Material Testing for Quality Control

Instruments, Sensors and Systems for Nondestructive Testing of Materials
Ultrasonic, Magnetic Particle and Penetrant Testing
Wall and Coating Thickness Gauges, Crack Depth Gauges

KARL DEUTSCH

ULTRASONIC INSTRUMENTS

ECHOGRAPH

For nondestructive testing of steel, castings, non-ferrous metals, porcelain, plastics and other sound conductive materials, to detect flaws like shrinkholes, inclusions, separations or poor bondings. Typical tested work pieces are weldings, castings, tubes, rods, billets and plates.

Digital Instruments

ECHOGRAPH 1090

Small, Lightweight, Coloured and Easy to Use

ECHOGRAPH 1094

Multi-Channel Instrument
with Multiplexer, up to 8 channels

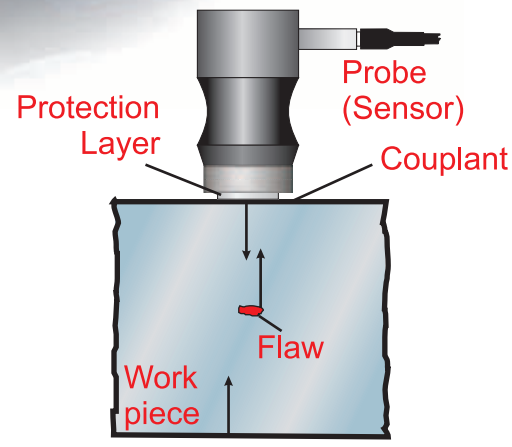
ECHOGRAPH 1016

the Compact Version

Analogue Instruments

ECHOGRAPH 1055

with a Large Screen



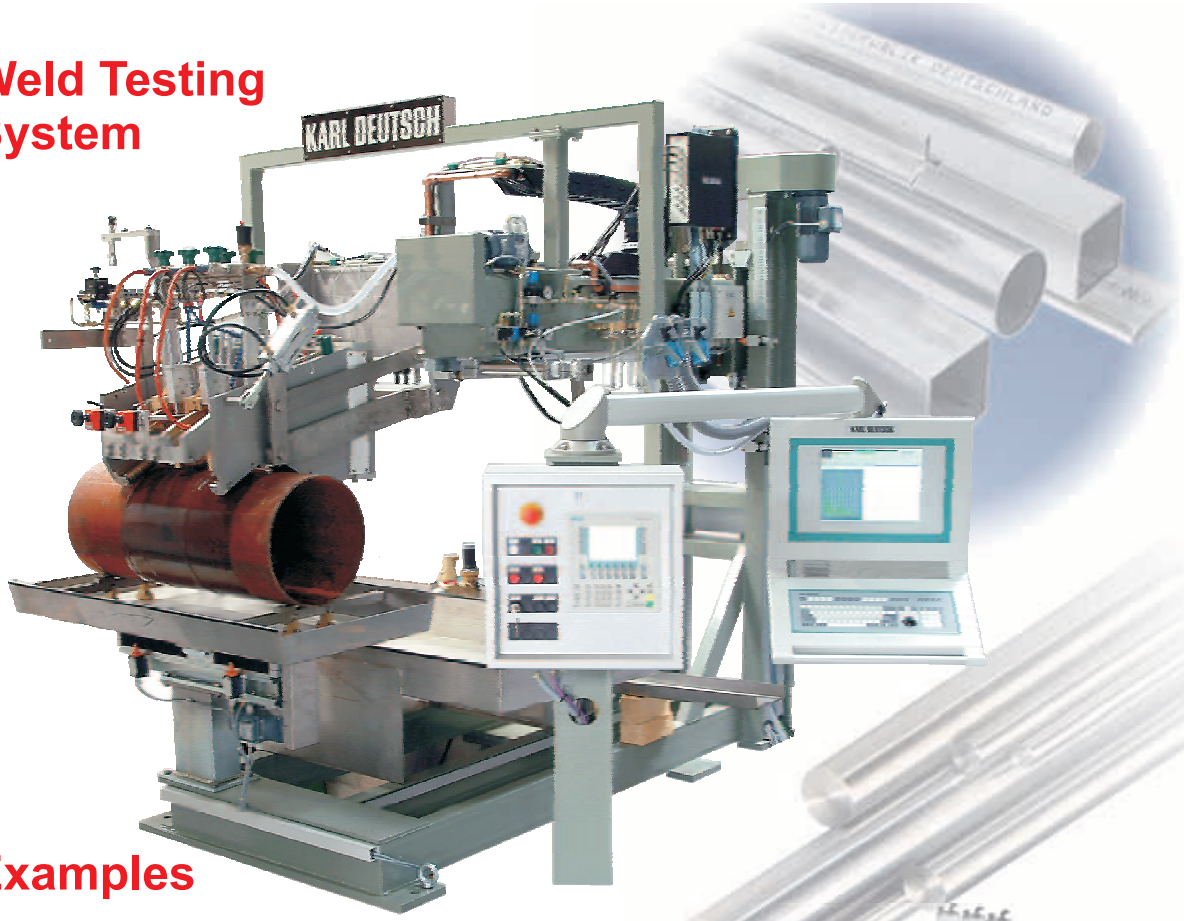
Method

Ultrasonic testing is mainly used for the detection of internal flaws inside a work piece. The good reflection of ultrasonic waves at an interface work piece - air (e.g. steel - air) is very helpful for the detection of internal flaws. By evaluating such reflections, inclusions and cracks are easy to detect. The reflections contain information on flaw size and position.

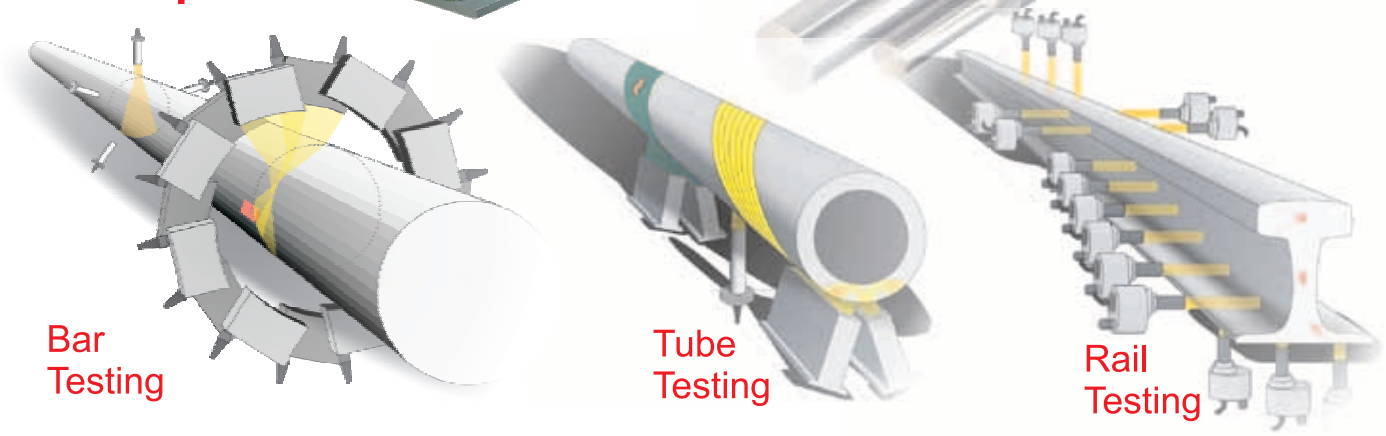
ECHOGRAPH
Ultrasonic-Systems

Mechanical and electrical components from one supplier, e.g. for tubes, billets, rods, plates, weldings, pressure cylinders, axles, turbine blades, aerospace components, rollers, ...

Weld Testing System



Examples



Bar Testing

Tube Testing

Rail Testing

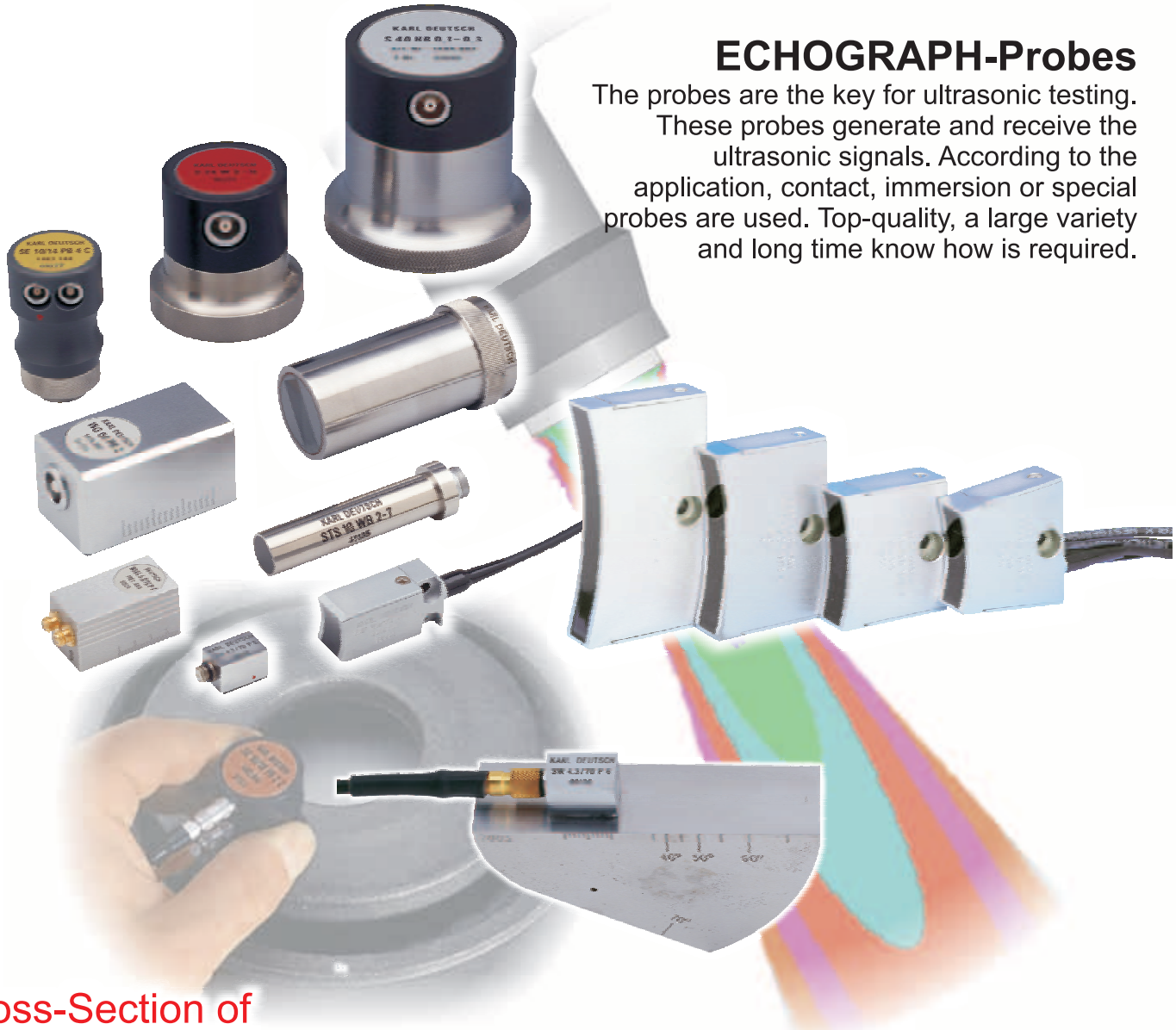
Method

The testing principle is similar to portable ECHOGRAPH equipment. Ultrasonic systems are automatic systems with a multichannel electronic. Advantages are a faster, more reliable and more objective testing procedure as well as an integration into the production line.

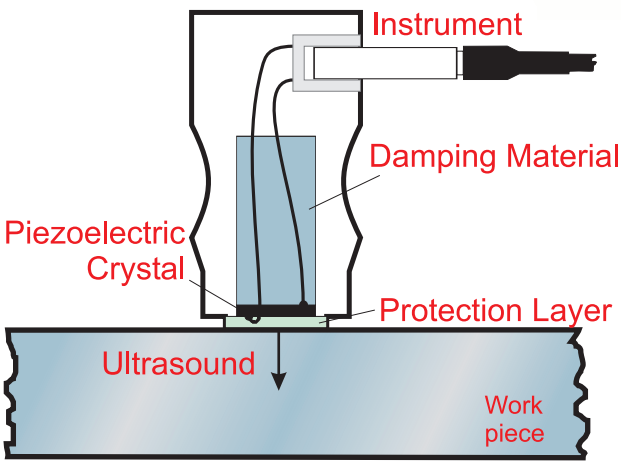
ULTRASONIC PROBES

ECHOGRAPH-Probes

The probes are the key for ultrasonic testing. These probes generate and receive the ultrasonic signals. According to the application, contact, immersion or special probes are used. Top-quality, a large variety and long time know how is required.



Cross-Section of Contact Probe



Generation of Ultrasound

Most sensors (probes) for ultrasonic testing make use of piezoelectric materials. If an external voltage is applied to the surfaces of such material, it is slightly deformed (inverse piezoelectic effect). Short voltage pulses are used for excitation and result in short acoustic wave pulses which travel into the work piece to be tested.

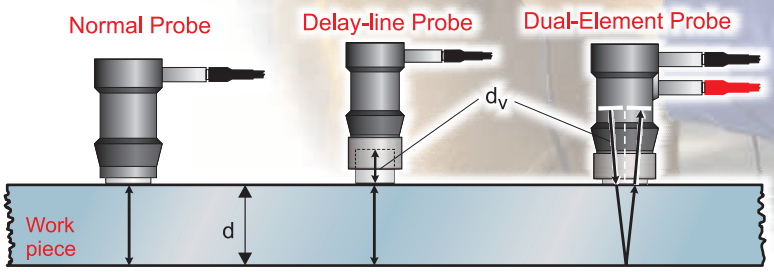
Reception of Ultrasound

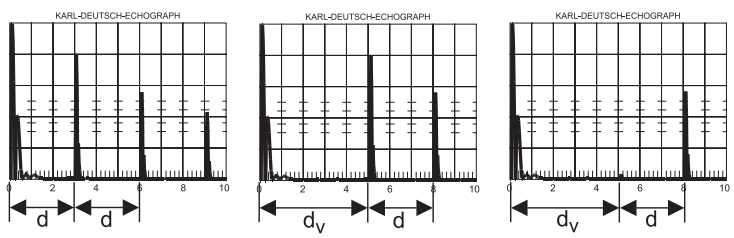
In most cases the same probe is used for transmission and reception. Reflected ultrasonic pulses from work piece interfaces (e.g. backwall) or from internal defects travel back to the transducer. The acoustic pulses produce tension or pressure loads on the piezoelectric material which are again converted into electric voltages (direct piezoelectric effect).

INSTRUMENTS for WALL THICKNESS and SOUND VELOCITY MEASUREMENT

ECHOMETER

High-precision display of wall thickness, convenient measurement of sound velocity and reliable quality control of castings – also through coatings – are key features of these small and versatile instruments. A wall thickness measurement is possible for all sound conductive materials.





Method

Due to a high-precision measurement of sound travel time (= time of sound propagation through the work piece) and by knowing the sound velocity, it is possible to calculate the wall thickness. Vice versa, by knowing the precise wall thickness, it is possible to measure the sound velocity within the tested material.

MAGNETIC PARTICLE TESTING

DEUTROPULS

Mobile Magnetic Particle Instruments and Accessories

for the detection of surface cracks in ferromagnetic work pieces. Typical are forgings and castings, especially for automotive components and other safety-relevant parts.

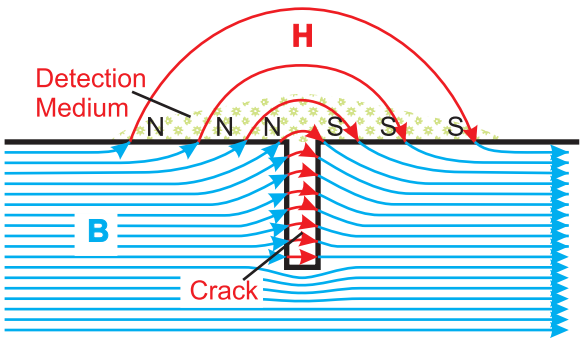
DEUTROPULS
Current Flow
Unit

Large-Area UV-lamp

UV-LED hand lamp

DEUTROMETER
Field Strength
Gauge

Control Blocks and Instruments to Control the Magnetic Field and Detection Medium



Method

The magnetic field is guided within the ferromagnetic material. Only at a disturbance (surface crack) the magnetic field leaves the work piece. This external field is called "stray flux" and is the essential effect for magnetic particle testing. The exit points become magnetic poles. Fine iron powder is used as a detection medium and sticks to these poles. The pole area is larger than the crack width, thus producing a clear crack indication on the component surface. With a coloured iron powder (e.g. fluorescent paint) an improved visibility is possible. The magnetic field is generated by an electric current or an external coil.

MAGNETIC PARTICLE TESTING

DEUTROFLUX

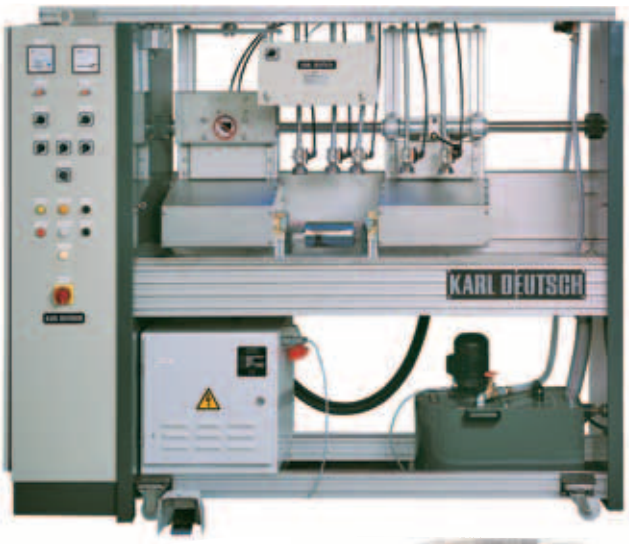
Stationary Magnetic Particle Systems

with two magnetization circuits to detect every crack independent of its orientation in ferromagnetic materials.

UWE-Concept

Stationary Test Bench

with clamping lengths from 350 mm to 900 mm



UWS-Concept

with a moving coil for large work piece lengths

Method

With stationary magnetic particle systems, the testing procedure is automated for higher throughput rates: clamping of the work piece, magnetization during the application of the detection media and post-magnetization to produce stable crack indication during drip-off of excess detection media. Sometimes, also loading and unloading of the machine is automated.

DEUTROMAT (Special Solutions)

with multiple contacts, chain conveyor,...

DETECTION MEDIA for MAGNETIC PARTICLE and PENETRANT TESTING

FLUXA

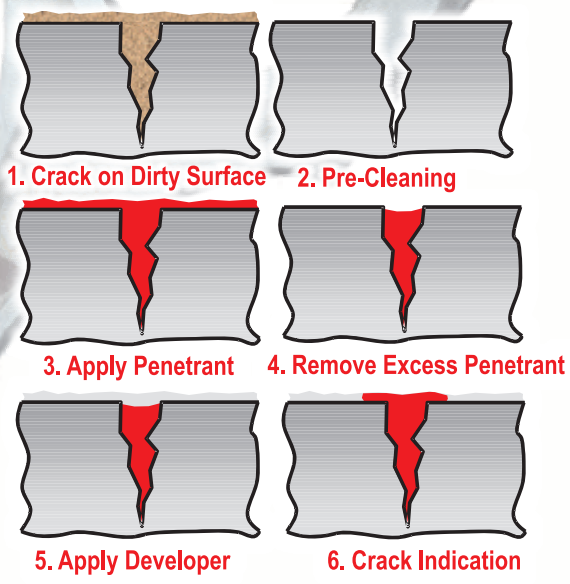
Detection Medium for Magnetic Particle Testing

improves the performance of every magnetic particle instrument and system. Wet (water or oil based concentrates) or dry detection media (iron powder) are capable to detect smallest cracks. A large variety of products is available for every test application. Colour, particle size, corrosion prevention, concentration and other features are important criteria of choice.

KD-CHECK

Penetrant Testing

for surface crack detection in almost every metallic and non-metallic material (steel, plastics, aluminium, brass,...). No test equipment is required for this highly-sensitive method. Broader use of aluminium components in the automotive industry put extra attention on this testing method.



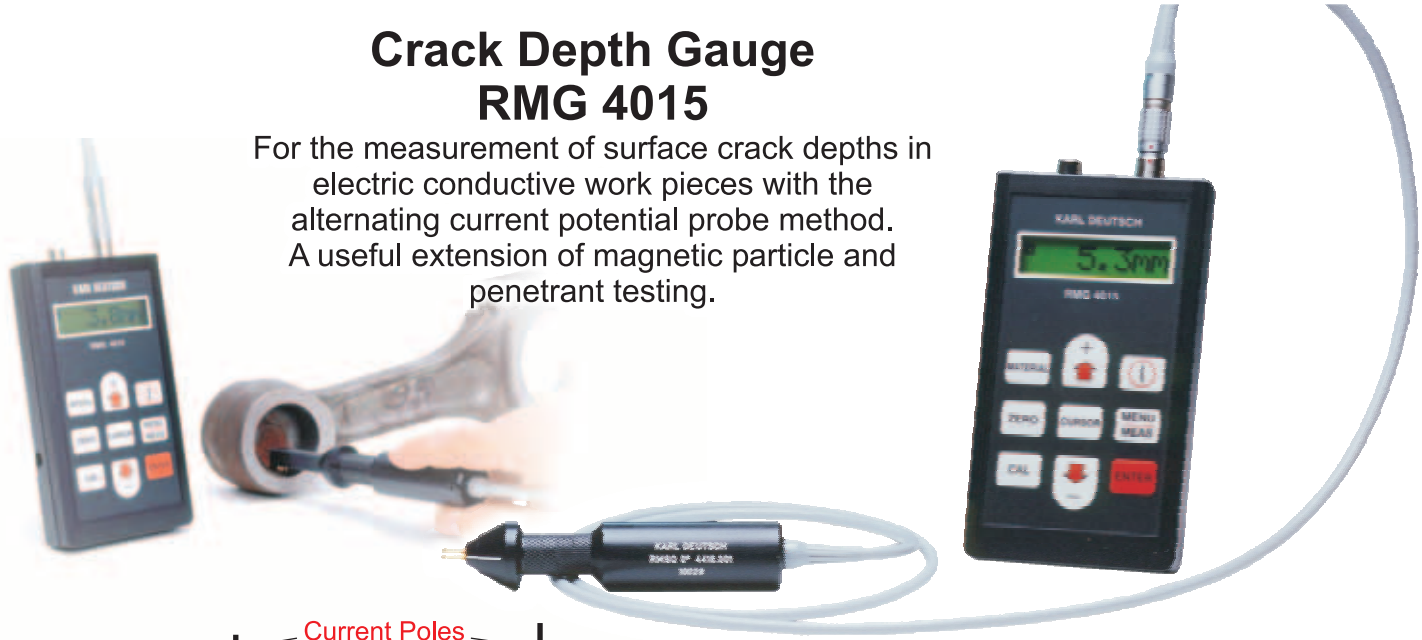
Method of Penetrant Testing

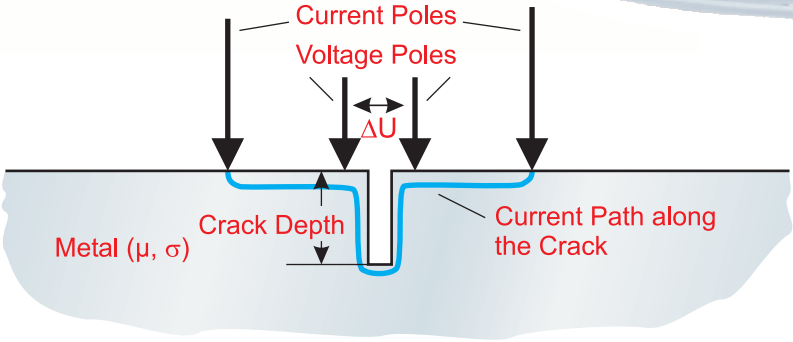
After pre-cleaning of the surface a coloured penetrant detection medium is applied to the surface. It penetrates into the open crack (capillary attraction). Afterwards, the penetrant on the surface is removed (without removing the penetrant within the crack). The application of a developer onto the surface sucks the remaining penetrant out of the crack. Since a white developer shows excellent contrast to a red penetrant, the crack indication is clearly visible.

CRACK DEPTH GAUGE
COATING THICKNESS GAUGES

Crack Depth Gauge
RMG 4015

For the measurement of surface crack depths in electric conductive work pieces with the alternating current potential probe method. A useful extension of magnetic particle and penetrant testing.



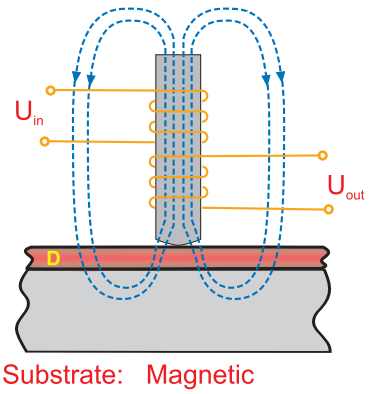


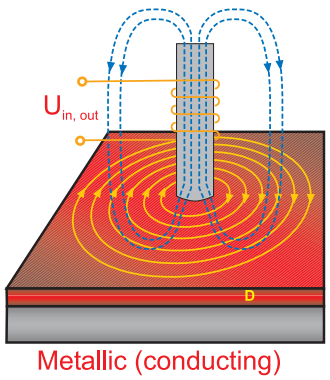
Method

The current flows through the work piece along the surface and along the crack faces from one current pole to the other. The measured voltage ΔU is proportional to the crack depth and is picked up by the voltage poles.

LEPTOSKOP
Coating thickness gauges

Measurement of the coating thickness on all metallic substrates.
For all non-magnetic coatings on ferromagnetic substrates and for all non-conductive coatings on (electrically) conducting substrates.





Method

A probe is placed on the coated surface.
<u>Magnetic substrate:</u> Depending on the coating thickness the magnetic flux in a measuring coil changes its value.
<u>Conductive substrate:</u> A coil induces a circular current (eddy current), which works contrary to the source field. This feedback depends on the coating thickness.

CORPORATE PROFILE and HISTORY

Quality in the 3rd Generation

Since its establishment in 1949, the pool-independent KARL DEUTSCH company develops products for nondestructive testing (NDT). The product range is focussed on ultrasonic and magnetic particle testing. Characterised by continuous innovations and reliability of the products, the trade marks ECHOGRAPH, ECHOMETER, DEUTROFLUX, LEPTOSKOP, FLUXA and KD-Check are well known world-wide. Applicational experience, theoretical knowledge and manufactural know-how of more than 6 decades as well as a strict quality management guarantee state-of-the-art instruments and accessories and a top position regarding quality, reliability and market position also for the future.

Karl Deutsch
At the Hannover Fair 1951

First LEPTOSKOP
in 1949

Microprocessor
Supported Digital
Instrument
Made in Germany

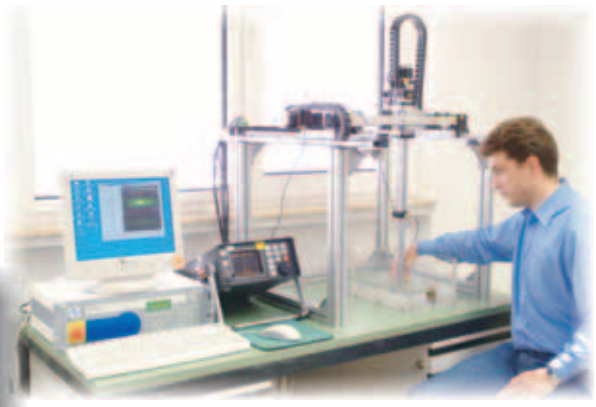
Dr.(USA) Wolfram Deutsch

Prof. Volker Deutsch

APPLICATION LABORATORY, TRAINING COURSES, BOOKS, QUALITY MANAGEMENT and SERVICE

Application Laboratory

Use our experience. In our application laboratory you are well adviced, surely also for your testing problem.



Training Courses

Register for our training courses. For decades we have provided these courses in ultrasonic, magnetic particle and penetrant testing. Current standards for personnel qualification (EN 473) are obeyed.

Service

Professional and fast service is a crucial factor of our quality management system (EN ISO 9001:2000).

Books for Practical People

Our experience and our knowledge is not kept secret. Please check our famous "red books" on NDT or find publications on our website.

Headquarter in Wuppertal and KARL DEUTSCH worldwide

Works 1 at the Otto-Hausmann-Ring 101:

Management, administration, research and development, manufacturing of portable test instruments, sensors and crack detection liquids

Works 2 at the Otto-Hausmann-Ring 201:

Development, design and manufacture of ultrasonic and magnetic particle testing systems

KARL DEUTSCH worldwide.

In addition to our headquarter in Wuppertal, KARL DEUTSCH has offices and representations in Europe, Asia, America, Africa and Australia. Our worldwide activity is the reason for our export rate of over 50%. That is how we can guarantee our customers technical support and innovative solutions in many countries and also fulfill international requests immediately.

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Belgium
Brazil
Bulgaria
China
Colombia
Czech Republic
Denmark
Egypt
Finland
France
Great Britain
Greece
Hungary
India
Indonesia
Iran
Israel
Italy
Japan
Korea
Malaysia
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