50	1.00	0.75
250	4.00	2.00	1.30	1.00
400	5.00	2.50	1.60	1.25
600	6.10	3.00	2.00	1.50
800	7.00	3.50	2.30	*
1500	9.70	4.80	*	*
2500	12.50	*	*	*
4000	15.80	*	*	*

Formula 1

$$V = \frac{250 \times \sqrt{T}}{F}$$

- V = minimum test voltage applied in volts
- T = dry film thickness of cured coating in microns
- F = a whole number factor which rates a coating's generic type and residual solvent content (Table 1)

The above minimum test voltages have been derived from Australian Standard AS3894.1-2002; the whole of this Standard should be used. The above voltages relate to the following: the detector should have a direct earth connection to the substrate and a fine wire brush electrode must be connected to the probe.

International Standards
NACE RP0274-98 derived table

Table 3 below is derived from NACE standards and should be used as a guide only.

**Table 3. kV Values from
NACE RP0274-98**

mm	kiloVolts
0.51	6
0.79	7
1.6	10
2.4	12
3.2	14
4.0	16
4.8	17
13	28
16	31
19	34

The above table should be taken as a GUIDE only. It is recommended that the whole of this standard be used.

MODELS

Two Inspector models are available:

- (i) Up to 10kV, using an internally mounted 9V alkaline battery.
- (ii) Up to 20kV, using an external rechargeable 12V power pack for extended testing periods and for testing up to 20kV when required. This 12V pack can be mains re-charged via the charger supplied.

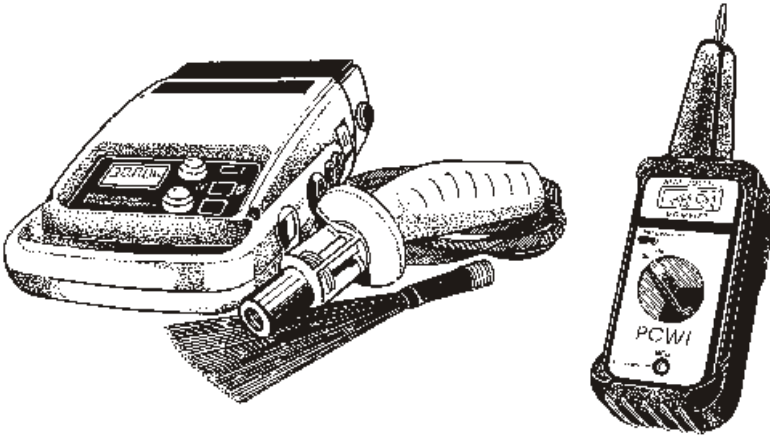
How to use the External Power Pack supplied with the 20kV model

For continuous testing, the detector can be powered from the external power pack by simply plugging it in. The detector will then run at elevated output voltages up to 20kV for extended periods. Unplug power pack for storage.

6.0 TROUBLESHOOTING

Symptom	Cause	Solution
No Display	Flat battery	Recharge/replace battery
Voltage drops during test	Slightly conductive, damp or salty surface Coating may not be fully cured Probe surface area too large	Wash and clean the surface Allow coating to cure Use a smaller probe, or increase voltage
Alarm sounds continuously during test	Slightly conductive, damp or salty surface Coating may not be fully cured Probe moved too fast Probe surface area too great	Wash and clean the surface Allow coating to cure. Move probe 1 metre every 4 seconds Use smaller probe
No alarm on fault	Voltage set too low	Increase voltage
No spark at probe tip	Poor connections Flat Battery	Clean and reconnect Recharge/replace battery
Probe voltage lower than display voltage	Poor Earth connection	Check all connections

7.0 OPTIONAL DETECTOR ACCESSORIES



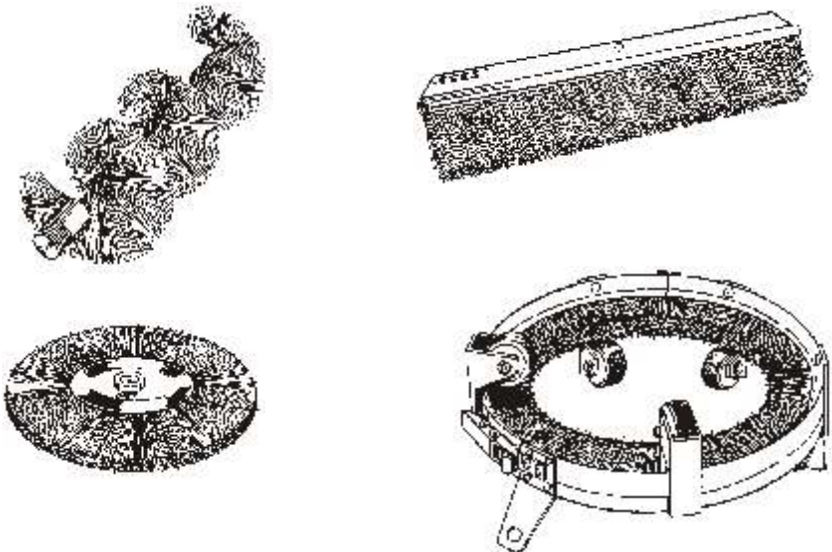
Compact DC15 and DC30

Crest Meters & Certification.

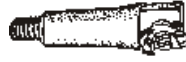
50mm (2in) to 600mm (24in) wide **flat brushes.**

25mm (1in) to 500mm (20in) Spiral wound and Disc **Internal circular pipeline brushes.**

25mm (1in) to 500mm (20in) **External circular pipeline brushes.**



60mm, 125mm, 200mm, 450mm **connectors** for flat or external pipeline brushes.



Fan Brushes



450mm covered **probe extensions**.

Spare slip-out **power packs**.

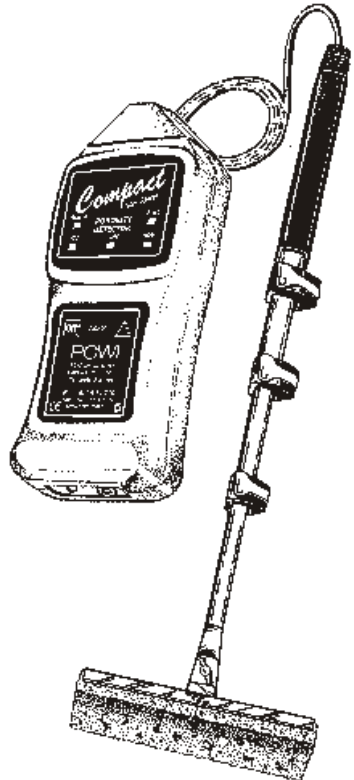
7m **Earth lead** with clamp.
10m trailing Earth lead (1m plastic encased).

Spare **neon light holders** and
neons.

50mm (2in) to 1210mm (48in) **Coils**
complete with ball bearing ends.

Coil Joiners.

Low Voltage units (**Wet Sponge**
Detectors)



8.0 WARRANTY

Subject to the warranty conditions below this PCWI Instrument is warranted by PCWI International Pty Ltd to be free from defects arising from faulty design, material, or workmanship for a period of 12 months from the date of original purchase by the end user or a maximum period of 15 months from dispatch to authorised distributors.

Probes and leads are warranted for 3 months. They are consumable items, and subject to wear and deterioration during use. The life of these parts can be much extended by keeping them in a dry clean condition, and storing them in suitable protective containers. During use, avoid "scrubbing" the probe along the surface of the work-piece.

WARRANTY CONDITIONS

During the warranty period listed above PCWI or it's authorized service representative will make good any defects covered by this warranty.

PCWI or it's authorised service representative will decide if there are any defects in design, material or workmanship.

This warranty only applies provided the instrument has been used in accordance with the manufacturers operating handbook recommendations.

This warranty does not cover damage, malfunction or failure resulting from misuse, neglect, abuse or used for a purpose for which it was not designed and no repairs, alterations or modifications have been attempted by other than PCWI on an authorized service.

This warranty applies only to the original user buyer.

This warranty does not cover any service that is needed after an accident, alterations, misuse, fire or floods.

This warranty is the only one given by PCWI and no one has the authority to change, or add to, the obligations and liabilities listed in it.

This warranty does not cover batteries, probe handle brushes (electrodes) and leads which are subject to wear.

During the warranty period PCWI or its authorized service representative will bear the transportation cost of the return of instrument/s repaired under warranty back to the users premises within the country of purchase.

HOW TO MAKE A WARRANTY CLAIM

Defective goods must be returned to PCWI or an authorized service representative at the Purchaser's expense. The goods must be accompanied by the Purchaser's written order describing the defect and authorising PCWI or its authorized service representative to invoice the Purchaser for any charges not covered by the warranty.

The purchasers order must also include the model and serial numbers of the instrument and address of the distributor and date of purchase.

Upon receipt at the service point the instrument will be examined to determine the nature and cause of the defect.

If the defect is covered by the warranty, a repair will be effected at PCWI's or authorized service representative expense. If the defect is not covered by the warranty, PCWI or authorized service representative will quote the Purchaser for a replacement or repair, and will not proceed until written acceptance of the quotation is received.

9.0 SERVICE AND MAINTENANCE

AUTHORISED SERVICE REPRESENTATIVE

To enable speedy "return to service" whether under warranty or otherwise, PCWI have appointed your distributor as a service centre and have provided all relevant information and recommended parts to be carried to assist distributor's technical staff carry out this essential part of the PCWI customer service.

CARE AND MAINTENANCE

This equipment is protected against hostile environments and is designed for prolonged use in the field without any special maintenance, other than routine battery recharging. However, the equipment is not totally sealed and appropriate precautions should be taken. Remember, it is a precision electronic instrument and should be treated as such. There are no internal user controls.

The equipment should only be operated by qualified personnel.

Some organic materials may attack plastic parts and cause early degradation. Contact with such materials should be avoided.

Do not operate damaged equipment.

Where the power supply is derived from internally mounted rechargeable cells and disassembly of the unit is necessary to access those batteries, **this action would void all warranty.**

SERVICE REPAIRS AND MAINTENANCE

Repairs not covered by the warranty or carried out after the warranty period, will be charged at the current hourly or set service rate, plus the cost of materials.

Goods for repair must be sent at the Purchaser's expense, and be accompanied by the Purchaser's written order describing the defect and authorising PCWI to invoice the purchaser for labour, materials and return delivery cost.

No service or repair will be undertaken until a written order is received.

BEFORE YOU CALL FOR SERVICE

Read the section on "troubleshooting" in this handbook and check the symptom, cause and solution before you call for service.

AUTHORISED SERVICE AGENT:



PCWI OFFERS

Strong technical support

In-house development and manufacturing enables us to provide strong technical support and a quick response to enquiries and orders.

Market and product knowledge

We understand technical specifications demanded by industry and recognise customer requirements are specific in relation to testing and measuring instruments.

NATA registered laboratory in metrology

PCWI's in-house laboratory can support testing for a range of instruments enabling Certification Traceable to National Standards.

Quality systems certified to ISO9001

PCWI's Quality Management System is certified to ISO9001.

Warranties and after sales service

PCWI provides 12 months warranty for its Detectors with detailed operator instruction handbooks and after sales service. An extension of this PCWI service is provided by your local distributor.



PCWI

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