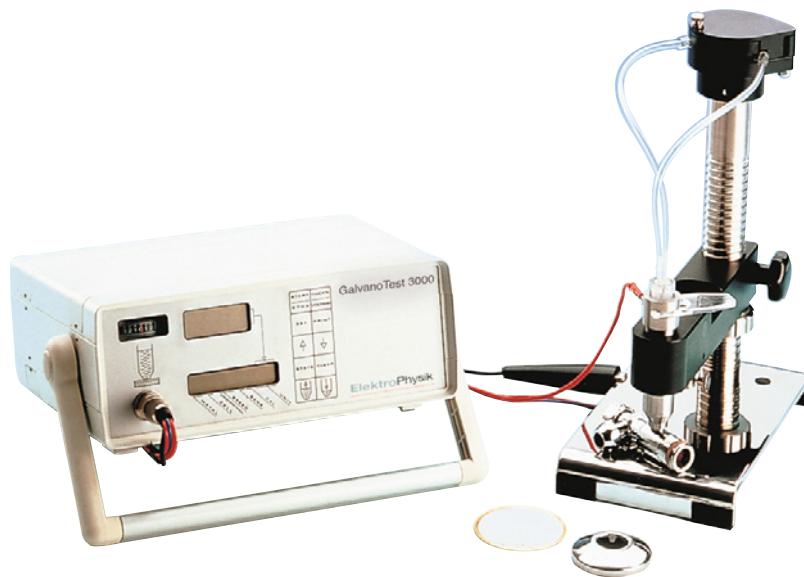


Advancing with Technology **ElektroPhysik**

Coating thickness
measurement

GalvanoTest



Versatile Coating Thickness Gauge:

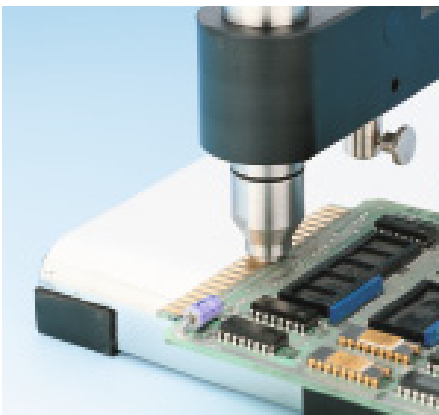
- measures almost any electroplated coating/base combination
- suitable for single and multi-layer coatings
- utilizes the coulometric principle, a de-plating method conforming to DIN 50 955 and ISO 2177

Also suitable for extremely thin coatings from 0.05 microns!

Coating thickness gauge GalvanoTest

Application

The coulometric or anodic de-plating technique is used for measuring the thickness of electroplated coatings on virtually all substrates such as steel, non-ferrous metals or insulating material bases. Typical applications include: nickel on steel, zinc on steel, tin on copper, silver on copper or copper on epoxy.



Typical measuring set-up:
Measurement of gold layers on PCBs

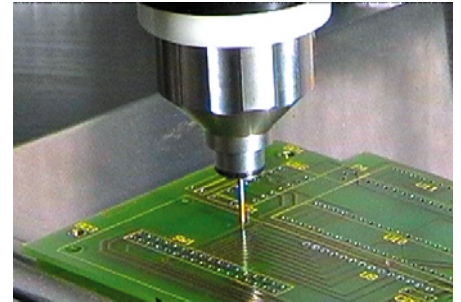
This technique simply involves the removal of a small, barely visible area of coating material. The substrate is not affected. The coulo-

metric method ensures reliable and exact results. Designed for complete ease of use, GalvanoTest requires no specific operator skills and only minimal training before actual measurements can take place. The coulometric principle is the only low-cost method to measure the individual layers of multi-layer systems, for instance chrome plus nickel plus copper on steel one after the other.

Connected to the MiniPrint data printer, GalvanoTest provides complete documentation of measuring results and statistics. For specific measuring analysis or later reference, the characteristic voltage curve during the de-plating process can also be printed out.

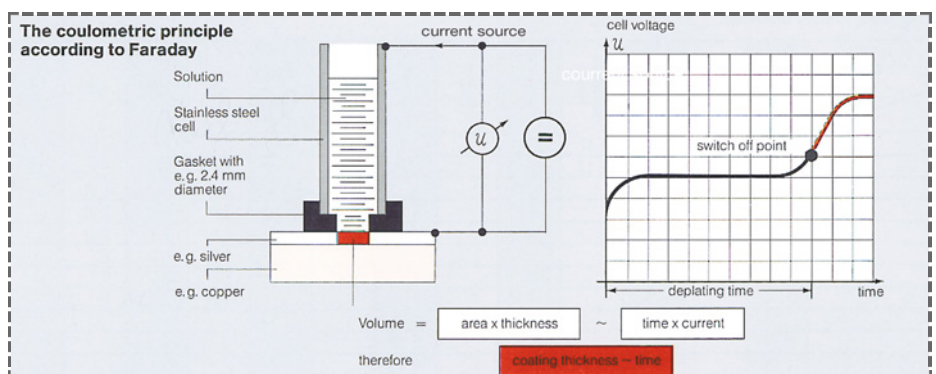
Measuring principle

Based on the principle of Faraday's law, GalvanoTest performs the electrolytic dissolution of a precisely delimited area of the sample. A measuring cell is filled with an electrolyte specially adapted to the



Centering unit for pinpoint cell positioning on small areas

selected coating/base combination. The measuring cell is placed on the test sample. A gasket inserted between the cell and the test sample prevents the solution from running out and at the same time precisely determines the area to be de-plated, e.g. 1 mm². The equipment is now ready to use and can be plugged into the electronic gauge. The current, through the electrolyte, dissolves the predetermined area of coating using an electro-chemical reaction. Once the etching is complete, a characteristic change in voltage automatically stops the de-plating process and coating thickness is displayed in microns or mils on the digital display.



| GalvanoTest Features | | Type 2000 | Type 3000 |
|--|--|-----------|-----------|
| Coating/ substrate combinations | – more than 70 coating/substrate combinations (standard version) | ● | ● |
| | – coatings on flat and curved surfaces | ● | ● |
| | – coatings on small components and wires | ● | ● |
| | – 10 preset types of metal: Cr, Ni, Cu, brass, Zn, Ag, Sn, Pb, Cd, Au | | ● |
| | – 9 preset types of metal: Cr, Ni, Cu, brass, Zn, Ag, Sn, Pb, Cd | ● | |
| | – 8 further metal coatings for special applications | | ● |
| | – 1 further metal coating for special application | ● | |
| | – measuring range: 0.05 ... 75 µm | ● | ● |
| Measuring cell | – with circulation pump | | ● |
| | – with air pulsator | ● | |
| Measuring surface | – gasket 8 mm ² /12.4 x 10 ⁻³ inch ² | ● | |
| | – gasket 4 mm ² /6.2 x 10 ⁻³ inch ² | ● | ● |
| | – mask 1 mm ² /1.55 x 10 ⁻³ inch ² | ● | ● |
| | – mask 0.25 mm ² /0.388 x 10 ⁻³ inch ² (deplated area barely visible) | | ● |
| | – electrolyte cup 0.25 mm ² to approx. 16 mm ² /(0.388–24.8) x 10 ⁻³ inch ² (optional) | ● | ● |
| Adjustable settings for optimum results | – maximum of 8 deplating speeds in the range of approx. 0.3–40 µm (0.012–1.57) mils/min | ● | ● |
| | – directly adjustable calibration factors; individual setting according to metal type and measuring surface | ● | ● |
| | – calibration setting with the aid of thickness standards | ● | ● |
| | – variable shut-down speed to suppress interference or for measuring alloy zones between coating and substrate | ● | ● |
| Data storage with GalvanoTest | – number of memories for various metals | 10 | 18 |
| | – number of readings which can be stored and evaluated | 2000 | 2000 |
| | – non-volatile memory retains all calibration settings, readings and statistical values after the gauge has been switched off | ● | ● |
| Statistical evaluation | – display of 6 statistical values – mean value, standard deviation, coefficient of variation, number of readings, highest and lowest single reading | ● | ● |
| | – immediate or delayed display of statistical values | ● | ● |
| | – immediate or delayed print-out/transfer of readings and statistics (available as an option) | | ● |
| | – display and print-out of date and time – year, month, day, hour and minute | ● | ● |
| GalvanoTest interfaces for peripheral devices | – interface for MiniPrint data printer | ● | ● |
| | – interface for an RS 232 C for connection to a PC | ● | ● |
| | – analog output for connection to an x-t recorder to chart voltage curve | ● | ● |
| Electrolyte alarm/saturation indicator | | | ● |
| Measuring uncertainty | – 5 % of reading on a measuring area of 8 mm ² after calibration | ● | ● |
| Power supply | – 110/220 V 50 ... 60 Hz/10 Watt | ● | ● |
| Dimensions/weight | – gauge: 260 mm x 250 mm x 100 mm/10.24 inch, 9.85 inch, 3.94 inch; approx. 2.5 kg | ● | ● |
| | – standard support approx. 2.5 kg | ● | |
| | – support with integrated pump approx. 3.0 kg | | ● |
| | – measuring range: 0.05 ... 75 microns | | |
| Additional features of the GalvanoTest | – print-out diagram showing measuring cell voltage levels over the coating; especially useful for detecting alloy zones between coating and substrate; with MiniPrint (available as an option) | ● | ● |
| | – operator guide to the alphanumeric displays with language option: German, French or English | ● | ● |
| | – unit of measurement in either metric (µm) or British system (mils) | ● | ● |
| | – when switched on, the gauge displays details of the last readings | ● | ● |
| | – illuminated voltmeter for monitoring the deplating process | ● | ● |
| | – easy to use – clearly-designed controls and easy-to-follow operating instructions with numerous examples | ● | ● |
| | – wide range of extras for measurements on small components, wire and multi-layer coatings | ● | ● |
| | | | ● |

Description

The GalvanoTest gauge consists of three major components:

1. Measuring cell

For measuring on even or curved surfaces up to 3 mm curvature radius, two different measuring cells are available. A measuring cell with circulating pump is connected to GalvanoTest 3000, a cell with air pulsator is connected to the 2000 model. The electrolyte is constantly moved around the measuring cell to ensure an even de-plating of the measuring area as well as on optimum use of the electrolyte.

For measuring wires or small parts, an electrolyte cup is available to dip the samples into the

electrolyte. The electrolyte cup can be used for both models and is available as an option.

2. Stand

The stand serves to hold the test sample in place. It permits the exact positioning of the measuring cell on the test sample.

3. Processing unit

GalvanoTest is a microprocessor based instrument with interactive LCD. It is suitable for measuring a variety of plating applications. The measuring application can be entered via touch-pad and visualized on a large alpha-numeric display. Various data ports are available to connect GalvanoTest to peripheral units



Electrolyte cup for measuring wires and small parts



MiniPrint – data printer for immediate print-out of readings, statistics and measuring cell voltage curve

such as a PC, printer or Y-T recorder. For data transfer, an MSoft 7000 Basic Edition software is available as an option.

Electrolyte solutions for the different coating/base combinations

| Coating | Base material | | | | | | | | | | | | |
|---------------|---------------|----------|--------|--------------------|---------|---------|--------|-------|--------|--------|-------|--------|----------------|
| | Lead | Lead/Tin | Chrome | Electroless Nickel | Cadmium | Gold*** | Copper | Brass | Nickel | Silver | Zinc | Tin | Tin/Zinc 78/22 |
| Non metallic | E 15 | E 4 | E 11 | E 17 | E 5 | | E 4 | E 4 | E 14 | E 4 | E 6 | E 7 | E 7 |
| Steel | E 15 | E 4 | E 11* | E 17* | E 5* | | E 4* | E 4 | E 14* | E 4* | E 20* | E 7* | E 7 |
| Copper | E 15 | E 4 | E 7* | | E 5* | | | | E 14* | E 8* | E 6* | E 9* | E 7 |
| Brass | E 15 | E 4 | E 7* | | E 5* | | E 12 | | E 14* | E 8* | E 6* | E 9** | E 7 |
| Aluminium | E 15 | E 4 | E 11* | E 17* | E 5 | | E 4* | E 4 | E 14 | E 4 | E 6** | E 11** | |
| Bronze | | | | | | | | | | E 8 | | E 7 | |
| Nickel | E 15 | | E 11* | | E 5 | | E 4 | E 4* | | E 4 | E 6 | E 7 | |
| Nickel-silver | | | | | | | | | | E 8 | | E 7 | |
| Zinc diecast | | | | | | | E 12 | | | | | | |
| Zinc | | | | | | | E 12* | | | | | | |
| Kovar | E 15 | | | | | | E 4 | | | | | | |
| Silicon | | | | | | | | | E 14 | | | | |
| Silver | E 15 | | | | | | | | | | | | |
| Cadmium | | | | | | | | | | | | E 7 | |

* Thickness standards are available

** Use internal cell type II

*** Sample necessary (only GalvanoTest 3000)

The solutions do not harm the coating until current is flowing. The accurate operation of the gauge can only be guaranteed if the original solutions are used. Their life is virtually unlimited.

Solution PE 1: for the removal of passivation from chromatised coatings.

Choosing GalvanoTest 2000 or 3000?

Two GalvanoTest models are available: The GalvanoTest 2000 is the basic model and measures a variety of coating/base combinations without any accessories being required. Designed for easy use, this model is

mostly recommended for measuring multi-layer applications.

With the GalvanoTest 3000 additional measuring conveniences are provided. Its measuring stand with integrated electrolyte pump and easy to change measuring cell for automatic electrolyte removal and refilling enable electrolyte savings as one

filling may be used for a large series of de-plating processes. Additional measuring cells may be purchased to house different electrolyte solutions for quick change over for multi-layer applications. Further advantages of the 3000 model: Even spots as small as 25 mm² as well as gold layers can be measured easily without problems.

GalvanoTest 2000 Supply Schedule

- GalvanoTest gauge
- Interface for connecting MiniPrint data printer or a PC
- Data port for Y-T recorder
- Standard measuring stand with measuring cell and pulsator nozzle
- Connecting cable gauge/measuring stand
- A-gasket (8 mm²)
- B-gasket (4 mm²)
- 3 bottles electrolyte, 100 ml each, according to customer selection (except E12)

- Pipettes
- Bottle for electrolyte waste
- Spray bottle for distilled water
- Rubber pencil
- Absorbent paper package
- Operating Manual

GalvanoTest 3000 Supply Schedule

- GalvanoTest gauge
- Interface for connecting MiniPrint data printer or a PC
- Data port for Y-T recorder
- Measuring stand with integrated circulator pump incl. measuring cell type 1

- Connecting cable gauge/stand
- 2 B-gaskets (4 mm²)
- 20 C-masks (1 mm²) and 2 gaskets Ø 1,5 mm for sealing the masks
- 20 D-masks (0,25 mm²)
- 5 bottles electrolyte, 100 ml each, according to customer selection (except E12)
- Bottle for electrolyte waste
- Spray bottle
- Rubber pencil
- Absorbent paper package
- Operating manual

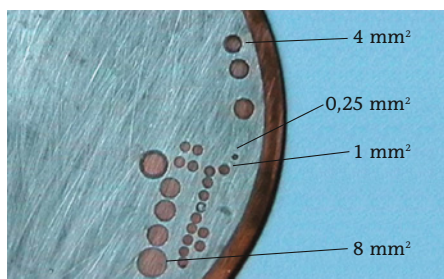
| Recommended accessories GalvanoTest | | Type 2000 | Type 3000 |
|--|---|-----------|-----------|
| - replacement gasket A | 8 mm ² /12.4 x 10 ⁻³ inch ² (diameter 3.2 mm/Ø 126 mils) | ● | |
| - replacement gasket B | 4 mm ² /6.2 x 10 ⁻³ inch ² (diameter 2.3 mm/Ø 90.6 mils) | ● | ● |
| - replacement mask C | 1 mm ² /1.55 x 10 ⁻³ inch ² (diameter 1.1 mm/Ø 43.3 mils) | ● | ● |
| - replacement mask D | 0.25 mm ² /0.388 x 10 ⁻³ inch ² (diameter 0.56 mm/Ø 22 mils) | | ● |
| - modified gasket D for measuring gold layers | | ● | ● |
| - measuring cell inner section type I or II (see table) for use with a different electrolyte, with pump tube and two tube clips; facilitates measurement of multi-layer coatings | | | ● |
| - cathode cup (illustrated) with connecting cable | | ● | ● |
| - clamp to measure wires using the electrolyte cup | | ● | ● |
| - fixture for small pieces | | ● | ● |
| - bottle holder | | ● | ● |
| - calibration standards (see table) | | ● | ● |
| - electrolyte solution (see table) | | ● | ● |
| - pipettes | | ● | ● |
| - precision support with centering tool Z1 and wire holder | | ● | |
| - MiniPrint data printer including charger, battery operated | | ● | ● |
| - connecting cable for MiniPrint data printer | | ● | ● |
| - replacement pump tube | | | ● |
| - replacement rubber pencil | | ● | ● |
| - connecting cable RS 232 C for connection to a PC or compatible printer | | ● | ● |
| - connecting cable for Y-T recorder to produce diagram of measuring cell voltage curve | | ● | ● |
| - centering tool (Z2) (not illustrated) | | | ● |
| - MSoft 7000 Basic Edition for visualising voltage curve, incl. multimeter and connecting cable | | ● | ● |
| - holder for inner measuring cells (5 pcs max.) | | | ● |

Measuring Cell Voltage Curve

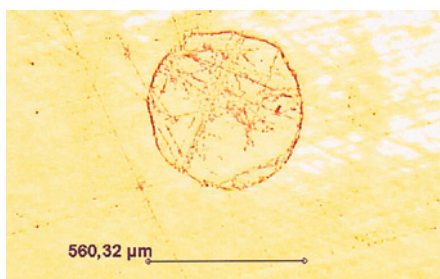
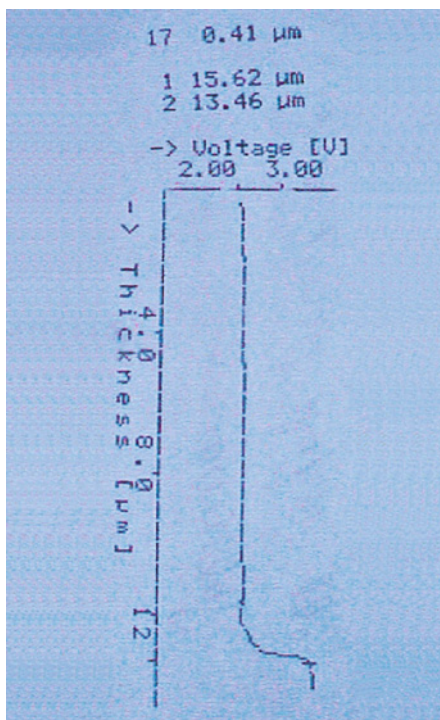
The print-out of the characteristic measuring cell voltage curve graphically represents the measuring process with its typical voltage jump at the end of measurement. The voltage jump terminates measurement and thickness is automatically displayed in microns or mils.

Size of De-Plating Area

The size of de-plating area can be precisely delimited using the supplied gaskets or masks. The illustrations below represent the actual de-plating area size along with a microscopic view of the measuring area delimited when using the D-mask (0,25 mm²).



De-plated areas created by the GalvanoTest are shown on a thickness standard with their actual sizes



Microscopic view of measuring area created by the D-mask

Further Gauges from our Range of Products

- Non-destructive coating thickness gauges (magnetic induction, eddy currents principle)
- Ultrasonic coating thickness gauges (non-destructive)
- Porosity detectors
- Wall thickness gauges
- Gloss measuring gauges
- Hardness and roughness measuring gauges
- On-line thickness measuring systems for flat materials
- On-line pinhole detectors