Probes

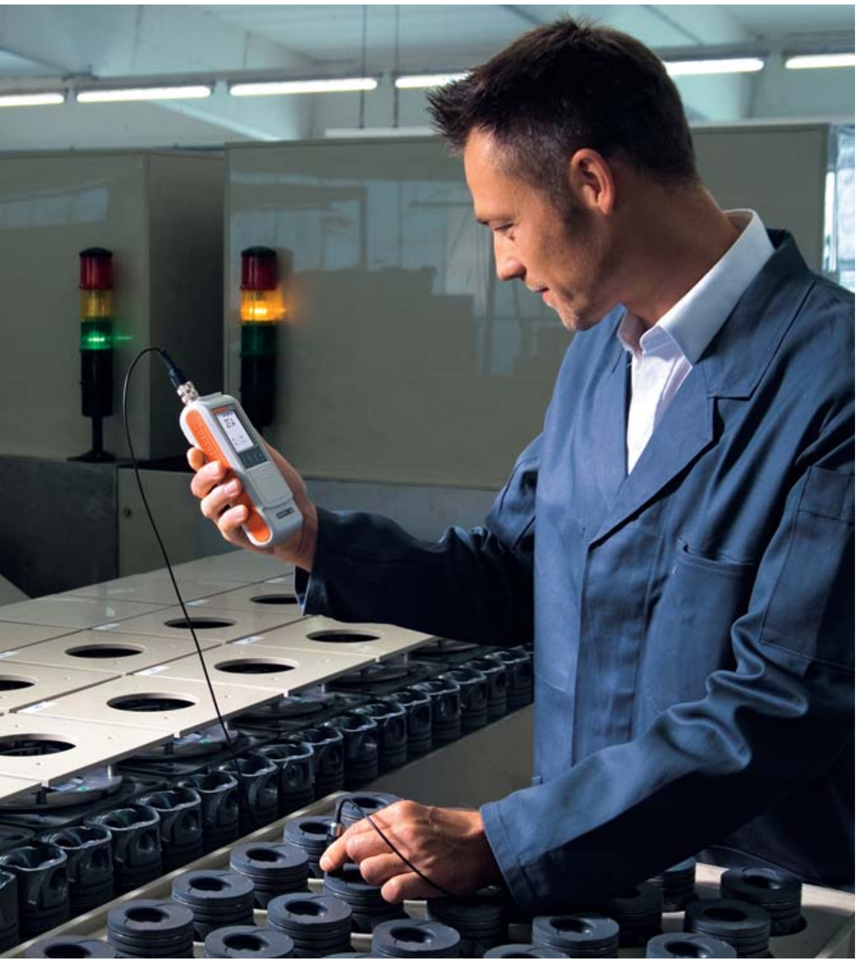
for coating thickness measurements

High-Precision Probes

The heart of any electromagnetic measurement system is the probe; the quality of its signal ultimately determines the overall quality of the metrological solution. The probe is a very complex system, which performs the conversion of the appropriate measuring method: In this case the coating thickness is transformed into an electrical signal (count rate, frequency, voltage) in order to display the value of the coating thickness in the instrument display.

Note

This document describes probes with electromagnetic measuring methods, which are most frequently used for coating thickness measurement. FISCHER also offers probes for material testing, e.g. for measuring the electrical conductivity or for the determination of the ferrite content. You can find a description of these probes for material testing in the documents of the corresponding measuring instruments.



Quality monitoring on engine pistons after the manufacturing process using the FTA3.3H probe

Solutions for individual measurement tasks

We offer the ideal probe for each individual measurement task. FISCHER engineers develop customer-specific probe constructions on demand, like the cavity probe V3FGA06H. This probe was specially designed for non-destructive measurements of EPD coatings within the box section of auto bodies - without having to cut the auto body itself.

Auto body in section to show how the probe measures the EPD coating within the auto body

Measuring with the internal probe FAI3.3-150

The extensive selection of FISCHER probes is as versatile as the measurement applications of our customers. After years of continuous development and innovation, the FISCHER probe program now encompasses some 100 probes designed to ensure optimal results for the widest range of measurement applications.

Probe selection based on several criteria
- Material combination of coating and base material
- Thickness of coating and base material
- Dimension of the measurement area
- Shape of the specimen
- Surface condition of the measurement area

Call us.
We are happy to consult you on the matter of choosing the right probe for your individual application.

ISO 9001
In keeping highest standards of quality and customer satisfaction, all members of the FISCHER Group are certified according to ISO 9001.

FISCHER Germany is accredited as a DAkkS calibration lab for the measured quantity "mass per unit area" according to DIN EN ISO/IEC 17025.

Features

☐ Robust
FISCHER probes are extremely robust and wear-resistant – they deliver precise measurements over a long period of time even on hard surfaces and after millions of uses.

☐ In-house development and manufacturing
All probes are developed and manufactured in-house to strict quality standards.

☐ Factory-calibration
Each individual probe is factory-calibrated at several reference points with the greatest care to ensure the highest possible degree of trueness.

☐ Electrical conductivity compensation
FISCHER's patented conductivity compensation – used in all eddy current probes – makes it possible to adjust for different conductivities of the base material, e. g. different aluminum alloys, eliminating time-consuming on-site calibration on the actual base material while simultaneously achieving very high levels of trueness.

☐ Curvature compensation
Special probes for the eddy current method are available that automatically compensate for the influence of curvature on rounded specimens.

☐ Reduction of measurement errors
A spring-loaded system ensures that the probe is always placed on the surface with the same pressure. This reduces measurement errors and increases the repeatability precision. Many of our probes are equipped with this spring-loaded system. As a result, soft surfaces can also be measured.

Content

Versatile Probe Program

A probe needs specific properties for each field of application for achieving best results with a high accuracy. The following list gives you an overview of the probe features.

Various measurement areas
- Diameter from 2 mm (78.7 mils)
- Areas from 30 mm x 30 mm (1.18 " x 1.18 ")

Various measuring sites
- Flat, even surfaces
- Easily reachable
- In boreholes
- In grooves and cavities
- On curved surfaces and on cylinders
- High specimen temperatures up to + 80 °C (+ 176 °F)
- Humidity ambients

Manual or automated measurements
- Hand-held probes
- Built-in probes for automated measuring systems

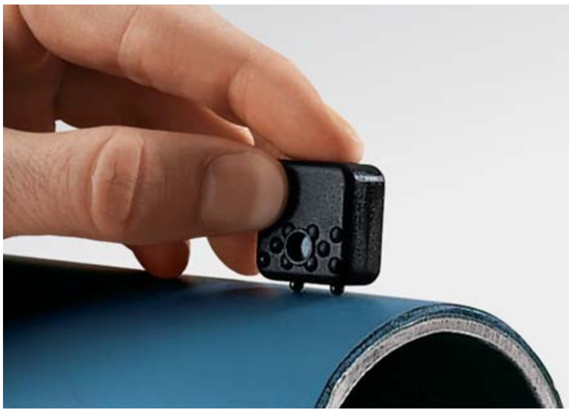
Various coating hardnesses
- Hard coating materials (metallic coatings like chrome etc.)
- Softly coated materials (paint, lacquer, textiles etc.)

Various base materials
- Iron and steel
- Non-ferrous metals
- Various metals
- Steel under Duplex coating systems
- Epoxy and plastic

Various probe tip designs

For different surface characteristics such as rough surface, soft coating material etc:
- Single probe tip or double probe tips
- Round or even pole tips
- Different probe tip sizes
- Different probe tip materials, e.g. hard metal, jewel, TiN/TiC, PVD, hard plastic

Versatile Fields of Applications



Measurement of the corrosion protection coating in plastics on steel pipes with the probe FKB10

Measurements of anodized coatings with the curvature-compensating probe FTD3.3

Measurement of zinc powder coating with the two-pole probe V7FKB4

Measuring of duplex coatings with the probe FDX13H

Automated measurement of the chrome coating on piston rods with the probe V2FGA06H

Measurement of auto body paint thickness using the Dual probe FD10

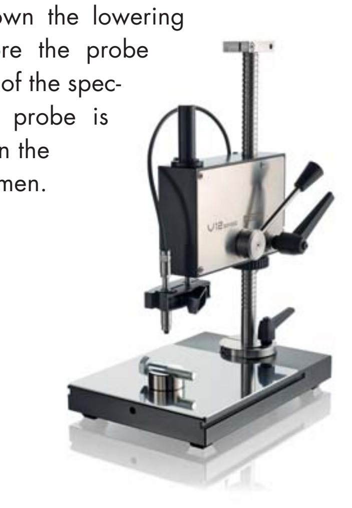
Support stands

For precise and reproducible measurements on small parts, such as fasteners, stampings, sleeves etc. or parts with complex geometry a measurement stand is necessary, into which a probe can be clamped. The reproducible positioning of the probe on the specimen substantially improves the repeatability of the readings – reduction of the reading variation. Suitable for all probes.

Stand V12 BASE (604-420)

Support stand with mechanical probe lowering device. A specific lever mechanism of the stand slows down the lowering speed shortly before the probe reaches the surface of the specimen. Thereby the probe is very softly placed on the surface of the specimen.

Measurements of anodized coatings on sleeves using the curvature-compensating probe FTD3.3, mounted into the support stand V12 BASE

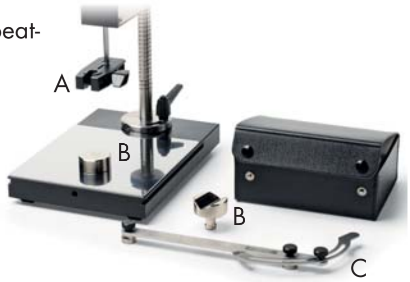


Stand V12 MOT (604-374)

Stand with motorized probe lowering device for top repeatability. It can be directly controlled by the stand keys or within the instrument FISCHERSCOPE® MMS® PC2. The Teach-In function ensures a very soft placing of the probe onto the specimen's surface.

Standard scope of supply of the support stands

- Various clamping devices for Fischer standard axial probes (A)
- Even and V-table for small parts (B)
- Stop device for repeatable specimen positioning (C)



Clamping device (601-691)

Optional accessory for clamping inside probes into the support stands V12 BASE or V12 MOT.

Clamping device (600-077)

Optional accessory for clamping angles probes into the support stands V12 BASE or V12 MOT.

Clamping device (600-213)

Optional accessory for clamping axial probes with Ø 16 mm into the support stands V12 BASE or V12 MOT.

Measurement of zinc coatings on screws using the probe FGAB1.3, mounted into the support stand V12 MOT

Guiding device for angle probes (600-080)
The guiding device makes it easier to reach the measurement point in bore holes or recesses. The angle probe is just clamped into the guiding device.
Insertion depth: max. 180 mm (7.09 ")

Measurement of the lacquer thickness on an aluminum rim wheel with the probe FAW3.3, mounted in the guiding device

Screw measurement device (602-916)
For accurate measurements of coating thicknesses on metallic fasteners according ISO 4042.
Suitable for the probes FGAB1.3, FGA06H or ESD2.4.
Scope of supply:

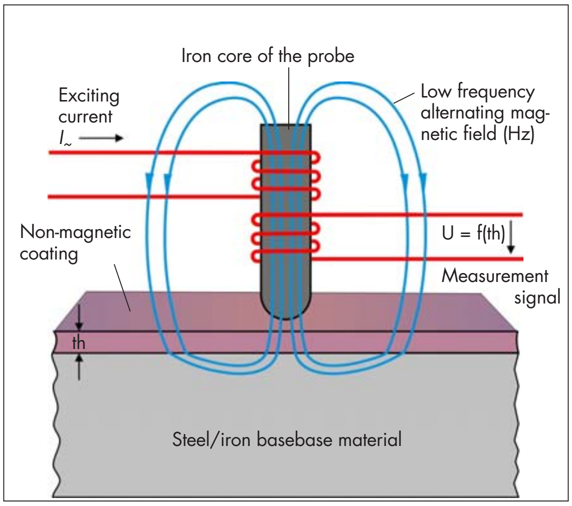
- Fixture for fillister head and ULF/ULS screws (M3; M3.5; M4)
- Fixture for cylinder head screws according to ISO 1207 (≤ M3) or ISO 4762/DIN 7984 (≤ M12).
  Please specify the required dimension with the order.

Universal bench device (604-261)
Universal bench device to fix and to position small parts of any shape. For measurements in combination with the support stands V12 Base or V12 MOT.

- Dimensions (HxWxD): 27 mm x 115 mm x 30 mm (1.1 " x 4.5 " x 1.2 ")
- Removable horizontal and vertical prisms
- Jaw width of 0.1 - 25 mm (0.004 - 0.984 ")

Scope of supply:
Carrying case, accessories and operator's manual

Magnetic induction test method
Standards: ISO 2178, ASTM 7091



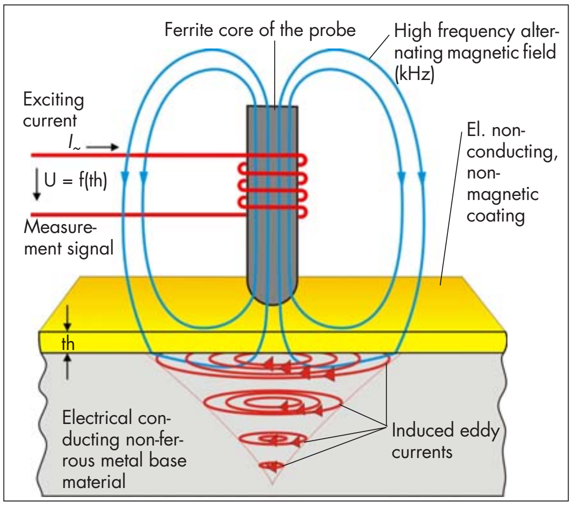
Schematic diagram of the magnetic induction test method. The indentation depth depends on the permeability of the base material.

Functional principle
Contact method. The excitation current generates a low-frequency magnetic field with a strength that corresponds to the distance between the probe and the base material. A measurement coil measures the magnetic field. In the instrument, the obtained measurement signal is converted into the coating thickness values via the characteristic probe output function, i.e., the functional correlation between the probe signal and the coating thickness.

Main fields of application
Non-magnetizable coating materials on magnetizable base material.
- Electroplated coatings of chrome, zinc, copper or aluminum on steel or iron
- Paint, enamel, lacquer or plastic coatings on steel or iron

Suitable instrument types
DELTASCOPE®, DUALSCOPE®, FISCHERSCOPE®
MMS® PC2 with module PERMASCOPE®

Eddy current test method (amplitude sensitive)
Standards: ISO 2360, ASTM 7091



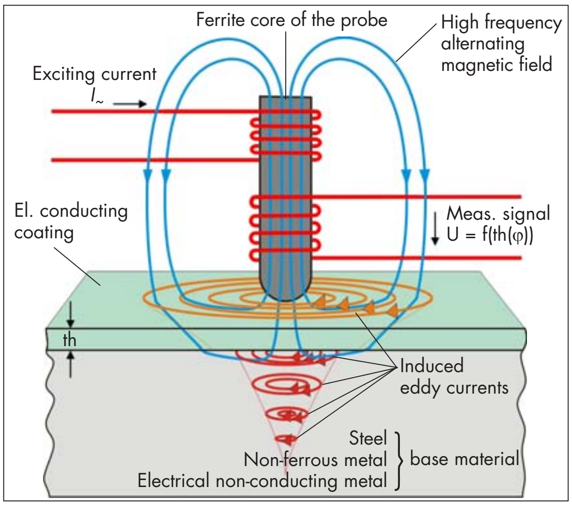
Schematic diagram of the amplitude sensitive eddy current test method. The indentation depth depends on the used frequency and the electrical conductivity of the base material.

Functional principle
Contact method. The excitation current generates a high-frequency magnetic field, which induces eddy currents in the base material. The strength of the eddy currents corresponds to the distance between the measurement probe and the base material. The magnetic field of the eddy currents opposes the original magnetic field and provides the measurement signal. Using the characteristic probe output function, i.e., the functional correlation between the measurement signal and the coating thickness, the measurement signal is converted in the instrument into the coating thickness value.

Main fields of application
Electrical non-conductive and non-magnetizable coating material on electrical conducting non-ferrous metal base materials.
- Paint, lacquer or plastic coatings on aluminum, copper, brass, zinc
- Anodized coatings on aluminum

Suitable instrument types
ISOSCOPE®, DUALSCOPE®, FISCHERSCOPE®
MMS® PC2 with module PERMASCOPE®

Eddy current test method (phase sensitive)
Standard: ISO 21968



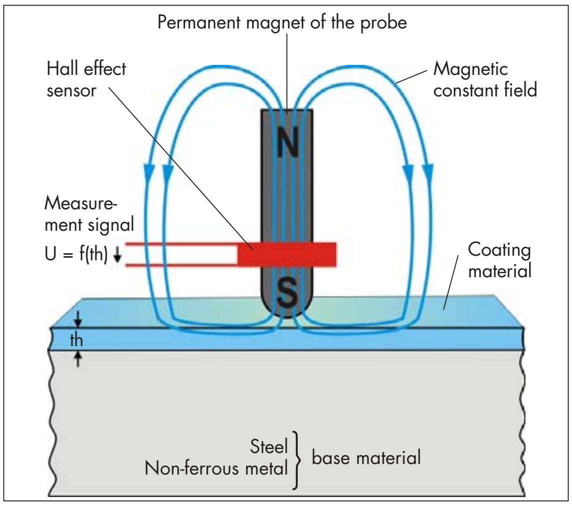
Schematic diagram of the phase sensitive eddy current method. The indentation depth of the magnetic field depends on the used frequency and the electrical conductivity of the materials.

Functional principle
Contact method. The excitation current generates a high-frequency magnetic field, which induces eddy currents in the material (coating or base material). The different formation of the eddy currents in the coating material and the base material is used for the coating thickness measurement. The phase shift Phi between the excitation current and the measurement signal is converted to a coating thickness value by using the characteristic probe output function, i.e., the functional correlation between the measurement signal and the coating thickness. In a certain range, which is determined by the probe, the reading is not dependent on the distance between the probe and the coating surface.

Main fields of application
Electrical conductive coating material on any base material.
- Zinc or Nickel coatings on steel or iron
- Copper coatings on brass or stainless steel
- Copper coatings on Epoxy, even under a lacquer protection coating

Suitable instrument types
PHASCOPE® PMP10, FISCHERSCOPE® MMS® PC2 with module SIGMASCOPE®/PHASCOPE® 1

Magnetic test method
Standards: ISO 2178, ASTM 7091



Schematic diagram of the magnetic test method. The indentation depth of the magnetic field depends on the permeability of the base material.

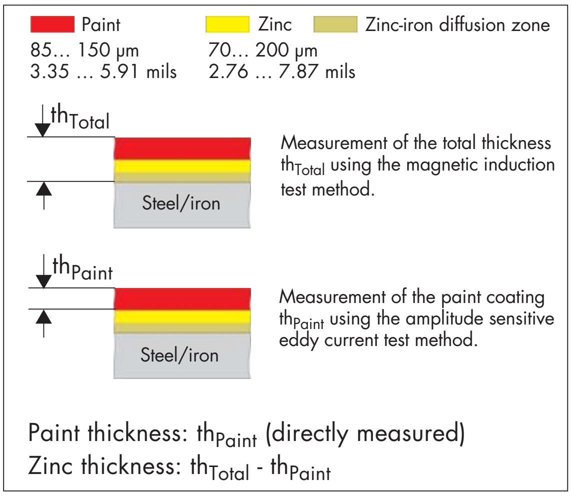
Functional principle
A permanent magnet generates a constant magnetic field with a strength that corresponds to the thickness of the coating to be measured or the distance between the measurement probe and the base material. The magnetic field strength is measured by a suitable sensor; using the characteristic probe output function, i.e., the functional correlation between the measurement signal and the coating thickness. The measurement signal is converted in the instrument into a coating thickness value.

Main fields of application
Non-magnetizable coating material on steel or iron or nickel coating on non-ferrous metal base material.
- Thick electroplated coatings of chrome, zinc, copper, aluminum etc. on steel or iron
- Thick coatings of enamel, paint or plastic on steel or iron
- Galvanically deposited nickel coatings (Ni) on copper or aluminum; also suited for nickel coatings on pc-board contacts, even under a thin gold coating
- Chemically deposited nickel coatings (Ni), if magnetizable, on copper or aluminum

Suitable instrument types
DUALSCOPE® H FMP150, FISCHERSCOPE® MMS® PC2 with module NICKELSCOPE®

Duplex Measurement

Duplex measurements in the corrosion protection sector (zinc coatings ≥ 70 µm/ 2.76 mils)



Determining the single coating thicknesses at the duplex measurement using the amplitude sensitive eddy current and the magnetic induction test methods

Functional principle

The magnetic induction test method and the amplitude sensitive eddy current test method are used for measuring duplex coatings with thick zinc coatings (≥ 70 µm / 2.76 mils). The operational principles of these two test methods are described on the preceding pages. The two test methods are used parallel such that in one measurement step, the individual coating thickness of paint and zinc are computed and displayed from the two measured readings. The non-magnetic zinc-iron diffusion zone goes along with the zinc coating thickness. The probe features a conductivity compensation, so that the different electrical conductivities of the pure zinc coating and the zinc-iron diffusion zone have no effect on the thickness measurement of the paint coating.

Main fields of application

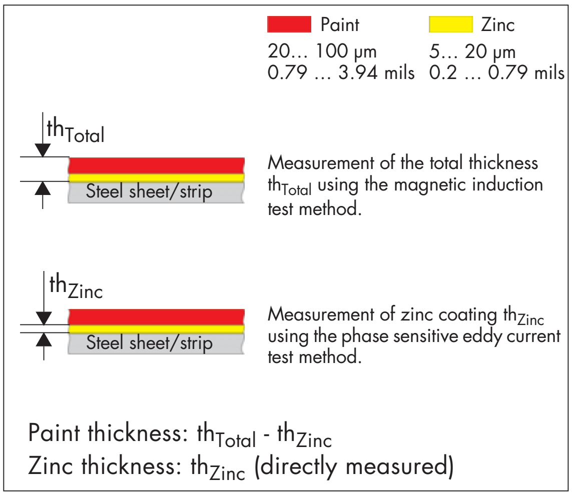
Duplex coatings on steel or iron.

- Specification measurements in the **corrosion protection sector** (zinc coatings ≥ 70 µm / 2.76 mils)
- Paint/lacquer and zinc coating thickness on hot-dip galvanized steel or iron (continuous or batch galvanized)
- Power pylons, bridge structural components, traffic guidance systems
- Gates, fences, guard rails

Suitable instrument types

DUALSCOPE® FMP20, DUALSCOPE® FMP40, DUALSCOPE® FMP100, DUALSCOPE® H FMP150

Duplex measurements on sheet metal with electrolytically or slight hot-dip galvanized coatings



Determining the single coating thicknesses at the duplex measurement using the phase sensitive eddy current and the magnetic induction test methods

Functional principle

The magnetic induction test method and the phase sensitive eddy current test method are used for measuring duplex coatings with thin zinc coatings (typical between 5 and 20 µm respectively 0.2 to 0.79 mils). The operational principles of these two test methods are described on the preceding pages. The two test methods are used parallel such that in one measurement step, the individual coating thickness of paint and zinc are computed and displayed from the two measured readings. Duplex coatings with hot-dip galvanized zinc coatings without pronounced zinc-iron diffusion zone can also be measured with these test methods.

Main fields of application

Duplex coatings on steel or iron.

- Quality measurements of **electrolytically or slight hot-dip galvanized coatings** (typical zinc coatings between 5 and 20 µm respectively 0.2 to 0.79 mils)
- Domestic appliance and electrical industry
- Auto body painting and brake pipes
- Cladding, steel roof constructions, packaging or vending machine housings

Suitable instrument types

PHASCOPE® PMP10 DUPLEX, FISCHERSCOPE® MMS® PC2 with module PHASCOPE® DUPLEX

Service worldwide
FISCHER has established a tightly-linked global network of service partners with highly qualified staff. Offering fast help, repairing and the availability of leasing and rental units, FISCHER supports you in every respect concerning your instruments and their use.

Calibration and certification
On your request Fischer issues a Quality Inspection Certificate for your probe and instrument according to DIN 55350-18. A broad assortment of calibration foils is available from FISCHER. On your request FISCHER issues a Factory Certificate for your calibration foil.

Application laboratories
More and more, demanding applications require highly qualified application advice. FISCHER addresses this need with its application laboratories located around the world (Germany, Switzerland, China, USA).

Measuring on a customer's specimen in a FISCHER application laboratory

User on-site training
With our training program we make your employees fit on-site for your measuring task. Our trainer takes account of your individual requirements and wishes.

User training for the DUALSCOPE® FMP100 on-site at the customer's

Seminars
Because we want you to receive maximum benefit from our products, FISCHER's experts are happy to share their application know-how. The seminars not only teach metrological basics but also hand-on experience in small groups to put the theory into practice.

A FISCHER seminar teaches metrological basics and practical knowledge in small groups

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