Probes FGAB1.3 / D-F Data Sheet

Probe models[1]	**FGAB1.3**	**D-F**
Part no.[1]	604-141	1006634

Measurement task: **Coating thickness on steel or iron base material (FE)**; NC/FE or NF/FE

Applications: Measuring the thickness of electrically non-conductive as well as of non-ferromagnetic metallic coatings on steel or iron base material (NC/FE and NF/FE).

Examples
- Paint, varnish or plastic coatings on steel or iron (NC/FE)
- Copper, brass, zinc, tin and chrome coatings on steel or iron (NF/FE)

Features
- Excellent suited for measuring electroplated metal coating thicknesses
- Preferably for measurements on smooth or polish surfaces
- Well suited for small measuring areas due to the small probe diameter
- Probe model FGAB1.3 also available as digital probe (D-F)

Restrictions
- The measurement data variation is relatively high on rough (e.g., sandblasted) surfaces.

* *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-ferrous 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.

Measuring range*: 0 ... 2000 µm (0 ... 78.74 mils)

Trueness* — **Steel or iron base material (FE)**

based on Fischer factory calibration standards at 20 °C (68 °F) for specimen and ambient temperature

0 ... 100 µm: ≤ 1 µm	(0 ... 13.94 mils: ≤ 0.039 mils)
100 ... 1000 µm: ≤ 1 % of nominal value	(13.94 ... 39.37 mils: ≤ 1 % of nominal value)
1000 ... 2000 µm: ≤ 3 % of nominal value	(39.37 ... 78.74 mils: ≤ 3 % of nominal value)

Repeatability precision* — **Steel or iron base material (FE)**

based on Fischer factory calibration standards at 20 °C (68 °F) for specimen and ambient temperature;

0 ... 100 µm: ≤ 0.3 µm	(0 ... 3.94 mils: ≤ 0.012 mils)
100 ... 2000 µm: ≤ 0.3 % of reading	(3.94 ... 78.74 mils: ≤ 0.3 % of reading)

Influence* — **Steel or iron base material (FE)**

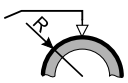
The following values are valid for a coating thickness with a nominal value of 75 µm (2.95 mils) on steel base material (FE) at 20 °C (68 °F) for specimen and ambient temperature. The quantity of influences are stated with the expanded measurement uncertainty U with the expanded factor of k = 2 (defines 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 

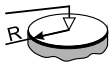
No influence within the scope of trueness from R = 142 mm ± 19 mm (R = 5.59 " ± 0.75 ")
Measurement deviation of 10 % for R = 14 mm ± 1.2 mm (R = 0.55 " ± 0.05 ")
Probe needs a minimum of R = 5 mm (support stand necessary) (R = 0.2 ")

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

Measuring spot 

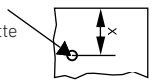
No influence within the scope of trueness from R = 87 mm ± 11 mm (R = 3.43 " ± 0.43 ")
Measurement deviation of 10 % for R = 9 mm ± 0.9 mm (R = 0.35 " ± 0.035 ")
Probe needs a minimum of R = 1 mm (support stand necessary) (R = 0.039 ")

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 = 9.9 mm ± 0.7 mm (R = 0.389 " ± 0.028 ")
Measurement deviation of 10 % for R = 4.75 mm ± 0.09 mm (R = 0.1890 " ± 0.0031 ")
Probe needs a minimum of R = 5 mm (support stand necessary) (R = 0.2 ")

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

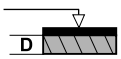
Messstelle = Sondenpolmitte 

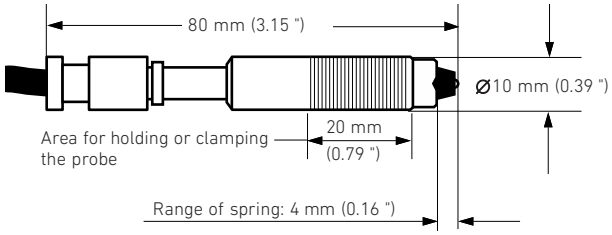
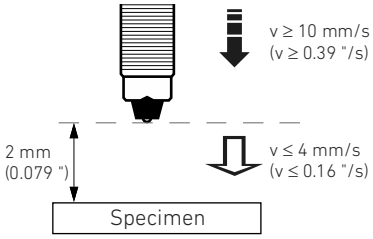
No influence within the scope of trueness from X = 3.8 mm ± 0.3 mm (X = 0.149 " ± 0.012 ")
Measurement deviation of 10 % for X = 0.9 mm ± 0.07 mm (X = 0.0354 " ± 0.0028 ")

Probes FGAB1.3 / D-F

Influence*	**Steel or iron base material (FE)**

The following values are valid for a coating thickness with a nominal value of 75 µm (2.95 mils) on steel base material (FE) at 20 °C (68 °F) for specimen and ambient temperature. 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".

Base material thickness (D), measurement deviation from nominal value Measuring spot 	No influence within the scope of trueness from D = 1 mm ± 0.25 mm (D = 0.0394 " ± 0.0098 ") Measurement deviation of 10 % for D = 0.39 mm ± 0.02 mm (D = 0.0153 " ± 0.0008 ")
Base material	Influence on base material (FE) permeability in regard to Fischer calibration standards (master calibration): No influence within the scope of trueness from ferrite content of 138 FN ± 0.04 FN Measurement deviation of 10 % for ferrite content of 119.3 FN ± 0.3 FN
Admissible ambient temperature at operation	-10 °C ... +40 °C (+14 °F ... +104 °F)
Admissible specimen temperature	max. +40 °C (max. +104 °F)

Probe design Single pole axial probes with spring-loaded measuring system Probe pole tip ■ wear-resistant ■ material: PVD coated steel ■ radius: 0.75 mm (29.53 mils) ■ replaceable by Fischer service center	Dimensions  Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1] Bending radius: [3] 30 mm (1.18 ")	Approach and touchdown speed for automated measurement  Lift-off distance between 2 measurements ≥ 8 mm (≥ 0.32 ")

Measuring method	Magnetic induction test method according to ISO 2178, ASTM D7091	
Calibration – Calibration foils	1-Point calibration *The 1-Point-Calibration is practicably in the lower measuring range only. This calibration method provides the best measuring accuracy in a small coating thickness range close by the stated foil thickness.*	2-Point calibration *The calibration using two calibration foils provides on the one hand the best measuring accuracy in the coating thickness range limited by the two foil thicknesses and on the other hand two calibration foils are necessary for calibrating the upper measurement range.*
Use following foil thickness (pairings) for calibration	max. 500 µm (19.7 mils)	Foil 1: ≤ 300 µm (11.8 mils); Foil 2: ≥ 600 µm (23.6 mils)

Probes work with following instruments

FGAB1.3 (analog probe)	■ Hand-held instruments: all DUALSCOPE® and DELTASCOPE® instruments of the FMP series and also all DUALSCOPE® and DELTASCOPE® 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-F (digital probe)	■ Hand-held instruments: all DUALSCOPE® and DELTASCOPE® instruments of the DMP series
Scope of delivery	Probe with connecting cable, prism adapter for measurements on pipes and bars, placing ring for placing the probe easier onto the surface, calibration foil set 605-414 (metal plate NF/FE for instrument check, 2 calibration foils with thicknesses of approx. 13 µm (0.51 mils) (CuBe) and 250 µm (9.84 mils))
Options	■ Calibration foils: various foil thickness are available up to 1500 µm (59.06 mils); 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; suitable probe clamp 602-370 included in support stand delivery ■ Support stand V12 MOT, 604-374, with motorized probe lowering device for highest repeatability; suitable probe clamp 602-370 included in support stand delivery

[1] *Probes with special cable lengths have own part no. and probe model names (e.g., FGAB1.3Lx; x = cable length in meter). This data sheet also applies to these probes.*
Probe D-F: max. cable length 3 m (118 "), it not allowed to use a USB connection cable to connect probe to instrument!