How to set up an Elcometer Continuous DC High Voltage Holiday Detector

When it comes to testing the porosity of protective coatings on pipelines, ballast tanks, or bridges for example - or testing for flaws in coatings on concrete - typically the high voltage or holiday detection method is used.

The high voltage method comes in two versions – Continuous DC and Pulsed DC. In this video, we'll be introducing you to the Continuous DC method, which is used to test non-conductive coatings up to 7.5mm (300mils) thick on conductive substrates.

So, how does it work?

Put simply, a high voltage of between 0.5-30kV is applied to a probe. The probe is then passed over the coated surface. The voltage to the probe is constant, hence the name Continuous DC. The voltage used should be high enough so that in areas where the coating is electrically weaker due to a flaw or discontinuity, there is sufficient voltage to break down the gap between the probe and the substrate.

When this break down occurs the current flows from the probe, through the substrate, and back into the holiday detector, via grounding cable which is clipped to an uncoated section of the substrate being tested, completing a circuit. This instantly triggers an alarm to signal a flaw has been detected.

As the high voltage method can locate any area where the coating is weaker than specified, this allows you to detect flaws that don't go all the way down to the substrate, as well as voids within the coating.

Elcometer has two continuous DC detectors: the Elcometer 236, where the high voltage supply is generated within the instrument and sent to the probe handle via a high voltage cable; and the Elcometer 266, where the high voltage supply is generated within the handle, and connected to the instrument via a low voltage cable, resulting in a safer way to test for flaws.

The gauges are powered by their own rechargeable battery that deliver 8-40 hours of continuous use, depending on the gauge being used and voltage being tested with. We recommend charging the battery fully before starting to ensure uninterrupted testing, and there are full details of the typical life of the batteries on the Elcometer website.

Please note before we get started, while this video is intended as a guide for how to use the Elcometer 236 and Elcometer 266, you should always consult the instruments' instruction book before use, and always take extreme care when using high voltage equipment.

To begin, with the tester switched off, connect the probe handle and earth return cable to the instrument. Then connect the earth return cable to an uncoated section of the substrate being tested.

When testing on concrete or cement substrates, you should hammer a masonry nail or similar conducting spike into the substrate and clip the return cable to it. This makes your earth signal return contact. Alternatively, if you have exposed, uncoated rebar or uncoated metal pipework, you can simply use that instead.

Next, fit the probe you'll be testing with to the probe handle. A band brush is supplied as standard with both gauges as it is ideal for most applications, but there are a wide range of probes for

different applications and coating types. There's a separate video on choosing the right probe for your application, later in the series.

With your chosen probe fitted, switch on the holiday detector.

Please note, the moment the Elcometer 236 is switched on, the voltage displayed on the LCD screen will be delivered to the probe tip. As a result, we recommend the voltage is set to 0 before switching on – simply turn the probe voltage control fully anti-clockwise to do this.

Alternatively, when you switch the Elcometer 266 on, voltage is not delivered to the probe until you switch the power on separately at the probe handle itself, and the gauge will emit a loud ticking noise to indicate there is voltage at the handle. There are also handles available for the Elcometer 266 with a two-stage safety switch to avoid accidental switch-on, which automatically cuts power to the probe should you lose grip of the handle.

Turn the voltage down to the lowest value above zero, and the gauge's sensitivity to its most sensitive. On the Elcometer 236 you turn the sensitivity dial fully clockwise to do this. And on the Elcometer 266 it is the lowest µA value, so the gauge is looking for the lowest current to set off the alarm. Then touch the probe against an uncoated section of the substrate to see it if alarms. This is to test the cables are connected correctly before testing.

When testing on concrete or cement substrates, this is where you should test if the substrate has enough moisture in it to conduct electricity; and, therefore, if it's suitable for use with a holiday detector.

Again set the gauge sensitivity to its most sensitive, and set the voltage to either the recommended value for testing your specified coating thickness, in the range of 3kV - 6kV if the test voltage is not known, or you can use the Elcometer 266's voltage calculator along with the dry film thickness of your coating to work out your test voltage. We'll show you more about the voltage calculator in the next video.

Then place the probe on the uncoated substrate about 4m (13ft) from your signal return cable. If the alarm sounds, the concrete is sufficiently conductive. If it doesn't sound then the concrete is too dry, and it's unlikely the Continuous DC holiday detector will be a suitable way to test. However, you may be able to test using a Pulsed DC detector. We'll show you how in the Elcometer 280 Pulsed DC video.

With your holiday detector successfully connected to the substrate and switched on, the next step is to set the voltage and sensitivity for testing the coating. And we'll show you how to do it in the next part of the series.

To go to the next video in the series you can click the pop-out in the top right, select one of the icons at the end of the video, or simply visit Elcometer.com if you can't see the links.

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