Probes FD13H / FDW13H / D-FN Data Sheet

			
Probe models	**FD13H**	**FDW13H**	**D-FN**
Part no.[1]	604-508	604-800	1006632

Measurement tasks	■ **Coating thickness on steel or iron base material (FE)**; NC/FE or NF/FE ■ **Coating thickness on non-ferrous metal base material (NF)**; NC/NF	
Applications	Probes for measurements on virtually all metals. The probes work with two test methods and are therefore able to measure coating thicknesses on non-ferrous metals (NF) as well as on ferrous metals (FE). Because of the large pole tip the probes are also well suited for measurements on rough (blasted) surfaces.	
Examples	**Steel or iron base material (FE)** ■ Paint, varnish, rubber or plastic coatings on steel, iron or cast iron (NC/FE) ■ Copper, brass, zinc, tin and chrome coatings on steel or iron (NF/FE) ■ Both electro-galvanized and hot galvanized coatings on steel, iron or cast iron (NF/FE)	**Non-ferromagnetic metal base materials (NF)** ■ Paint, varnish or plastic coatings on aluminium, copper or brass (NC/NF)
Features	■ Preferably for measurements on flat surfaces ■ Excellently suited for measurements on rough surfaces, measurements on smooth surfaces are of course also possible ■ Wear-resistant probe pole tip ■ Probe model FD13H also available as digital probe (D-FN), in which the measurement signal is already converted into the measured value directly in the probe ■ Probe D-FN: Humidity protection	
Restrictions	-	**Non-ferromagnetic metal base materials (NF)** ■ The probes measure with a high-precision conductivity compensation developed by Helmut Fischer, so different electrical conductivities of the base material (particularly various aluminium alloys) have no effect on the coating thickness measurement. ■ Strong influence due to surface curvatures
Measuring ranges*	**Steel or iron base material (FE)** 0 ... 2000 µm (0 ... 78.74 mils)	**Non-ferromagnetic metal base materials (NF)** 0 ... 2000 µm (0 ... 78.74 mils)
*	*The values for measurement range, trueness, repeatability precision and measurement deviations are valid for electrically non-conductive coating materials on steel or iron (NC/FE). The values may differ for measurements on non-ferromagnetic coating materials (NF).*	-
	The specifications for trueness) and repeatability precision apply to ambient and specimen temperatures at the time of calibration. The values for trueness and repeatability may increase compared to the values specified here if the temperature during measurement differs from the temperature during calibration.	
Trueness* based on Fischer factory calibration standards at 20 °C (68 °F) for specimen and ambient temperature	**Steel or iron base material (FE)** 0 ... 75 µm: ≤ 1.5 µm 75 ... 1000 µm: ≤ 2 % of nominal value 1000 ... 2000 µm: ≤ 3 % of nominal value (0 ... 2.95 mils: ≤ 0.06 mils) (2.95 ... 39.37 mils: ≤ 2 % of nominal value) (39.37 ... 78.74 mils: ≤ 3 % of nominal value)	**Non-ferromagnetic metal base materials (NF)** 0 ... 50 µm: ≤ 1 µm 50 ... 1000 µm: ≤ 2 % of nominal value 1000 ... 2000 µm: ≤ 3 % of nominal value (0 ... 1.97 mils: ≤ 0.039 mils) (1.97 ... 39.37 mils: ≤ 2 % of nominal value) (39.37 ... 78.74 mils: ≤ 3 % of nominal value)

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Repeatability precision*	**Steel or iron base material (FE)**	**Non-ferromagnetic metal base materials (NF)**
based on Fischer factory calibration standards at 20 °C (68 °F) for specimen and ambient temperature	0 ... 50 µm: ≤ 0.25 µm 50 ... 2000 µm: ≤ 0.5 % of reading (0 ... 1.97 mils: ≤ 0.0098 mils) (1.97 ... 78.74 mils: ≤ 0.5 % of reading)	0 ... 100 µm: ≤ 0.5 µm 100 ... 2000 µm: ≤ 0.5 % of reading (0 ... 3.94 mils: ≤ 0.02 mils) (3.94 ... 78.74 mils: ≤ 0.5 % of reading)

Influence*	**Steel or iron base material (FE)**	**Non-ferromagnetic metal base materials (NF)**

The following values are valid for a coating thickness with a nominal value of 75 µm (2.95 mils).

The quantity of influences are stated with the expanded measurement uncertainty U with the expanded factor of k = 2 (defines an interval with the confidence level of 95.45 %) – according to ISO/IEC Guide 98-3:2008-09 "Guide to the expression of uncertainty in measurement".

Curvature (R), measurement deviation from nominal value with reference to a calibration on flat surface

Measuring spot

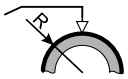
No influence within the scope of trueness from R = 55 mm ± 9 mm (R = 2.17 " ± 0.35 ") Measurement deviation of 10 % for R = 28 mm ± 1.6 mm (R = 1.10 " ± 0.063 ")	No influence within the scope of trueness from R = 550 mm ± 56 mm (R = 21.65 " ± 2.2 ") Measurement deviation of 10 % for R = 110 mm ± 5.6 mm (R = 4.33 " ± 0.22 ")

FD13H and FDW13H probes require a minimum of R = 25 mm (support stand necessary) (R = 0.98 ")

D-FN probe requires a minimum of R = 29 mm (support stand necessary) (R = 1.14 ")

Curvature (R), measurement deviation from nominal value with reference to a calibration on flat surface

Measuring spot



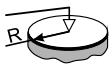
No influence within the scope of trueness from R = 80 mm ± 5 mm (R = 3.14 " ± 0.2 ") Measurement deviation of 10 % for R = 16 mm ± 1.2 mm (R = 0.63 " ± 0.047 ")	No influence within the scope of trueness from R = 447 mm ± 28 mm (R = 17.6 " ± 1.1 ") Measurement deviation of 10 % for R = 92 mm ± 3.4 mm (R = 3.62 " ± 0.13 ")

FD13H and D-FN probes needs a minimum of R = 1.5 mm (support stand necessary) (R = 0.06 ")

FDW13H probe needs a minimum of R = 2 mm (support stand necessary) (R = 0.08 ")

Edge distance (R), specification from probe tip center, measurement deviation from nominal value

Measuring spot in the center of the circular surface



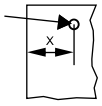
No influence within the scope of trueness from R = 11.5 mm ± 0.3 mm (R = 0.45 " ± 0.012 ") Measurement deviation of 10 % for R = 6.4 mm ± 0.3 mm (R = 0.25 " ± 0.012 ")	No influence within the scope of trueness from R = 3.2 mm ± 0.2 mm (R = 0.13 " ± 0.0079 ") Measurement deviation of 10 % for R = 2.4 mm ± 0.04 mm (R = 0.094 " ± 0.0016 ")

FD13H and FDW13H probes require a minimum of R = 7 mm (support stand necessary) (R = 0.28 ")

D-FN probe requires a minimum of R = 8 mm (support stand necessary) (R = 0.32 ")

Edge distance (X), specification from probe tip center, measurement deviation from nominal value

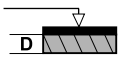
Measuring spot = Probe pole center



No influence within the scope of trueness from X = 3.6 mm ± 0.3 mm (X = 0.14 " ± 0.012 ") Measurement deviation of 10 % for X = 1.0 mm ± 0.05 mm (X = 0.039 " ± 0.002 ")	No measurement deviation within the trueness - for FD13H and D-FN probe as of X = 2.2 mm ± 0.05 mm (X = 0.087 " ± 0.002 ") - for FDW13H probe as of X = 2.2 mm ± 0.1 mm (X = 0.087 " ± 0.004 ") Measurement deviation of 10 % for X = 1.9 mm ± 0.04 mm (X = 0.075 " ± 0.0016 ")

Base material thickness (D), measurement deviation from nominal value

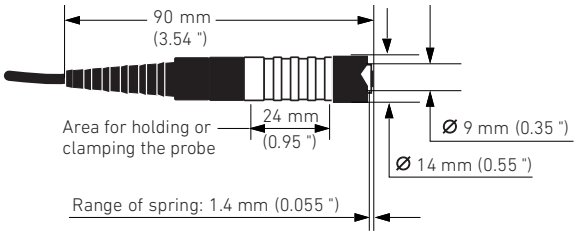
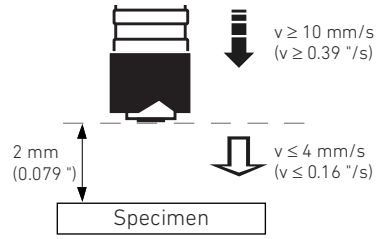
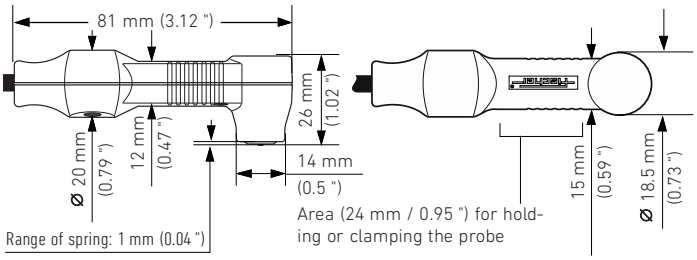
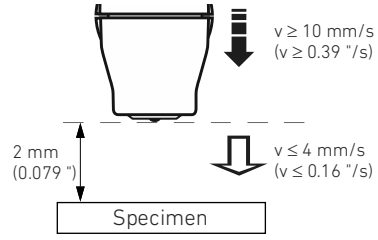
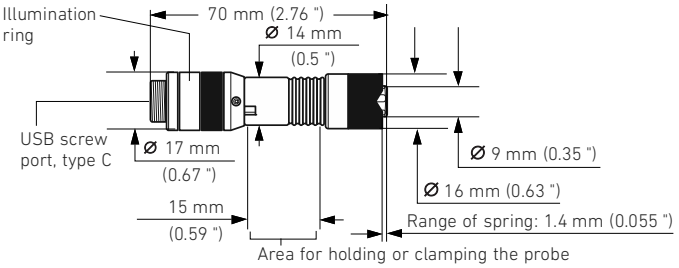
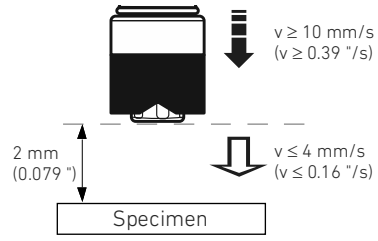
Measuring spot



Steel or iron base material (FE)	**Base material Aluminium**
No influence within the scope of trueness from D = 1.0 mm ± 0.1 mm (D = 39.4 mils ± 3.94 mils) Measurement deviation of 10 % for D = 0.5 mm ± 0.03 mm (D = 19.7 mils ± 1.18 mils)	No influence within the scope of trueness from D = 0.1 mm ± 0.01 mm (D = 3.94 mils ± 0.39 mils) Measurement deviation of 10 % for D = 0.02 mm ± 0.001 mm (D = 0.79 mils ± 0.039 mils)

Base material	**Steel or iron base material (FE)**	**Non-ferromagnetic metal base materials (NF)**
	Influence on base material (FE) permeability in regard to Fischer calibration standards (master calibration): No measurement error for a ferrite content from 137 FN ± 0.2 FN onwards. Measurement error of 10 % for ferrite content of 123 FN ± 0.8 FN.	Influence of the el. conductivity of the base material (NF) in the range from 30 to 100 % IACS: Measurement deviation ≤ 2 %, valid for the total measurement range.

Probes FD13H / FDW13H / D-FN

Probe design	Dimensions	Approach and touchdown speed for automated measurement
FD13H probe Single pole axial probes with spring-loaded measuring system Probe pole tip ■ Wear-resistant ■ Material: hard metal ■ Radius: 2 mm (0.079 ") ■ Not replaceable	 Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1] Bending radius: ≥ 30 mm (1.18 ")	 Lift-off distance between 2 measurements ≥ 8 mm (≥ 0.32 ")
FDW13H probe Single pole angle probe with spring-loaded measuring system Probe pole tip ■ Wear-resistant ■ Material: hard metal ■ Radius: 2 mm (0.079 ") ■ Not replaceable	 Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1] Bending radius: ≥ 30 mm (1.18 ")	 Lift-off distance between 2 measurements ≥ 8 mm (≥ 0.32 ")
D-FN probe ■ Single pole axial probes with spring-loaded measuring system ■ Humidity protection Probe pole tip ■ Wear-resistant ■ Material: hard metal ■ Radius: 2 mm (0.079 ") ■ Not replaceable	 Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1] Bending radius: ≥ 30 mm (1.18 ")	 Lift-off distance between 2 measurements ≥ 8 mm (≥ 0.32 ")

Measuring methods	**Steel or iron base material (FE)** Magnetic induction test method according to ISO 2178, ASTM D7091	**Non-ferromagnetic metal base materials (NF)** Amplitude-sensitive eddy current test method according to ISO 2360, ASTM D7091
Calibration – Calibration foils	**Steel or iron base material (FE)**	**Non-ferromagnetic metal base materials (NF)**

The specifications for trueness and repeatability precision only apply to a very narrow coating thickness range around the specified foil thickness for a 1-point calibration and for a 2-point calibration only for the coating thickness range limited by the thicknesses of the two calibration foils.

Lower measurement range	0 ... 500 µm (0 ... 19.7 mils)	0 ... 800 µm (31.5 mils)
Use following foil thickness(es) for calibration	1-point calibration: 1 foil up to ca. 500 µm (19.7 mils) 2-point calibration: 2 foils up to ca. 500 µm (19.7 mils)	1-point calibration: 1 foil up to ca. 800 µm (31.5 mils) 2-point calibration: 2 foils up to ca.800 µm (31.5 mils)
Upper measurement range	500 ... 2000 µm (19.7 ... 78.7 mils)	800 µm ... 2000 µm (31.5 ... 78.7 mils)
Use following foil thickness(es) for calibration	1-point calibration: not recommended 2-point calibration: foil 1 ca. 500 µm (19.7 mils); foil 2 ca. 1500 µm (59.06 mils)	1-point calibration: not recommended 2-point calibration: foil 1 ca. 800 µm (31.5 mils); foil 2 ca. 2000 µm (78.7 mils)
Admissible ambient temperature at operation	-10 °C ... +40 °C (+14 °F ... +104 °F)	
Admissible specimen temperature	max. +40 °C (+104 °F)	

Probes FD13H / FDW13H / D-FN

Probes work with	
FD13H and FDW13H (analog probes)	■ Hand-held instruments: all DUALSCOPE® instruments of the FMP series ■ FD13H: all DUALSCOPE® instruments of the DMP series by using DMP-F-Probe-Adapter (1007336) ■ Bench top instruments: FISCHERSCOPE® MMS® PC and FISCHERSCOPE® MMS® PC2 both with PERMASCOPE® F-Probe module (604-293, 12-pin connecting socket)
D-FN (digital probe)	■ Hand-held instruments: all DUALSCOPE® instruments of the DMP series
Scope of delivery	■ All: Probe with connecting cable, calibration foil sets 605-413 (metal plate NF/FE for instrument check, 2 calibration foils with thicknesses of approx. 9 µm (0.35 mils) (CuBe) and 125 µm (4.92 mils)) and 605-415 (metal plate NC/NF for instrument check, 2 calibration foils with thicknesses of approx. 24 µm (0.95 mils) and 250 µm (9.84 mils)) ■ FD13H, additional: prism adapter for measurements on pipes and bars ■ D-FN: probe connecting cable with screwable USB C plugs
Options	■ Calibration foils: various foil thicknesses are available up to 1500 µm ((59.06 mils) for steel or iron base material (FE)) and up to 2000 µm ((78.7 mils) for non-ferromagnetic metal base materials (NF)); suitable calibration foil thicknesses are specified in section Calibration – Calibration foils ■ Manufacturer Certificate M according to DIN 55350-18 (only in connection with measuring instrument) ■ Support stand V12 BASE, 604-420, with mechanical probe lowering device; FD13H: suitable probe clamp 602-370 included in support stand delivery D-FN: suitable probe clamp 600-213 FDW13H: no probe clamp available ■ Support stand V12 MOT, 604-374, with motorized probe lowering device for highest repeatability; FD13H: suitable probe clamp 602-370 included in support stand delivery D-FN: suitable probe clamp 600-213 FDW13H: no probe clamp available

[1] *Probes with special cable lengths have own part no. and probe model names. This data sheet also applies to these probes.*
Probe D-FN: max. cable length 3 m (118 "), it is not allowed to use a USB extension cable to connect probe to instrument!

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