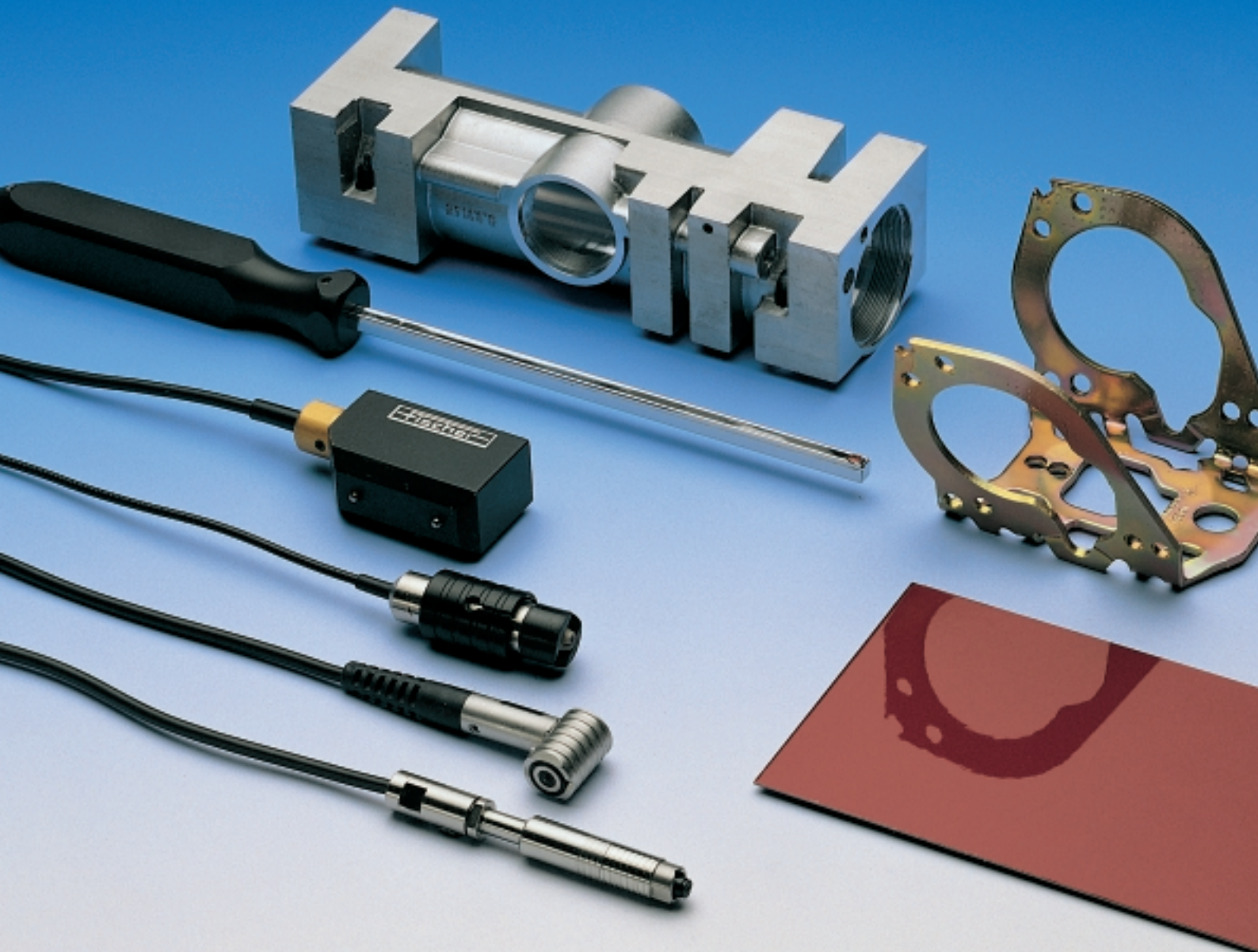


## Application Specific Probes The key to successful coating measurement

Probes are the most important component of systems used to measure coating thickness with either magnetic, magnetic induction and eddy current methods. This is the reason significant efforts and resources are expended by FISCHER for the development and quality control of probes.

- **FISCHER probes are adapted and optimized for the application!**  
This guarantees accurate and reliable measurement results.

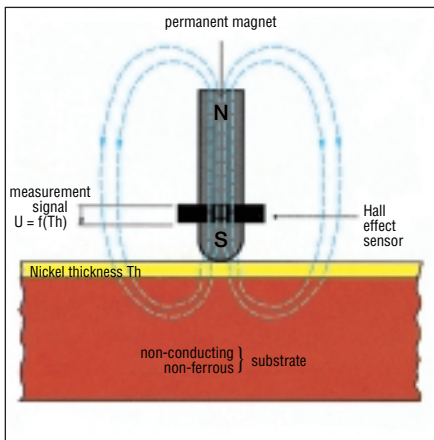
- **FISCHER probes are dependable and durable!**  
The probes are long lasting and durable, even when measurements are to be performed which test their “wear resistance”.
- **FISCHER probes are reliable!**  
This is due to their advanced design, their careful assembly and use of high quality components.



# Measuring Methods and Processing Measuring Signals

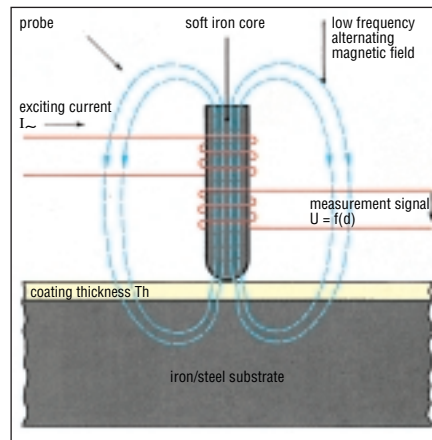
This technical information material introduces standard magnetic probes, magnetic induction probes and eddy current

probes to measure coating thickness. The fundamental, physical principles are explained below.



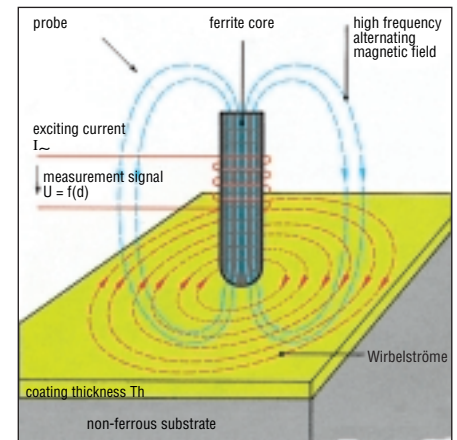
## Magnetic Method

A permanent magnet produces a continuous magnetic field (DIN EN ISO 2178) the strength of which depends upon the thickness of the coating to be measured (Ni/Fe), or the distance between probe and substrate (NF/Fe). The strength of the magnetic field is measured with an appropriate sensor and the coating thickness is calculated from this information.



## Magnetic Induction Method

The energizing alternating current produces a low frequency magnetic field (DIN EN ISO 2178) the strength of which depends upon the distance between the probe and the substrate. The magnetic flux density is measured by means of a pickup coil. The induced measurement signal obtained is converted into the coating thickness value through translation using the characteristic probe output function.



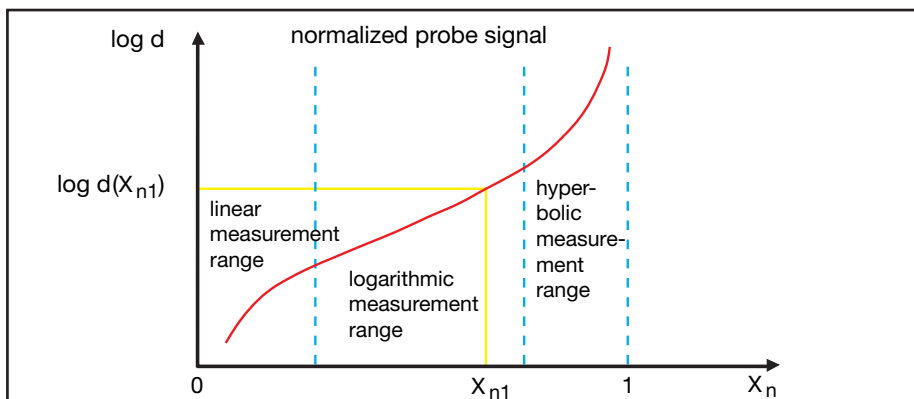
## Eddy Current Method

The energizing current produces a high frequency magnetic field (DIN EN ISO 2360) which induces eddy currents in the substrate material (or in the coating material to be measured with the modified test method). The magnitude of the induced eddy currents depends upon the distance (coating thickness) between probe and substrate. The measurement signal is then evaluated as a function of the eddy currents produced.

## Signal Processing

The electrical signal transmitted from the probe is processed by the measuring instrument and digitized. The processed signal is normalized to standardize the possible measuring range and to minimize any disturbing effects. With type E .... series smart probes this signal is then converted

through a characteristic probe output function which is stored in the memory chip of the probe connector, into a measurement value indicative of the measured coating thickness. With other (older) probes this characteristic function is stored in the measuring system.



Normalization of the probe signal is performed as follows:

$$X_n = \frac{X - X_0}{X_s - X_0}$$

The variables are:

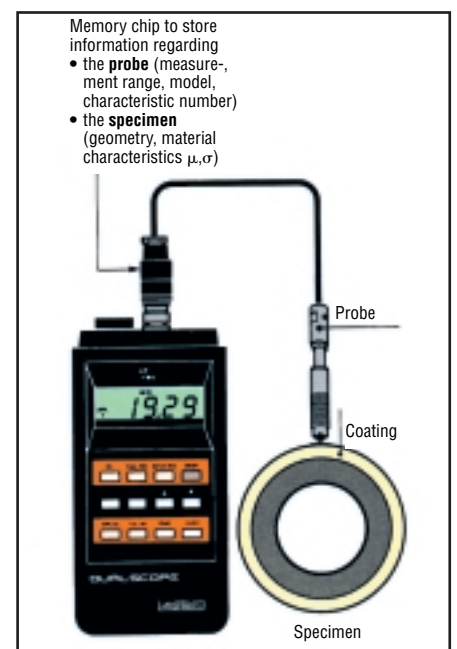
$X_0$  : probe signal from the uncoated substrate

$X_s$  : probe signal from infinitely thick coating (saturation thickness)

$X$  : probe signal from the measured coating thickness  $d$ .

The normalized signal  $X_n$  therefore is only able to assume values between 0 and 1.

$X_n$  is then converted over the characteristic probe output function into the measured coating thickness value  $d$ .



The characteristic probe output function is stored in the memory chip of the probe connector and thus the probe contains all information required for the measurement. The operator simply recalls the measurement application; the system is ready to measure immediately. Measurements performed at intermittent time intervals therefore always start with the same reference value.

## Tables for the selection of probes

The solution for many different coating thickness measurements with the magnetic, magnetic induction or eddy current method depends upon the selection of the „correct“ probe. Often the measurement accuracy and measurement precision can be optimized by using a more suitable probe.

The following tables provide an overview of all standard probes. The technical data and values shown should facilitate selection of the probe best suited for your specific application. Explanations are listed below.

## Explanation to the Technical Data

### Measurement Range

The measurement range of the probe specifies the limits of the coating thickness that can be measured.

### Measurement Accuracy

(DIN 55350 section 13, paragraph 2.1.1)

The measurement accuracy has been determined with plastic foils of specific thickness. The specified value  $u_s$  corresponds to the measured systematic deviation (bias) between the measured thickness value and true thickness value of the calibration foil.

Example: 50 - 1000  $\mu\text{m}$ :  $0,5\%$   
 $\uparrow$   
 $u_s$

This parameter is a quality indicator showing how good the measurement signal from the probe has been converted over the characteristic probe output function stored in the memory of the probe into a corresponding coating thickness value.

### Measurement Precision

(DIN 55350 section 13, paragraph 2.1.2.2)

The value shown represents the measured standard deviation, which can be obtained by replicate measurements on an appropriate plastic foil.

The measurement uncertainty of a group mean measurement is then calculated according to DIN 1319 section 3 as follows:

$$u_z = \frac{t}{\sqrt{n}} \cdot s$$

For group size  $n=10$  a student's  $t$  value of 2.5 applies.

### Comments

The most important quality attributes of a measurement method are mainly measurement accuracy, measurement precision and measurement uncertainty.

The measurement uncertainty  $u$  (DIN 55350 section 13, par 4.1) is calculated from  $u_z$  and  $u_s$  according to:

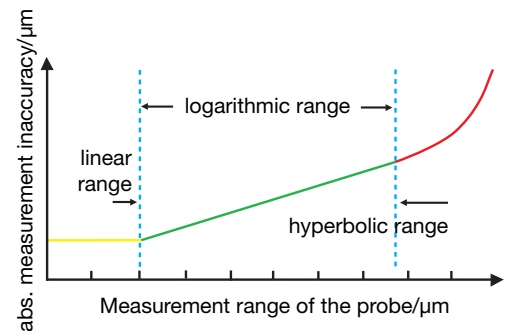
$$u = \sqrt{u_z^2 + u_s^2}$$

The measurement methods utilized here yield different values of  $u_z$  and  $u_s$  over the complete measurement range of a probe. Within the so called linear range of the probe (see graph to the right), their values are almost constant. If the same value applies for the hyperbolic as well as logarithmic range, the hyperbolic measure-

ment uncertainty is not stated.

The values of  $u_s$  and  $u_z$  are listed in the following tables as either absolute values (for example: 1  $\mu\text{m}$ ) or as relative values referring to the measurement value (for example: 0.5 %).

The values listed represent the optimum values which have been determined with FISCHER standards. In many cases marginal values may be obtained due to less than ideal surface conditions. FISCHER cannot be held accountable for marginal values obtained from rough surfaces.



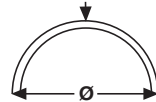
## Test Specimen Geometry

For the above mentioned measurement methods the geometry of the measurement area influences the measurement value. The following tables list two values for each geometry dependent factor (except for substrate thickness).

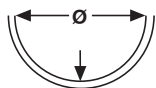
The upper value indicates the smallest diameter of the object that can be measured, for which the curvature dependent measurement bias will not exceed 10% of the true value. Calibration was performed on a flat surface of "infinite" area using the same substrate material.

The lower value indicates the limiting diameter at which if exceeded a measurement is no longer possible due to the geometry of the probe (for example: the probe tip no longer contacts the surface), or at which the measurement signal is too small due to insufficient material volume.

Measurement point



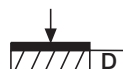
**convex curvature diameter**



**concave curvature diameter**



**diameter of the test area**



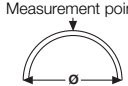
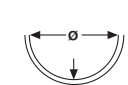






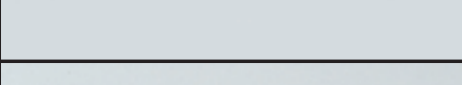

**substrate thickness D**



The limit value  $D$  indicates the substrate thickness below which the measurement value deviates more than 10% from an "infinitely" thick base metal.

The limiting values have been determined with a foil thickness, which produces a reading which is approximately in the center of the probe measuring range.

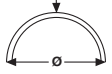
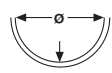








With increasing measured thickness the 10% bias error is obtained with smaller curvature diameters, and respectively smaller substrate thicknesses.



# Characteristic values and technical data of probes for the

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	Measurement point  Ø for 10% error min. Ø
	Measurement range	Measurement precision* $s$	 Ø for 10% error min. Ø
	EGA1.3 602-118	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 0.5 % 1000-1500 $\mu\text{m}$ : < 2.5 %	$\sigma$ : 14 mm (550 mils) min. $\sigma$ : 2 mm (80 mils)
	0-1500 $\mu\text{m}$ 0-60 mils	0-50 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 50-1500 $\mu\text{m}$ : 0.2 %	$\sigma$ : 36 mm (1.4") min. $\sigma$ : 10 mm (400 mils)
	EGAW1.3 602-119	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 0.5 % 1000-1500 $\mu\text{m}$ : < 2.5 %	$\sigma$ : 14 mm (550 mils) min. $\sigma$ : 1 mm (40 mils)
	0-1500 $\mu\text{m}$ 0-60 mils	0-50 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 50-1500 $\mu\text{m}$ : 0.2 %	$\sigma$ : 36 mm (1.4") min. $\sigma$ : 18 mm (700 mils)
	EGAB1.3 601-793 EGAB1.3.L 602-794 EGAB1.3.T 602-359	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-1000 $\mu\text{m}$ : 0.5 % 1000-2000 $\mu\text{m}$ : < 3 %	$\sigma$ : 18 mm (700 mils) min. $\sigma$ : 2 mm (80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-50 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 50-2000 $\mu\text{m}$ : 0.2 %	$\sigma$ : 35 mm (1.4") min. $\sigma$ : 10 mm (400 mils)
	EGABW1.3 601-964 EGABW1.3.L 602-925	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-1000 $\mu\text{m}$ : 0.5 % 1000-2000 $\mu\text{m}$ : < 3 %	$\sigma$ : 16 mm (640 mils) min. $\sigma$ : 1 mm (40 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-50 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 50-2000 $\mu\text{m}$ : 0.2 %	$\sigma$ : 35 mm (1.4") min. $\sigma$ : 18 mm (720 mils)
	EGABI1.3-150 601-932	0-50 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 1 %	$\sigma$ : 16 mm (630 mils) min. $\sigma$ : 2 mm (80 mils)
	0-1000 $\mu\text{m}$ 0-40 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 0.3 %	$\sigma$ : 35 mm (1.4") min. $\sigma$ : 9 mm (350 mils)
	EGABI1.3-260 601-961	0-50 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 1 %	$\sigma$ : 16 mm (630 mils) min. $\sigma$ : 2 mm (80 mils)
	0-1000 $\mu\text{m}$ 0-40 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 0.3 %	$\sigma$ : 35 mm (1.4") min. $\sigma$ : 9 mm (350 mils)
	EGAB1.3-SD 602-107	0-50 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 1 % 1000-2000 $\mu\text{m}$ : < 3 %	only for flat specimen
	0-2000 $\mu\text{m}$ 0-80 mils	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 0.5 %	only for flat specimen
	V1EGA1HR34 602-109 V1EGA1HR34L 602-367	0-50 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 50-1000 $\mu\text{m}$ : 1 %	$\sigma$ : 18 mm (700 mils) min. $\sigma$ : 2 mm (80 mils)
	0-1000 $\mu\text{m}$ 0-40 mils	0-100 $\mu\text{m}$ : 0.2 $\mu\text{m}$ 100-1000 $\mu\text{m}$ : 0.2 %	$\sigma$ : 35 mm (1.4") min. $\sigma$ : 7 mm (280 mils)

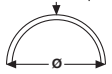
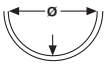





 $\varnothing$ for 10% error min. $\varnothing$	Probe tip radius	Height	Type of probe Application
	Probe tip material	Diameter/width	
 <i>D</i> for 10% error	replaceable probe tip	Length (see page 24)	
	$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	---
<i>Heat treated steel</i>		10 mm (0.4")	
<i>D</i> : 0.2 mm (8 mils)	yes	110 mm (4.3")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	23 mm (0.9")	Single tip right angle probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Especially well suited for coating thicknesses of $\leq 10 \mu\text{m}$ (0.4 mil) in pipes, bore holes, recesses, etc. The probe tip is subject to wear on hard and abrasive surfaces. The EGAWB1.3 probe should be used for coating thicknesses $> 100 \mu\text{m}$ (4 mils).
	<i>Heat treated steel</i>	14 mm (0.6")	
<i>D</i> : 0.2 mm (8 mils)	yes	72 mm (2.8")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	---	Axial single tip probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Most commonly used probe for electroplated metal and organic coatings. For the measurement of nonferrous metal coatings on steel or iron. Scatter of the measuring values on rough (for example: grit blasted) surfaces is however relatively high. Double pole probes should be used in such instances if the geometry of the parts permits the use of this type of probe.
	<i>PVD coated</i>	10 mm (0.4")	
<i>D</i> : 0.2 mm (8 mils)	yes	110 mm (4.3")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	23 mm (0.9")	Single tip right angle probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Most commonly used probe for electroplated metal and organic coatings in pipes, bore holes, recesses, etc. Scatter of the measuring values on rough (for example: grit blasted) surfaces is however relatively high. Double pole probes should be used in such instances if the geometry of the parts permits the use of this type of probe.
	<i>PVD coated</i>	14 mm (0.6")	
<i>D</i> : 0.2 mm (8 mils)	yes	72 mm (2.8")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	6.5 mm (0.26")	Single pole probe for inside measurement applications with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Suitable for measurements in bore holes, pipes or grooves. To obtain the smallest possible measurement uncertainty, externally triggered measurement acquisition should be used when measuring small inside diameters to prevent measurement errors. Smallest permissible inside diameter: 9 mm (0.36"). Maximum insertion depth: 150 mm (6").
	<i>PVD coated</i>	5.5 mm (0.22")	
<i>D</i> : 0.2 mm (8 mils)	yes	320 mm (12.6")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 2 mm (80 mils)	0.75 mm (30 mils)	6.5 mm (0.26")	Single pole probe for inside measurement applications with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Suitable for measurements in bore holes, pipes or grooves. To obtain the smallest possible measurement uncertainty, externally triggered measurement acquisition should be used when measuring small inside diameters to prevent measurement errors. Smallest permissible inside diameter: 9 mm (0.36"). Maximum insertion depth: 260 mm (10").
	<i>PVD coated</i>	5.5 mm (0.22")	
<i>D</i> : 0.2 mm (8 mils)	yes	430 mm (17")	
$\varnothing$ : 8 mm (320 mils) min. $\varnothing$ : 8 mm (320 mils)	flat: $\varnothing$ 8 mm (320 mils)	---	Axial single tip probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). The flat surface probe tip is especially suited for soft coatings (screen printing material, soft plastic material, etc.). For the measurement of nonferrous metal coatings on steel or iron. The surface to be measured has to be completely clean. Any foreign matter or dirt particles on the test surface produces measurement errors.
	<i>Polyamide</i>	18 mm (0.7")	
<i>D</i> : 0.2 mm (8 mils)	no	100 mm (4")	
$\varnothing$ : 6 mm (240 mils) min. $\varnothing$ : 2 mm (80 mils)	0.8 mm (32 mils)	4.3 mm (0.17")	Single tip probe for inside measurement applications with fixed measurement system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Suitable for measurements in bore holes, pipes or grooves. To obtain the smallest possible measurement uncertainty, externally triggered measurement acquisition should be used when measuring small inside diameters to prevent measurement errors. Smallest permissible inside diameter: 7 mm (0.28"). Maximum insertion depth: 60 mm (2.4").
	<i>Tungsten carbide</i>	4 mm (0.16")	
<i>D</i> : 0.2 mm (8 mils)	no	120 mm (4.7")	

# Characteristic values and technical data of probes for the

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	Measurement point  Ø for 10% error min. Ø
	Measurement range	Measurement precision* $s$	 Ø for 10% error min. Ø
	EGA2H 602-121 EGA2HF 602-754	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-500 $\mu\text{m}$ : 0.5 % 500-1500 $\mu\text{m}$ : < 1 %	$\varnothing$ : 25 mm (990 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-1500 $\mu\text{m}$ 0-60 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-1500 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 34 mm (1.3") min. $\varnothing$ : 22 mm (870 mils)
	EGAW2H 602-122	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-500 $\mu\text{m}$ : 0.5 % 500-1500 $\mu\text{m}$ : < 1 %	$\varnothing$ : 25 mm (990 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-1500 $\mu\text{m}$ 0-60 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-1500 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 34 mm (1.3") min. $\varnothing$ : 18 mm (700 mils)
	EGB2 602-023	0-0,2 mm : 0.002 mm 0,2-3 mm : 1 % 3-5 mm : < 5 %	$\varnothing$ : 30 mm (1.2") min. $\varnothing$ : 2 mm (80 mils)
	0-5 mm 0-200 mils	0-0,2 mm : 0.0005 mm 0,2-5 mm : 0.3 %	$\varnothing$ : 40 mm (1.6") min. $\varnothing$ : 9 mm (350 mils)
	EGBW2 602-024	0-0,2 mm : 0.002 mm 0,2-3 mm : 1 % 3-5 mm : < 5 %	$\varnothing$ : 30 mm (1.2") min. $\varnothing$ : 2 mm (80 mils)
	0-5 mm 0-200 mils	0-0,2 mm : 0.0005 mm 0,2-5 mm : 0.3 %	$\varnothing$ : 40 mm (1.6") min. $\varnothing$ : 18 mm (700 mils)
	EK4 602-123	0-100 $\mu\text{m}$ : 1 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 1 %	$\varnothing$ : 22 mm (870 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-25 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 25-2000 $\mu\text{m}$ : 0.4 %	$\varnothing$ : 38 mm (1.5") min. $\varnothing$ : 13 mm (510 mils)
	EKB4 602-108	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 0.5 %	$\varnothing$ : 20 mm (800 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-2000 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 38 mm (1.5") min. $\varnothing$ : 13 mm (510 mils)
	V1EKB4 602-126	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 0.5 %	$\varnothing$ : 20 mm (800 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-2000 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 38 mm (1.5") min. $\varnothing$ : 20 mm (800 mils)
	V7EK4 602-582 V7EK4L 602-605	0-100 $\mu\text{m}$ : 1.5 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 1.5 %	$\varnothing$ : 22 mm (870 mils) min. $\varnothing$ : 2 mm (80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-25 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 25-2000 $\mu\text{m}$ : 0.4 %	$\varnothing$ : 38 mm (1.5") min. $\varnothing$ : 20 mm (800 mils)



 <p>Ø for 10% error min. Ø</p>	Probe tip radius	Height	<p><b>Type of probe</b> <b>Application</b></p>
	<i>Probe tip material</i>	<i>Diameter/width</i>	
 <p>D for 10% error</p>	replaceable probe tip	Length (see page 24)	
<p>Ø : 15 mm (590 mils) min. Ø : 2 mm (80 mils)</p>	2.25 mm (88 mils)	---	<p>Axial single tip probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Due to the larger probe tip diameter better suited for rough surfaces than the EGAB1.3 probe.</p>
	<i>Tungsten carbide</i>	13 mm (0.5")	
	yes	80 mm (3.2")	
<p>Ø : 15 mm (590 mils) min. Ø : 2 mm (80 mils)</p>	2.25 mm (88 mils)	23 mm (0.9")	<p>Axial single tip probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Has the largest measurement range of all single tip probes. Due to unshielded magnetic field larger geometric influence, however smaller tilting effect.</p>
	<i>Tungsten carbide</i>	14 mm (0.6")	
	yes	72 mm (2.8")	
<p>D : 0.4 mm (16 mils)</p>			
<p>Ø : 12 mm (470 mils) min. Ø : 2 mm (80 mils)</p>	1.0 mm (40 mils)	---	<p>Axial single tip probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Due to the larger probe tip diameter better suited for rough surfaces than the EGAB1.3 probe.</p>
	<i>PVD coated</i>	10 mm (0.4")	
	yes	110 mm (4.3")	
<p>D : 0.25 mm (10 mils)</p>			
<p>Ø : 12 mm (470 mils) min. Ø : 2 mm (80 mils)</p>	1.0 mm (40 mils)	23 mm (0.9")	<p>Single tip angle probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Same as EGB2 probe, however preferably used for measurements in pipes, bore holes or recesses.</p>
	<i>PVD coated</i>	14 mm (0.6")	
	yes	72 mm (2.8")	
<p>D : 0.25 mm (10 mils)</p>			
<p>Ø : 30 mm (1.2") min. Ø : 15 mm (590 mils)</p>	1.25 mm (49 mils)	21 mm (0.8")	<p>Double pole probe for angular measurements with fixed measurement system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Double pole probe producing the lowest possible measurement uncertainty. The uncoated probe tips make this probe especially suited for thin coatings (for example: lubricant and phosphate coatings). Greater measuring precision on rough surfaces than single tip probes, however faster probe tip wear than with EKB4 probe.</p>
	<i>Heat treated steel</i>	12 mm (0.5")	
	yes	18 mm (0.7")	
<p>D : 0.4 mm (16 mils)</p>			
<p>Ø : 30 mm (1.2") min. Ø : 15 mm (590 mils)</p>	1.25 mm (49 mils)	21 mm (0.8")	<p>Double pole probe for angular measurements with fixed measurement system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Well suited for thin coatings. Higher measurement precision on rough surfaces than single pole probes.</p>
	<i>PVD coated</i>	12 mm (0.5")	
	yes	18 mm (0.7")	
<p>D : 0.4 mm (16 mils)</p>			
<p>Ø : 30 mm (1.2") min. Ø : 15 mm (590 mils)</p>	1.25 mm (49 mils)	---	<p>Double pole probe for inside measurements with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Suitable for measurement in bore holes, pipes or grooves. Greater measuring precision on rough surfaces than with EGAB1.3-150 (260) probe. Smallest permissible inside diameter: 8.5 mm (0.34") Maximum insertion depth: 185 mm (7.4")</p>
	<i>PVD coated</i>	8.5 mm (0.3")	
	yes	300 mm (11.8")	
<p>D : 0.4 mm (16 mils)</p>			
<p>Ø : 30 mm (1.2") min. Ø : 15 mm (590 mils)</p>	1.25 mm (49 mils)	---	<p>Axial double-tip measurement probe with spring-loaded measuring element. Measures nonferrous and nonmetal coatings on steel or iron (NE, Iso/Fe). Especially well suited for thin layers (phosphorous coatings) because of uncoated probe tips. Higher repeatability than single tip probes when measuring rough surfaces. Spring loaded measuring system allows exact positioning and constant pressure force, which is advantageous for measuring weak coatings.</p>
	<i>Heat treated steel</i>	20 mm (0.8")	
	yes	70 mm (2.8")	
<p>D : 0.4 mm (16 mils)</p>			

# Characteristic values and technical data of probes for the

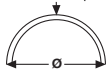
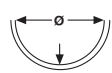




<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	 Measurement point Ø for 10% error min. Ø
	Measurement range	Measurement precision* $s$	 Ø for 10% error min. Ø
	V7EKB4 602-583 V7EKB4L 602-606	0-100 $\mu\text{m}$ : 1 $\mu\text{m}$ 100-2000 $\mu\text{m}$ : 1 %	$\varnothing$ : 20 mm (800 mils) min. $\varnothing$ : 2 mm ( 80 mils)
	0-2000 $\mu\text{m}$ 0-80 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-2000 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 38 mm (1.5") min. $\varnothing$ : 20 mm ( 800 mils)
	EKB10 602-225	0-0.5 mm : 0.005 mm 0.5-8 mm : 1 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-8 mm 0-320 mils	0-0.5 mm : 0.0025 mm 0.5-8 mm : 0.5 %	$\varnothing$ : 75 mm (3") min. $\varnothing$ : 24 mm (950 mils)
	EKB10-OD 602-165 EKB10L-OD 602-760	0-0.5 mm : 0.005 mm 0.5-8 mm : 1 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-8 mm 0-320 mils	0-0.5 mm : 0.0015 mm 0.5-8 mm : 0.3 %	$\infty$ $\infty$
	V1EKB10 602-676	0-0.5 mm : 0.01 mm 0.5-8 mm : 2 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-8 mm 0-320 mils	0-0.5 mm : 0.0025 mm 0.5-8 mm : 0.5 %	$\varnothing$ : 75 mm (3") min. $\varnothing$ : 24 mm (950 mils)
	EKB25 601-952 EKB25L 602-913	0-1 mm : 0.02 mm 1-7 mm : 2 % 7-15 mm : < 5 %	$\varnothing$ : 60 mm (2.4") min. $\varnothing$ : 10 mm (400 mils)
	0-15 mm 0-590 mils	0-0.5 mm : 0.01 mm 0.5-15 mm : 2 %	$\varnothing$ : 85 mm (3.3") min. $\varnothing$ : 20 mm (800 mils)



Note concerning the application of probes using the magnetic induction measurement method:  
 Please consult with the manufacturer before measuring electrically conducting coatings with thicknesses > 500  $\mu\text{m}$  (20 mils).



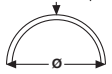
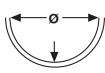








 <p><math>\varnothing</math> for 10% error min. <math>\varnothing</math></p>	Probe tip radius	Height	Type of probe Application
 <p><math>D</math> for 10% error</p>	Probe tip material	<i>Diameter/width</i>	
	replaceable probe tip	Length (see page 24)	
<p><math>\varnothing</math> : 30 mm (1.2") min. <math>\varnothing</math> : 15 mm (590 mils)</p>	1.25 mm (49 mils)	---	Axial double tip measurement probe with spring-loaded measuring system. Measurement of nonferrous- and nonmetal coatings on steel or iron substrate (NF, Iso/Fe). Higher measurement precision on rough surfaces than single tip probes. Spring-loaded measuring system provides better positioning and constant pressure force (advantageous for measuring soft coatings).
<p><math>D</math> : 0.4 mm (16 mils)</p>	<i>PVD coated</i>	20 mm (0.8")	
	yes	70 mm (2.8")	
<p><math>\varnothing</math> : 30 mm (1.2") min. <math>\varnothing</math> : 20 mm (800 mils)</p>	1.5 mm (60 mils)	27 mm (1.1")	Double pole probe for angular measurements with fixed measurement system. Especially well suited for thick coatings. Greater measuring precision on rough surfaces than single pole probes.
<p><math>D</math> : 0.5 mm (20 mils)</p>	<i>PVD coated</i>	14 mm (0.5")	
	yes	50 mm (2")	
<p><math>\varnothing</math> : 30 mm (1.2") min. <math>\varnothing</math> : 38 mm (1.5")</p>	flat: 34 x 24 mm (1300 x 950 mils)	26 mm (1.0")	Double pole probe for angular measurements with fixed measurement system. The large flat contact surface is especially well suited for thick and compressible soft coatings (for example rubber sheeting for offset printing).
<p><math>D</math> : 0.5 mm (20 mils)</p>	<i>Polyamide</i>	24 mm (1.0")	
	no	53 mm (2.1")	
<p><math>\varnothing</math> : 30 mm (1.2") min. <math>\varnothing</math> : 20 mm (800 mils)</p>	1.5 mm (60 mils)	---	Double pole probe for angular measurements with spring-loaded measuring system. Suitable for thick coatings in bore holes, pipes, or recesses. Greater measuring precision on rough surfaces than with single pole probes. Externally triggered measurement acquisition should be used with small inside diameters to prevent measurement errors. Smallest permissible inside diameter: 13 mm (0.5") Maximum insertion depth : 260 mm (10")
<p><math>D</math> : 0.5 mm (20 mils)</p>	<i>PVD coated</i>	13 mm (0.5")	
	yes	380 mm (15")	
<p><math>\varnothing</math> : 50 mm (2") min. <math>\varnothing</math> : 40 mm (1.6")</p>	1.5 mm (60 mils)	33 mm (1.3")	Double pole probe for angular measurements with fixed measurement system. Especially suited for thick, nonmetallic coatings.
<p><math>D</math> : 0.7 mm (28 mils)</p>	<i>PVD coated</i>	20 mm (0.8")	
	yes	65 mm (2.6")	



# Characteristic values and technical data of probes for the

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	<p><b>Description</b>  <b>Order Number</b></p>	<p><b>Measurement accuracy*</b>  <math>u_s</math></p>	<p>Measurement point   <b>Ø for 10% error</b>                      min. Ø</p>
	<p><b>Measurement range</b></p>	<p><b>Measurement precision*</b>  <math>s</math></p>	<p> <b>Ø for 10% error</b>                      min. Ø</p>
	<p>EK50 602-127                      EK50L 602-923</p>	<p>0-1 mm : 0.05 mm                      1-10 mm : 5 %                      10-30 mm : &lt; 7 %</p>	<p>Ø : 100 mm (4")                      min. Ø : 10 mm (400 mils)</p>
	<p>0-30 mm                      0-1200 mils</p>	<p>0-1 mm : 0.02 mm                      1-30 mm : 2%</p>	<p>Ø : 140 mm (5.5")                      min. Ø : 14 mm (550 mils)</p>
	<p>EGA06H 602-936                      EGA06H-L 602-626</p>	<p>0-50 µm : 0.3 µm                      50-700 µm : &lt; 2 %</p>	<p>Ø : 18 mm (720 mils)                      min. Ø : 1 mm ( 40 mils)</p>
	<p>0-700 µm                      0-28 mils</p>	<p>0-50 µm : 0.1 µm                      50-700 µm : &lt; 0.3 %</p>	<p>Ø : 30 mm (1.2")                      min. Ø : 20 mm (800 mils)</p>
	<p>EGA06H-MC                      603-092</p>	<p>0-70 µm : 0.3 µm                      70-700 µm : &lt; 2 %</p>	<p>Ø : 18 mm (720 mils)                      min. Ø : 1 mm ( 40 mils)</p>
	<p>0-700 µm                      0-28 mils</p>	<p>0-70 µm : 0.08 µm                      70-700 µm : &lt; 0.08 %</p>	<p>Ø : 30 mm (1.2")                      min. Ø : 20 mm (800 mils)</p>
	<p>V2EGA06H                      603-112</p>	<p>0-50 µm : 0.3 µm                      50-700 µm : &lt; 2 %</p>	<p>Ø : 18 mm (720 mils)                      min. Ø : 1 mm ( 40 mils)</p>
	<p>0-700 µm                      0-28 mils</p>	<p>0-50 µm : 0.1 µm                      50-700 µm : &lt; 0.3 %</p>	<p>---</p>

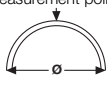
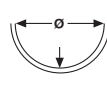








 <p>Ø for 10% error min. Ø</p>	Probe tip radius	Height	Type of probe Application
	Probe tip material	Diameter/width	
 <p>D for 10% error</p>	replaceable probe tip	Length (see page 24)	
<p>Ø : 84 mm (3.3") min. Ø : 70 mm (2.8")</p> <p>D : 1.2 mm (47 mils)</p>	2.5 mm (98 mils)	33 mm (1.3")	<p>Double pole probe for angular measurements with fixed measurement system. Especially suited for very thick, nonmetallic coatings. For austenitic stainless steel coatings smaller measurement errors due to ferromagnetic delta ferrite content than with all other types of probes.</p>
	<i>Heat treated steel</i>	20 mm (0.8")	
	yes	95 mm (3.7")	
<p>Ø : 5 mm (200 mils) min. Ø : 2 mm (80 mils)</p> <p>D : 0.25 mm (10 mils)</p>	0.3 mm (12 mils)	110 mm (4.4")	<p>Axial single tip measurement probe with spring-loaded measuring system. Measures electrically nonconducting or nonferrous coatings on steel or iron (NF/Fe). Mechanical design especially suited for installation in customer-specific probe fixtures or guide devices for precise probe positioning.</p>
	<i>Tungsten carbide</i>	13 mm (0.52")	
	no	---	
<p>Ø : 5 mm (200 mils) min. Ø : 2 mm (80 mils)</p> <p>D : 0.25 mm (10 mils)</p>	0.3 mm (12 mils)	110 mm (4.4")	<p>Axial single tip measurement probe with spring-loaded measuring system. Measures electrically nonconducting or nonferrous coatings on steel or iron (NF/Fe). Mechanical design especially suited for installation in customer-specific probe fixtures or guide devices for precise probe positioning.</p>
	<i>Tungsten carbide</i>	13 mm (0.52")	
	no	---	
<p>Ø : 5 mm (200 mils) min. Ø : 2 mm (80 mils)</p> <p>D : 0.25 mm (10 mils)</p>	0.3 mm (12 mils)	---	<p>Measures electrically nonconducting or nonferrous metal coatings on steel or iron (NF/Fe). Measuring element same as with EGA06H probe. Especially well suited for the integration in automated measurement systems. No measurement tip wear even after several million measurement cycles when used properly. Suited for cylindrical specimen with diameter range 8 to 25 mm. (0.32" to 1"). Other diameters on request.</p>
	<i>Tungsten carbide</i>	10 mm (0.4")	
	no	110 mm (4.4")	

# Characteristic values and technical data of probes for the



<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	Measurement point  Ø for 10% error min. Ø
	Measurement range	Measurement precision* $s$	 Ø for 10% error min. Ø
	ETA3.3H 602-128 ETA3.3HL 602-799	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-800 $\mu\text{m}$ : 0.5 % 800-1200 $\mu\text{m}$ : < 2 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-1200 $\mu\text{m}$ 0-45 mils	0-50 $\mu\text{m}$ : 0.15 $\mu\text{m}$ 50-1200 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 30 mm (1.2")
	ETA3.3 601-797	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-800 $\mu\text{m}$ : 0.5 % 800-1200 $\mu\text{m}$ : < 3 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-1200 $\mu\text{m}$ 0-45 mils	0-100 $\mu\text{m}$ : 0.2 $\mu\text{m}$ 100-1200 $\mu\text{m}$ : 0.2 %	$\varnothing$ : 55 mm (2.2") min. $\varnothing$ : 30 mm (1.2")
	ETA3.3FG 602-623	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-1200 $\mu\text{m}$ : 0.5 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-1200 $\mu\text{m}$ 0-45 mils	0-50 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 50-1200 $\mu\text{m}$ : 0.2 %	$\infty$ $\infty$
	ETA3.3-5.6 602-645	0-100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100-800 $\mu\text{m}$ : 0.5 % 800-1200 $\mu\text{m}$ : < 3 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-1200 $\mu\text{m}$ 0-45 mils	0-100 $\mu\text{m}$ : 0.2 $\mu\text{m}$ 100-1200 $\mu\text{m}$ : 0.2 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 30 mm (1.2")
	EAW3.3 602-025 EAW3.3L 602-922	0-50 $\mu\text{m}$ : 0.75 $\mu\text{m}$ 50-1200 $\mu\text{m}$ : 1.5 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 2 mm (80 mils)
	0-1200 $\mu\text{m}$ 0-45 mils	0-50 $\mu\text{m}$ : 0.25 $\mu\text{m}$ 50-1200 $\mu\text{m}$ : 0.5 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 34 mm (1.6")
	EAI3.3-150 602-026	0-200 $\mu\text{m}$ : 1 $\mu\text{m}$ 200-800 $\mu\text{m}$ : 0.5 %	$\varnothing$ : 60 mm (2.4") min. $\varnothing$ : 2 mm (80 mils)
	0-800 $\mu\text{m}$ 0-32 mils	0-100 $\mu\text{m}$ : 0.3 $\mu\text{m}$ 100-800 $\mu\text{m}$ : 0.3 %	$\varnothing$ : 55 mm (2.2") min. $\varnothing$ : 9 mm (350 mils)
	EA9 601-965	0-0.25 mm : 0.005 mm 0.25-2.5 mm : 2 % 2.5-3.5 mm : < 3.5 %	$\varnothing$ : 160 mm (6.3") min. $\varnothing$ : 2 mm (80 mils)
	0-3.5 mm 0-140 mils	0-1 mm : 0.002 mm 1-3.5 mm : 0.2 %	$\varnothing$ : 160 mm (6.3") min. $\varnothing$ : 40 mm (1.6")
	EA30 602-027 EA30L 602-633	0-2 mm : 0.05 mm 2-20 mm : 2.5 %	$\varnothing$ : 1200 mm (47") min. $\varnothing$ : 200 mm (7.9")
	0-20 mm 0-800 mils	0-1 mm : 0.002 mm 1-20 mm : 0.2 %	$\infty$ $\infty$

 Ø for 10% error min. Ø	Probe tip radius	Height	Type of probe Application
	Probe tip material	Diameter/width	
 D for 10% error	replaceable probe tip	Length (see page 24)	
	ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	1.2 mm (47 mils)	---
<i>Tungsten carbide</i>		18 mm (0.7")	
yes		70 mm (2.8")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	1.2 mm (47 mils)	---	Axial single tip probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Standard probe for paint and plastic coatings, as well as for anodized coatings. Can possibly also be used when surfaces exhibit a damp condition (acidic contamination of test surface). Smaller tilting effect than with ETA3.3F probe.
	<i>Jewel tip</i>	18 mm (0.7")	
	yes	70 mm (2.8")	
ø : 15 mm (590 mils) min. ø : 7 mm (280 mils)  D : 0.09 mm (3.5 mils)	2.5 mm (98 mils)	---	Axial single tip probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Especially suited for anodized coatings when surfaces exhibit a wet (acidic) contamination of the test surface. Larger tilting effect than with ETA3.3 probe.
	<i>Polyamide</i>	18 mm (0.7")	
	yes	70 mm (2.8")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	2.8 mm (110 mils)	---	Axial single tip probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Due to the larger radius of the probe tip lower measurement scatter on rough surfaces than with ETA3.3 probe.
	<i>Jewel tip</i>	18 mm (0.7")	
	yes	70 mm (2.8")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	1.2 mm (47 mils)	23 mm (0.9")	Single tip angle probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Suitable for measurements on flat objects or in pipes, bore holes and recesses. Can also be used when surfaces exhibit a damp condition (acidic contamination of test surface).
	<i>Jewel tip</i>	14 mm (0.6")	
	yes	72 mm (2.8")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	1.2 mm (47 mils)	6.5 mm (0.26")	Single tip angle probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Suitable for measurements in pipes, bore holes and recesses, etc. Can possibly also be used when surfaces exhibit a wet condition (acidic contamination of test surface). To avoid positioning errors externally triggered measurement acquisition should be used.
	<i>Jewel tip</i>	5.5 mm (0.22")	
	yes	320 mm (12.6")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.09 mm (3.5 mils)	8 mm (320 mils)	23 mm (0.9")	Single tip angle probe with spring-loaded measuring system. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Suitable for measurement of thicker plastic- or rubber coatings.
	<i>Heat treated steel</i>	14 mm (0.6")	
	no	72 mm (2.8")	
ø : 42 mm (1.6") min. ø : 34 mm (1.3")  D : 0.09 mm (3.5 mils)	flat: ø 34 mm (1.3")	43 mm (1.7")	Single tip angle probe with fixed measurement systems. Measurement of nonconductive coatings on nonferromagnetic substrate (Iso/NF). Suitable for measurement of thicker plastic- or rubber coatings. Also to measure wall thickness of, for example, plastic tanks with an aluminum backing foil. For surfaces with larger curvature a V-groove adapter shoe has to be used.
	<i>Polyamide</i>	34 mm (1.3")	
	no	60 mm (2.4")	

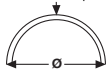
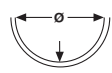


# Characteristic values and technical data of probes for the

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	 Measurement point $\varnothing$ for 10% error min. $\varnothing$
	Measurement range	Measurement precision* $s$	 $\varnothing$ für 10%-Fehler min. $\varnothing$
	EA70 602-028	0 - 5 mm : 0.05 mm 5 - 50 mm : 1 %	$\varnothing$ : 2500 mm (98") min. $\varnothing$ : 300 mm (11.9")
	0 - 50 mm 0 - 2"	0 - 50 mm : 0.3 %	$\infty$ $\infty$
	ETA3.3-Cu** 602-550 ETA3.3F-Cu** 603-015	0 - 10 $\mu\text{m}$ : 0.3 $\mu\text{m}$ 10 - 130 $\mu\text{m}$ : 3 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 1 mm (40 mils)
	0 - 150 $\mu\text{m}$ 0 - 6 mils Cu/Iso	0 - 20 $\mu\text{m}$ : 0.2 $\mu\text{m}$ 20 - 130 $\mu\text{m}$ : 1 %	$\varnothing$ : 55 mm (2.2") min. $\varnothing$ : 10 mm (400 mils)
	ETA3.3-CuMR1** 603-161	0.5 - 15 $\mu\text{m}$ : 0.3 $\mu\text{m}$	---
	0.5 - 15 $\mu\text{m}$ 0.02 - 0.6 mil	0.5 - 8 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 8 - 15 $\mu\text{m}$ : 1.2 %	---
	ETA3.3-CuMR2** 603-164	2 - 10 $\mu\text{m}$ : 0.1 $\mu\text{m}$ 10 - 50 $\mu\text{m}$ : 1 %	---
	2 - 50 $\mu\text{m}$ 0.08 - 2 mils	2 - 10 $\mu\text{m}$ : 0.05 $\mu\text{m}$ 10 - 50 $\mu\text{m}$ : 0.5 %	---
	ETA3.3-CuMR3** 603-167	10 - 100 $\mu\text{m}$ : 1.5 $\mu\text{m}$ 100 - 250 $\mu\text{m}$ : 1.5 %	---
	10 - 250 $\mu\text{m}$ 0.4 - 10 mils	10 - 100 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 100 - 250 $\mu\text{m}$ : 0.5 %	---
	ETA3.3-Cr** 602-607	0 - 50 $\mu\text{m}$ : 1 $\mu\text{m}$ 50 - 500 $\mu\text{m}$ : 2 %	$\varnothing$ : 50 mm (2") min. $\varnothing$ : 1 mm (40 mils)
	0 - 500 $\mu\text{m}$ 0 - 20 mils Cr/NF	0 - 50 $\mu\text{m}$ : 0.5 $\mu\text{m}$ 50 - 500 $\mu\text{m}$ : 1 %	$\varnothing$ : 55 mm (2.2") min. $\varnothing$ : 10 mm (400 mils)
	ETD3.3 602-607	0 - 100 $\mu\text{m}$ : 1 $\mu\text{m}$ 100 - 800 $\mu\text{m}$ : 1 %	$\varnothing$ : 4 mm (160 mils) min. $\varnothing$ : 2 mm (80 mils)
	0 - 800 $\mu\text{m}$ 0 - 32 mils	0 - 100 $\mu\text{m}$ : 0.2 $\mu\text{m}$ 100 - 800 $\mu\text{m}$ : 0.2 %	$\varnothing$ : < 40 mm (1.6") min. $\varnothing$ : 40 mm (1.6")
	ET280** 602-302	0 - 10 cm : 0.05 cm 10 - 30 cm : 0.5 %	---
	1 - 30 cm 0.4 - 12"	0 - 10 cm : 0.01 cm 10 - 30 cm : 0.1 %	---

\*\* Probe can not be connected to FISCHERSCOPE® MMS®



 Ø for 10% error min. Ø	Probe tip radius	Height	Type of probe Application
	Probe tip material	Diameter/width	
 D for 10% error	replaceable probe tip	Length (see page 24)	
	ø : 82 mm (3.2") min. ø : 74 mm (2.9")  D : 0.09 mm (3.5 mils)	flat: ø 75 mm (3")	43 mm (1.9")
Polyamide		75 mm (3")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  no substrate influence	1.2 mm (48 mils)	---	Axial single tip measurement probe with spring-loaded measuring system. Measures nonferrous- and nonmetal coatings on electrically nonconducting substrate (NF/Iso). Preferred application is copper thickness measurement on pc-board surfaces. The copper may not be lacquered.
	Jewel tip	10 mm (0.4")	
ø : 2 mm (80 mils)  board thickness (Epoxy) 0.4 mm (16 mils)	1.2 mm (48 mils)	70 mm (2.8")	Axial single tip measurement probe with spring-loaded measuring system. Measures nonferrous metal coatings on nonferromagnetic substrate (ISO/NE). Especially well suited for measuring Cu coating thickness on pc-boards. The copper may not be lacquered.
	Jewel tip	18 mm (0.7")	
ø : 2 mm (80 mils)  board thickness (Epoxy) 0.8 mm (32 mils)	1.2 mm (48 mils)	70 mm (2.8")	Axial single tip measurement probe with spring-loaded measuring system. Same applications as ETA3.3-CuMR1 probe, however suitable for thicker coatings.
	Jewel tip	18 mm (0.7")	
ø : 2 mm (80 mils)  board thickness (Epoxy) 1 mm (40 mils)	1.2 mm (48 mils)	110 mm (4.4")	Axial single tip measurement probe with spring-loaded measuring system. Same applications as ETA3.3-CuMR1 and -MR2 probes, however suitable for thicker coatings.
	Jewel tip	10 mm (0.4")	
ø : 4 mm (160 mils) min. ø : 2 mm (80 mils)  D : 0.7 mm (28 mils) (Al)	1.2 mm (48 mils)	---	Axial single tip measurement probe with spring-loaded measuring system. Measures chrome coatings on nonferrous substrate like steel, aluminum or copper. Measuring of chrome coatings on stainless steel or titanium or other substrates with very low electrical conductivity is not possible.
	Jewel tip	10 mm (0.4")	
ø : 6 mm (240 mils) min. ø : 3 mm (120 mils)  D : 0.09 mm (3.6 mils)	1.2 mm (48 mils)	---	Patented axial single tip measurement probe with spring-loaded measuring system. Unique curvature compensation for measuring paint-, laquer-, plastic and anodized coatings on nonferrous metals. Especially well suited for curved surfaces like motorcar body sheet, blinds etc. Probe can be operated with Fischer instrument types DUALSCOPE® MP20 or MP40.
	Jewel tip	16 mm (0.6")	
---	---	205 mm (8.2")	Axial measurement probe with fixed measurement system. Measures nonmetal coatings on nonferromagnetic substrate materials (Iso/NF) or on steel and iron (Iso/Fe). Suited for measurements of the pavement thickness in road construction, thick synthetic or rubber coatings or for measuring the thickness of walls of, e.g., large-volume synthetic tanks by placing an aluminum foil on the other side.
	---	300 mm (12")	
---	no	---	

# Characteristic values and technical data of probes for the modified

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$	Measurement point  Ø for 10% error min. Ø
	Measurement range	Measurement precision* s	 Ø for 10% error min. Ø
	EDX10 603-084	NF/Fe Zn 15-30 µm (0.6-1.2 mils): 15 % Zn ≥ 30 µm (1.2 mils): 5 % Iso/NF Paint 0-50 µm (2 mils): 5 % Paint ≥ 50 µm (2 mils): 1 %	ø : 13 mm (520 mils) (NF/Fe) min. ø : 1 mm (40 mils) (NF/Fe)  ø : 45 mm (1.8") (Iso/NF) min. ø : 1 mm (40 mils) (Iso/NF)
	0 - 800 µm (32 mils)  Total paint + Zn (NF/Fe) or only paint (paint/Fe)	NF/Fe Zn 15-30 µm (0.6-1.2 mils): 0.6 µm Zn ≥ 30 µm (1.2 mils): 2 % Iso/Fe Paint ≤ 1.5 µm (0.06 mil)	ø : 30 mm (1.2") (NF/Fe) min. ø : 15 mm (600 mils) (NF/Fe)  ø : 45 mm (1.8") (Iso/Fe) min. ø : 15 mm (600 mils) (Iso/Fe)
	ED10 602-796  ED10L 602-093	NF/Fe 0-50 µm : 0.2 µm (0.008 mil) 50-1500 µm (0-60 mils) : 1 % Iso/NF 0-100 µm : 0.5 µm (0.02 mil) 100-1200 µm (4-48 mils) : 0.5 %	ø : 15 mm (600 mils) (NF/Fe) min. ø : 1 mm (40 mils) (NF/Fe)  ø : 75 mm (3") (Iso/NF) min. ø : 1 mm (40 mils) (Iso/NF)
	Dual Mode 0-800 µm (0-32 mils) (NE/Fe) 0-800 µm (0-32 mils) (Iso/NE) Single Mode 0-1500 µm (0-60 mils) (NE/Fe) 0-1200 µm (0-48 mils) (Iso/Fe)	NF/Fe 0-50 µm : 0.1 µm (0.004 mil) 50-1500 µm (2-60 mils) : 0.5 % Iso/NF 0-100 µm : 0.2 µm (0.008 mil) 100-1200 µm : 0.5 %	ø : 30 mm (1.2") (NF/Fe) min. ø : 15 mm (600 mils) (NF/Fe)  ø : 75 mm (3") (Iso/NF) min. ø : 15 mm (600 mils) (Iso/NF)

Note: Electrical conductivity changes of the base material in the range between 17 MS/m and 58 MS/m (30-100% IACS) cause



# Characteristic values and technical data of probes for the

	Description/No.	$u_s^*$	Lift-off h
		$s^*$	Convex curvature
	ESD1 <sup>(1)</sup> 602-307	0-500 µm (0-20 mils) (Zn/Fe) 0-180 µm (0-7.2 mils) (Cu/Fe) 0-100 µm (0-4 mils) (Ni/Fe)	h : 0-700 µm (0-28 mils) (NF/Fe)  h : 0-200 µm (0-8 mils) (Ni/Fe)
	ESD1L <sup>(1)</sup> 602-898	0.04 µm (0.0016 mils) or 1 % (Zn/Fe) 0.1 µm (0.004 mils) or 2 % (Ni/Fe)	ø 10%: 4 mm/2 mm (160/80 mils) at 25 µm (1 mil) Zn/Fe min ø: 4 mm/2 mm (160 mils/80 mils) at 25 µm (1 mil) Ni/Fe
	ESD2 602-308	0-200 µm (0-8 mils) (Zn/Fe) 0-80 µm 80-3.2 mils) (Cu/Fe) 0-50 µm (0-2 mils) (Ni/Fe)	h : 0-700 µm (0-28 mils) (NF/Fe)  h : 0-200 µm (0-8 mils) (Ni/Fe)
		0.02 µm (0.008 mils) or 0.5 % (Zn/Fe) 0.05 µm (0.002 mils) or 1 % (Ni/Fe)	ø 10%: 4 mm/2 mm (160/80 mils) at 25 µm (1 mil) Zn/Fe min ø: 4 mm/2 mm (160 mils/80 mils) at 25 µm (1 mil) Ni/Fe

Index description see page 22.



# eddy current measuring method

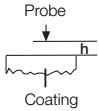
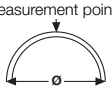







 <b>Ø for 10% error</b> min. Ø	Probe tip radius <hr/> Probe tip material <hr/> replaceable probe tip	Height <hr/> Diameter/width <hr/> Length (see page 24)	Type of probe Application
 <b>D for 10% error</b>			
NF/Fe Edge effect: 0.5 mm (20 mils) Min. Ø : 2 mm (28 mils)	0.75 mm (30 mils)	---	Axial measurement probe for simultaneous measurement of individual coating thicknesses of duplex coatings (paint/zinc) on steel sheets (e.g., in household appliance manufacturing) or on steel constructions in structural metal engineering. Both electro-galvanized and hot galvanized coatings can be measured. Probe can be connected to measuring instrument models DUALSCOPE® MP20 and MP40.
Iso/Fe Edge effect: 0.7 mm Min. Ø : 2 mm (28 mils)	<i>Tungsten carbide</i>	13 mm (0.5")	
NF/Fe Ø : 0.4 mm (16 mils) Iso/Fe depending on the normalization layer	no	100 mm (4")	
Ø : 12 mm (480 mils) (NF/Fe) min. Ø : 2 mm (80 mils) (NF/Fe)	0.75 mm (30 mils)	---	Axial measurement probe for simultaneous measurement of individual coating thicknesses according to the magnetic induction method and eddy current method. Especially well suited for measuring paint- and laquer thicknesses on steel or iron or aluminum or copper etc. Because of small probe tip not suited for measuring on rough e.g. shot-blasted surfaces. Both electro-galvanized and hot galvanized coatings can be measured. Probe can be connected to instrument models DUALSCOPE® MP10/20/30/40 (depending on the measuring method) and FISCHERSCOPE® MMS® module PERMASCOPE®.
Ø : 4 mm (160 mils) (Iso/NF) min. Ø : 2 mm (80 mils) (Iso/NF)	<i>Tungsten carbide</i>	13 mm (0.5")	
D : 0.2 mm (8 mils) (NF/Fe)  D : 0.09 mm (4 mils) (Iso/NF)	no	100 mm (4")	

a measurement error of < 2% with all eddy current probes listed in the tables.



# phase-sensitive eddy current measurement method

<b>Ø for 10% error</b> <b>D for 10% error</b>	Probe tip radius Probe tip material replaceable probe tip	Height Diameter/width Length (see page 24)	Type of probe Application
6 mm/4 mm (240/160 mils) at 25 µm (1 mil) Zn/Fe  6 mm/4 mm (240/160 mils) at 25 µm (1 mil) Ni/Fe	flat: Ø 5.5 mm (220 mils)	---	
0.1 mm (4 mils)	<i>Polyamide</i>	16 mm (0.6")	
0.1 mm (4 mils)	no	110 mm (4.3")	
6 mm/2 mm (240/80 mils) at 25 µm (1 mil) Zn/Fe  6 mm/2 mm (240/80 mils) at 25 µm (1 mil) Ni/Fe	flat: Ø 5.5 mm (220 mils)	---	Axial single tip measurement probe with spring-loaded measuring element. Measures nonferrous metal coatings on steel or iron (NF/Fe) or on nonferrous metal coatings (NF/NF) and galvanized nickel coatings on steel or iron (Ni/Fe). Same applications and characteristics as ESD1 probe, however suitable for thinner coatings. As with probes ESD1 and ESD3 very little influence from test area geometry.
0.1 mm (4 mils)	<i>Polyamide</i>	16 mm (0.6")	
0.1 mm (4 mils)	no	110 mm (4.3")	

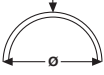
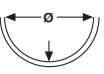


# Characteristic values and technical data of probes for the phase-

<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	<p>Description                      Order Number</p>	<p>Measurement                      range</p>	 <p>Lift-off h</p>
		<p>Measurement                      precision*                      S                      (the greater value applies)</p>	 <p>Measurement point                      Ø for                      10% error/min. Ø</p>
	ESD3 <sup>(1)</sup> 602-309	0 - 2000 µm (Zn/Fe) 0 - 1000 µm (Cu/Fe)	0 - 700 µm (28 mils)
		0.2 µm or 0.5 % (Cu/Fe)	22 mm/6 mm (870/240 mils) at 200 µm (8 mils) Cu/Fe
	ESL08A <sup>(1)</sup> 602-224	5 - 80 µm (Cu/Iso)	Lift-off compensation for bore diameters of 0.8 - 1.8 mm (32 to 70 mils)
		0.3 µm or 1 %	only for measurements in boreholes with 0.8 to 2.0 mm (32 to 80 mils) diameter
	SL08A <sup>(6)</sup> 602-385	5 - 80 µm (Cu/Iso)	Lift-off compensation for bore diameters of 0.8 - 1.8 mm (32 to 70 mils)
		0.3 µm or 1 %	only for measurements in boreholes with 0.8 to 2.0 mm (32 to 80 mils) diameter
	ESG2 <sup>(7)</sup> 602-311 ESG2L <sup>(7)</sup> 602-724	1 - 800 µm (paint/Zn) 1 - 100 µm (Zn/Fe)	no lift-off compensation
		1 µm or 1 % (paint/Zn) 1 µm or 1 % (Zn/Fe)	ø : 20 mm (800 mils) (paint/Zn) ø : 6 mm (240 mils) (Zn/Fe)
	ESC1 <sup>(1)</sup> 602-658	0 - 170 µm (Cu/Iso) 0 - 700 µm (Cr/Cu)	h : 0 - 300 µm (12 mils) no lift-off compensation
		0.04 µm or 1 % (Cu/Iso) 0.1 µm or 2 % (Cr/Cu)	6 mm/3 mm (240/120 mils) at 100 µm (4 mils) Cu/Iso 35 mm/2 mm (1400/80 mils) at 230 µm (9 mils) Cr/Al
	ESC2 602-237	0 - 90 µm (Cu/Iso) 0 - 200 µm (Cr/Cu)	h : 0 - 300 µm (12 mils) no lift-off compensation
		0.02 µm or 0.5 % (Cu/Iso) 0.05 µm or 1 % (Cr/Cu)	6 mm/3 mm (240/120 mils) 35 mm/2 mm (1400/80 mils) at 150 µm (6 mils) Cr/Al
	ESC3 <sup>(1)</sup> 603-039	90 - 1000 µm (Cu/Iso)	0 - 500 µm (0 - 20 mils)
		0.3 µm/0.5 %	not relevant

Index description see page 22.


 <p>Ø for 10% error/min. Ø</p>	<p>Probe tip radius</p>	<p>Height</p>	<p>Type of probe Application</p>
 <p>D for 10% error</p>	<p>Probe tip material</p>	<p>Diameter/width</p>	
	<p>replaceable probe tip</p>	<p>Length (see page 24)</p>	
<p>15 mm/10 mm (0.6/0.4") at 200 µm (8 mils) Cu/Fe</p>	<p>flat: ø 15 mm (600 mils)</p>	<p>---</p>	<p>Measures nonferrous metal coatings on steel or iron (NF/Fe) or nonferrous metal coatings (NF/NF). Same applications (except Ni/Fe) and characteristics as ESD1 probe, however suitable for thicker coatings.</p>
<p>0.2 mm (8 mils)</p>	<p>Polyamide</p>	<p>35 mm (1.4")</p>	
	<p>no</p>	<p>130 mm (5.2")</p>	
<p>not relevant</p> <p>board thickness from D = 0.5 mm (20 mils) to 2.5 mm (100 mils) can be entered</p>	<p>ø Probe tip: 0.78 mm (31 mils)</p>	<p>---</p>	<p>Single tip axial probe for inside measurements with fixed measurement system. Designed specifically to measure the thickness of copper plating (even under a Sn- or SnPb-coating) in metallized through holes of PC-boards. Smallest permissible PTH diameter: 0.8 mm (32 mils).</p>
	<p>Austenitic steel</p>	<p>13 mm (0.5")</p>	
	<p>no</p>	<p>100 mm (4")</p>	
<p>not relevant</p> <p>board thickness from D = 0.5 mm (20 mils) to 2.5 mm (100 mils) can be entered</p>	<p>ø Probe tip: 0.78 mm (31 mils)</p>	<p>---</p>	<p>Single pole probe for inside measurements with fixed measurement system. Same as ESL08A probe, however used only for CU-SCOPE CMP1A.</p>
	<p>Austenitic steel</p>	<p>13 mm (0.5")</p>	
	<p>no</p>	<p>100 mm (4")</p>	
<p>10 mm/4 mm (400/160 mils)</p> <p>0.2 mm (8 mils) Fe</p>	<p>ø Probe tip: 0.78 mm (31 mils)</p>	<p>---</p>	<p>Axial single tip probe with spring-loaded measuring system. Simultaneous measurement of a double coating, i.e. paint over zinc on steel. Suitable to measure so-called Duplex coatings (paint over zinc and zinc alloy on galvanized surfaces) on sheet metal or strips. Not suitable for thick, hot dipped galvanized coatings, because of the nonhomogeneous alloy composition with unknown material properties and characteristics.</p>
	<p>Austenitic steel</p>	<p>20 mm (0.8")</p>	
	<p>no</p>	<p>100 mm (4")</p>	
<p>8 mm/6 mm (320/240 mils) at 100 µm (4 mils) Cu/Iso 10 mm/6 mm (400/240 mils) at 230 µm (9 mils) Cr/Al</p> <p>0.9 mm (35 mils) CuZn</p>	<p>flat: ø 5.5 mm (220 mils)</p>	<p>---</p>	<p>Measurement of nonferrous metal coatings on nonconductive substrates (NF/NC) and nonferrous metal substrates (NF/NF). Main application is to measure Cu-cladding thickness on PC-boards, also under a conformal coating; also measures the thickness of metal foils, as well as Cr-coatings on copper, aluminum or brass.</p>
	<p>Polyamide</p>	<p>16 mm (0.63")</p>	
	<p>no</p>	<p>110 mm (4.3")</p>	
<p>8 mm/4 mm (320/160 mils) at 60 µm (2.4 mils) Cu/Iso 10 mm/4 mm (400/160 mils) at 150 µm (6 mils) Cr/Al</p> <p>0.5 mm (20 mils) CuZn</p>	<p>flat: ø 5.5 mm (220 mils)</p>	<p>---</p>	<p>Same application as ESC1 probe, however for thinner coatings.</p>
	<p>Polyamide</p>	<p>16 mm (0.63")</p>	
	<p>no</p>	<p>110 mm (4.3")</p>	
<p>15 mm (600 mils)</p>	<p>no tip, flat: ø 15 mm (600 mils)</p>	<p>130 mm (5.2")</p>	<p>Axial single tip measurement probe with spring-loaded measuring element. Measures nonferrous metal coatings on nonmetal (NF/Iso) or on nonferrous metal substrate materials (NF/NF). Same applications as ESC1 probe, but for thicker coatings.</p>
	<p>Polyamide</p>	<p>18 mm (0.7")</p>	
<p>not relevant</p>	<p>no</p>	<p>---</p>	

# Characteristic values and technical data of probes for the modified



<p>Note regarding probe designations:                      L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.                      F: Measuring element protected against moist, aggressive media.                      T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.                      * Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy $u_s$	Measurement point  Ø for 10% error min. Ø
	Measurement range	Measurement precision* s (the greater value applies)	 Ø for 10% error min. Ø
	EN3 602-305	0 - 0.25 mm : 0.002 mm 0.25 - 2 mm : 1 % 2 - 4 mm : < 2 %  1 - 15 µm : 0.3 µm 15 - 150 µm : 2 %	Ø : 22 mm (870 mils) (NF/Fe) min. Ø : 2 mm (80 mils)  Ø : 10 mm (400 mils) (Ni/NF) min. Ø : 2 mm (80 mils)
	0 - 4 mm (0 - 160 mils) (NF/Fe)	0 - 0.25 mm : 0.0003 mm 0.25 - 4 mm : < 0.5 %	Ø : 40 mm (1.6") (NF/Fe) min. Ø : 50 mm (2")
	0 - 150 µm (0 - 6 mils) (Ni/NF)	1 - 20 µm : 0.2 µm 20 - 150 µm : 1 %	Ø : < 10 mm (0.7") (Ni/NF) min. Ø : 50 mm (2")
	ENW3 602-380	0 - 0.25 mm : 0.002 mm 0.25 - 2 mm : 1 % 2 - 4 mm : < 2 %  1 - 15 µm : 0.3 µm 15 - 150 µm : 2 %	Ø : 22 mm (870 mils) (NF/Fe) min. Ø : 2 mm (80 mils)  Ø : 10 mm (400 mils) (Ni/NF) min. Ø : 2 mm (80 mils)
	0 - 4 mm (0 - 160 mils) (NF/Fe)	0 - 0.25 mm : 0.0003 mm 0.25 - 4 mm : < 0.5 %	Ø : 40 mm (1.6") (NF/Fe) min. Ø : 40 mm (1.6")
	0 - 150 µm (0 - 6 mils) (Ni/NF)	1 - 20 µm : 0.2 µm 20 - 150 µm : 1 %	Ø : < 10 mm (0.7") (Ni/NF) min. Ø : 40 mm (2")

All probes can be connected to FISCHERSCOPE® MMS® Module NICKELSCOPE®



# Characteristic values and technical data of probes for the

	ERCU N 603-220	Range I: 0.1 - 10 µm 0.1 - 5 µm = 0.075 µm 5 - 10 µm = 1.5 %  Range II: 5 - 120 µm 5 - 50 µm = 0.5 µm 50 - 80 µm = 1 % > 80 µm = 2 %	only for flat specimen
	0.1-120 µm (0.04 - 4.8 mils) Cu/Epoxy	Range I: 0.1 - 10 µm 0.1 - 5 µm = 0.05 µm 5 - 10 µm = 1 %  Range II: 5 - 120 µm 5 - 50 µm = 0.25 µm 50 - 80 µm = 0.5 % > 80 µm = 2 %	only for flat specimen

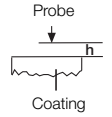
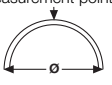







Probe can only be connected to FISCHERSCOPE® MMS® PCB

 <p>Ø for 10% error min. Ø</p>	Probe tip radius	Height	Type of probe Application
 <p>D for 10% error</p>	Probe tip material	Diameter/width	
	replaceable probe tip	Length (see page 24)	
<p>ø : 22 mm (870 mils) min. ø : 2 mm (80 mils)</p> <p>ø : 8 mm (320 mils) min. ø : 2 mm (80 mils)</p>	flat: 0.75 mm (30 mils)	---	<p>Axial single tip probe with spring-loaded measuring system.</p> <p>Measurement of nonferrous metal coatings on steel and iron (NF/Fe) or electroplated nickel coatings on nonferrous substrates (Ni/NF).</p> <p>Ideally suited for the measurement of electroplated nickel coatings on, for example: PC-board contacts, also under a thin coating of gold. Also used to measure thick NF metal coatings on steel, not subject to eddy current induced measurement errors in thick conductive coatings.</p>
<p>D : 0.1 mm (4 mils)</p> <p>not relevant (Ni/NF)</p>	<i>Heat treated steel</i>	13 mm (0.5")	
	no	80 mm (3.1")	
<p>ø : 22 mm (870 mils) min. ø : 2 mm (80 mils)</p> <p>ø : 8 mm (320 mils) min. ø : 2 mm (80 mils)</p>	flat: 0.75 mm (30 mils)	23 mm (0.9")	<p>Single tip angle probe with spring-loaded measuring system.</p> <p>Same as probe EN3, however designed for measurements in pipes, bore holes or recesses.</p>
<p>D : 0.1 mm (4 mils)</p> <p>not relevant (Ni/NF)</p>	<i>Heat treated steel</i>	14 mm (0.6")	
	no	72 mm (2.8")	

# electrical conductivity method

 <p>: 8 x 8 mm (320 x 320 mils)</p> <p>min.  : 1 mm</p>	50 µm (2 mils)	130 mm (5")	<p>Four-point probe measuring copper coating thicknesses on the surface of printed circuit boards according to the electric resistance method. No interference from underlying copper coatings separated by thin isolating layers.</p>
	<i>Heat treated steel</i>	32 mm (1.2")	
<p>not relevant</p>	no	---	

# Characteristic values and technical data of probes to measure the



<p>Note regarding probe designations:</p> <p>L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m.</p> <p>F: Measuring element protected against moist, aggressive media.</p> <p>T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible.</p> <p>* Note: Probe capability (accuracy and precision) tested under controlled conditions.</p>	Description Order Number	Measurement accuracy* $u_s$		Lift-off h
	Measurement range	Measurement precision* s		Ø for 10% error min. Ø
	ES1A <sup>(1)</sup> 602-222	0.3 % of measured value	0 - 700 µm (28 mils)	
	0.5 - 108 % IACS 0.3 - 63 MS/m	0.01 % IACS or 0.03 % of measured value	50 mm (200 mils) 2 mm (80 mils)	
	ESW1A <sup>(1)</sup> 602-389	0.3 % of measured value	0 - 700 µm (28 mils)	
	0.5 - 108 % IACS 0.3 - 63 MS/m	0.01 % IACS or 0.03 % of measured value	50 mm (200 mils) 2 mm (80 mils)	
	ES2 602-223	0.5 % of measured value	0 - 500 µm (20 mils)	
	0.5 - 108 % IACS 0.3 - 63 MS/m	0.01 % IACS or 0.05 % of measured value	36 mm (1400 mils) 2 mm (80 mils)	
	S1A <sup>(2)</sup> 601-568	0.3 % of measured value	0 - 700 µm (28 mils)	
	0.5 - 108% IACS 0.3 - 63 MS/m	0.01 % IACS or 0.03 % of measured value	50 mm (200 mils) 2 mm (80 mils)	
	SW1A <sup>(2)</sup> 601-615	0.3 % of measured value	0 - 700 µm (28 mils)	
	0.5 - 108% IACS 0.3 - 63 MS/m	0.01 % IACS or 0.03 % of measured value	50 mm (200 mils) 2 mm (80 mils)	
	S2 <sup>(3)</sup> 601-569	0.5 % of measured value	0 - 500 µm (20 mils)	
	0.5 - 108% IACS 0.3 - 63 MS/m	0.01 % IACS or 0.05 % of measured value	36 mm (1400 mils) 2 mm (80 mils)	
	ES4B <sup>(4)</sup> ES4O <sup>(5)</sup> 602-539    603-235	0,3 % of measured value	0 - 500 µm (20 mils)	
	0,5-108 % IACS 0,3-63 MS/m	0,01 % IACS or 0,03 % of measured value	30 mm (1.2") 1 mm (40 mils)	

<sup>(1)</sup> : Probe can only be connected to FISCHERSCOPE® MMS® module SIGMASCOPE® and module DUPLEX

<sup>(2)</sup> : Probe can only be connected to SIGMASCOPE® SMP1B

<sup>(3)</sup> : Probe can only be connected to SIGMASCOPE® SMP2

<sup>(4)</sup> : Probe can only be connected to FISCHERSCOPE® MMS® EURO HF

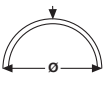
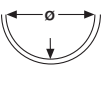



 Ø for 10% error min. Ø	Probe tip radius	Height	Type of probe Application
	Probe tip material	Diameter/width	
 D for 10% error	replaceable probe tip	Length (see page 24)	
	22 mm (870 mils) 15 mm (590 mils)  0.91 mm (36 mils) at 52% IACS	flat: ø 14 mm (550 mils)	---
Polyamide		35 mm (1.4")	
22 mm (870 mils) 15 mm (590 mils)  0.91 mm (36 mils) at 52% IACS	flat: ø 14 mm (550 mils)	40 mm (1.6")	Single tip angle probe with fixed measurement system. Same application as ES1A probe, however designed for measurements in pipes, bore holes or recesses. A separate V-groove adapter has to be used on curved surfaces.
	Polyamide	35 mm (1.4")	
12 mm (470 mils) 5 mm (200 mils)  0.44 mm (17 mils) at 52% IACS	flat: ø 5.5 mm (220 mils)	---	Axial single tip probe with fixed measurement system. Same application as ES1A probe, however due to the higher measurement frequency especially suited for thinner specimen (strips, sheet metal, coatings).
	Polyamide	---	
22 mm (870 mils) 15 mm (590 mils)  0.91 mm (36 mils) at 52% IACS	flat: ø 14 mm (550 mils)	---	Axial single tip probe with fixed measurement system. Same application as ES1A probe, however only in conjunction with the hand-held instruments SMP1B and SMP1BS.
	Polyamide	18 mm (0.7")	
22 mm (870 mils) 15 mm (590 mils)  0.91 mm (36 mils) at 52% IACS	flat: ø 14 mm (550 mils)	40 mm (1.6")	Single tip angle probe with fixed measurement system. Same application as S1A probe, however designed for measurements in pipes, bore holes and recesses.
	Polyamide	35 mm (1.4")	
12 mm (470 mils) 5 mm (200 mils)  0.44 mm (17 mils) at 52% IACS	flat: ø 5.5 mm (220 mils)	---	Axial single tip probe with fixed measurement system. Same application as ES2 probe, however only in conjunction with the hand-held instrument SMP2.
	Polyamide	16 mm (0.6")	
10 mm (400 mils) 5 mm (200 mils)  0.35 mm at 30 MS/m and 480 kHz	flat: ø 14 mm (550 mils)	---	Axial single-tip measurement probe with fixed measuring element. Measures the electrical conductivity of nonferrous metals according to the eddy current method. Applications include material sorting, heat treatment inspections and analysis of structural conditions. Suitable for the following measurement frequencies: 120 kHz, 240 kHz and 480 kHz. Measurement ES40 probe is additionally suited for a frequency of 60 kHz and contains an integrated temperature sensor.
	Polyamide	18 mm (0.7")	
10 mm (400 mils) 5 mm (200 mils)  0.35 mm at 30 MS/m and 480 kHz	flat: ø 14 mm (550 mils)	---	Axial single-tip measurement probe with fixed measuring element. Measures the electrical conductivity of nonferrous metals according to the eddy current method. Applications include material sorting, heat treatment inspections and analysis of structural conditions. Suitable for the following measurement frequencies: 120 kHz, 240 kHz and 480 kHz. Measurement ES40 probe is additionally suited for a frequency of 60 kHz and contains an integrated temperature sensor.
	Polyamide	18 mm (0.7")	

(5) : Probe can only be connected to SIGMASCOPE® SMP10

(6) : Probe can only be connected to CU-SCOPE® CMP1A

(7) : Probe can only be connected to FISCHERSCOPE® MMS Module DUPLEX

# Characteristic values and technical data of probes to measure

Note regarding probe designations: L: cable length for magnetic induction probes 5 m and for eddy current probes 3 m instead of 1.5 m. F: Measuring element protected against moist, aggressive media. T: Intermittent measurements on specimens with temperatures up to 100 °C (212 °F) possible. * Note: Probe capability (accuracy and precision) tested under controlled conditions.	Description Order Number	Measurement accuracy* $u_s$	Measurement point  Ø for 5% error min. Ø
	Measurement range	Measurement precision* $s$	 Ø for 5% error min. Ø
	EGAB1.3-FE 602-221	0 - 5 %Fe/5FN : 0.1 %FE/FN 5 %Fe/5FN - 80 %/110FN : 2 %	ø : 15 mm (590 mils) min. ø : 1 mm (80 mils)
	0.1 - 80 % Fe 0.1 - 110 FN	0 - 10 %Fe/10FN : 0.05 %Fe/FN 10 %Fe/10FN - 80 %Fe/110FN : 0.5 %	ø : 30 mm (1.2") min. ø : 10 mm (400 mils)
	EGABW1.3-FE 602-304 EGABW1.3L-FE 602-614	0 - 5 %Fe/5FN : 0.1 %FE/FN 5 %Fe/5FN - 80 %/110FN : 2 %	ø : 15 mm (590 mils) min. ø : 1 mm (40 mils)
	0.1 - 80 % Fe 0.1 - 110 FN	0 - 10 %Fe/10FN : 0.05 %Fe/FN 10 %Fe/10FN - 80 %Fe/110FN : 0.5 %	ø : 36 mm (1.4") min. ø : 18 mm (720 mils)
	EGAB1.3-150FE 602-706	0 - 5 %Fe/5FN : 0.1 %FE/FN 5 %Fe/5FN - 80 %/110FN : 2 %	ø : 15 mm (590 mils) min. ø : 2 mm (80 mils)
	0.1 - 80% Fe 0.1 - 110 FN	0 - 10 %Fe/10FN : 0.05 %Fe/FN 10 %Fe/10FN - 68 %Fe/110FN : 0.5 %	ø : 30 mm (1.2") min. ø : 9 mm (350 mils)

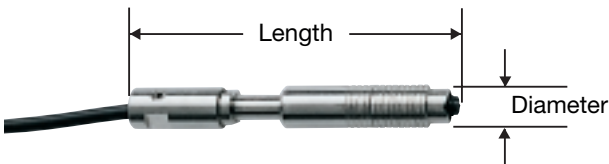
All probes can be connected to FISCHERSCOPE® MMS® module PERMASCOPE® and FERITSCOPE® MP30

<sup>(1)</sup> : Measurement of Delta Ferrite content in sheet material. Thickness of the sheet material.

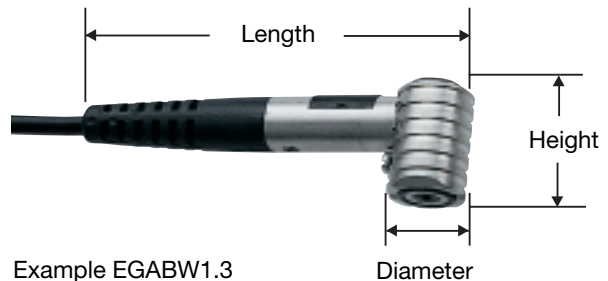
<sup>(2)</sup> : Measurement of Delta Ferrite content in clad layers. Thickness of the cladding.

## Comments to probe dimensions:

Listed are the maximum diameter (respective to width) and the maximum height of the probe, as well as the overall length from the probe tip to the cable entry point.





Example EGAB1.3

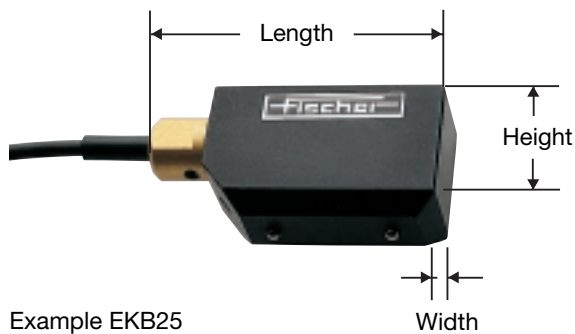


Example EGABW1.3

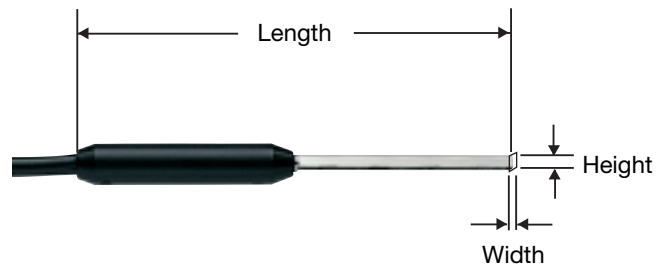


# the ferrite content

 <p>Ø for 5% error min. Ø</p>	Probe tip radius	Height	Type of probe Application
 <p>D for 5% error* D for 10% error**</p>	Probe tip material	Diameter/width	
	replaceable probe tip	Length (see page 24)	
<p>ø : 10 mm (400 mils) min. ø : 2 mm (80 mils)</p> <p>D : 1 mm (40 mils) D : 1 mm (40 mils)</p>	<p>0.75 mm (30 mils)</p> <p><i>PVD coated</i></p> <p>yes</p>	<p>---</p> <p>10 mm (0.4")</p> <p>110 mm (4.3")</p>	<p>Axial single tip probe with spring-loaded measuring system. Measurement of the Delta Ferrite content in ferrite percent or WRC ferrite number. Suitable for the measurement of delta ferrite content in weld metal and clad layers of austenitic or Duplex stainless steel. Also used to determine the ratio of martensite in austenitic stainless steels.</p>
<p>ø : 10 mm (400 mils) min. ø : 2 mm (80 mils)</p> <p>D : 1 mm (40 mils) D : 1 mm (40 mils)</p>	<p>0.75 mm (30 mils)</p> <p><i>PVD coated</i></p> <p>yes</p>	<p>23 mm (0.9")</p> <p>14 mm (0.6")</p> <p>72 mm (2.8")</p>	<p>Single pole angle probe with spring-loaded measuring system. Same application as EGAB1.3-FE probe, however preferred for measurements in pipes, bore holes or recesses.</p>
<p>ø : 10 mm (400 mils) min. ø : 2 mm (80 mils)</p> <p>D : 1 mm (40 mils) D : 1 mm (40 mils)</p>	<p>0.75 mm (30 mils)</p> <p><i>PVD coated</i></p> <p>yes</p>	<p>6.5 mm (0.26")</p> <p>5.5 mm (0.22")</p> <p>320 mm (12.6")</p>	<p>Single tip probe for inside measurements with spring-loaded measuring system. Same application as EGAB1.3-FE probe, however designed for measurements in pipes, bore holes and grooves. Externally triggered measurement acquisition should be used when measuring small inside diameters to prevent measurement errors. Maximum insertion depth : 320 mm (12.8").</p>



Example EKB25



Example V1EGA1HR34

# Accessories

For the accurate measurement of coating thickness on small parts, such as fasteners, stampings, sleeves, etc. or parts with complex geometry. Probe specific mounting adapters are required.

\*: included with standard V12 measurement stand (order number 602-260) or V12-SP stand (order number 602-262)



V12 measurement stand with base\* and adapter 600-796\* to mount the following probes:

- ETA3.3H, ETA3.3F, ETA3.3T
- EGAB1.3-SD
- V6EKB4



V12 measurement stand with V-table\*, adapter 600-173\* and adapter 600-077 to mount the following probes:

- EGABW1.3, EGBW2, EGABW1.3FE
- EAW3.3, EA9
- ENW3



V12 measurement stand with adapter 600-213 to mount the following probes:

- ESD1, ESD2
- ESC1, ESC2
- ES2



V12 measurement stand with magnetic shuttle table 600-019 and adapter 600-173\* to mount the following probes:

- EGA2H
- EN3



V12 measurement stand with V-table\*, adapter 600-173\* and adapter 601-691 to mount the following probes:

- EGAB1.3-150, EGAB1.3-260, V1EKB4, V1EKB10, EGAB1.3-150FE
- EA13.3-150



V12-SP measurement stand with quick loading screw fixture and adapter 602-370\* to mount the following probes:

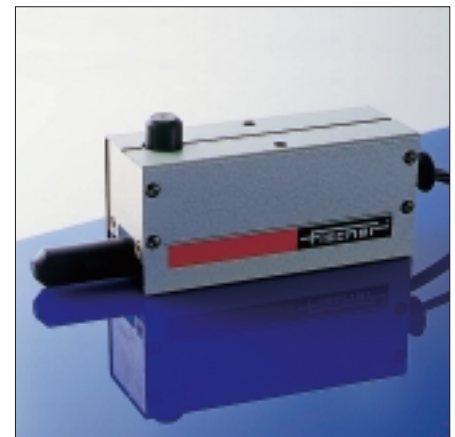
- EGAB1.3, EGB2, EGAB1.3FE



Screw measurement device for accurate measurements of coating thicknesses on metallic fasteners according to ISO DIN 4042.



Measuring stand V12 mot. MP for automated measurements specifically for paint coatings without indentation- or positioning errors.



Measuring head MD4 for automatic measurements of coatings on ferromagnetic substrate materials. Easy integration into production lines for 100% testing.

A series of hand-held and bench top instruments are available for the probes listed. For magnetic induction based measurement the DELTASCOPE® MPxC series is used, the ISOSCOPE® MP series is used for eddy current

coating thickness measurement, the DUALSCOPE® MP20 and MP40 series combine the magnetic induction and eddy current methods.



DELTASCOPE® MP10 displays individual measurement values without statistics, it has no serial interface (no printing, no data transfer) and does not store measurement values.



DUALSCOPE® MP20 with statistical measurement series evaluation capability. Does not store measurements, it has no serial interface.



Measurement of the paint coating thickness on a curved surface using ETD3.3 probe and DUALSCOPE® MP40.



Measurement of a duplex coating (paint/zinc coating on iron) using EDX10 probe and DUALSCOPE® MP40.



Measurement system Fischerscope® MMS with various methods for coating thickness measurement and material testing.



Hand-held NICKELSCOPE® NMP2 for the measurement of nickel or nonferrous metal coating on steel, as well as nonferrous metal coatings on nonconductive substrates.



The CU-SCOPE CMP1A is used to measure copper plating thickness in PCB through holes.



SIGMASCOPE® SMP10 for measuring the electrical conductivity of nonferromagnetic, electrically conducting metals.



The FERITSCOPE® MP30 determines the delta ferrite content in austenitic weld metal or duplex stainless steel.