# Probes F20H / FW20 / D-F-ro Data Sheet

| |  |  |  |
|---|---|---|---|
| Probe models | **F20H** | **FW20** | **D-F-ro** |
| Part no.[1] | 604-535 | 605-534 | 1006895 |

| | |
|---|---|
| Measurement task | **Coating thickness on steel, iron, cast iron base material (NC or NF/FE)**; NC/FE and 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, vulcanized rubber or plastic on iron, steel or cast iron (FE)<br>■ Zinc, chromium or copper on iron or steel (FE) |
| Features | ■ Excellently suited for measurements on rough surfaces, measurements on smooth surfaces are of course also possible<br>■ Wear resistant probe pole extends the operational readiness of the probe<br>■ Humidity protection<br>■ Angle probe FW20H with its small hight is designed for measurements in pipes, bore holes and recesses<br>■ Probe model F20H also available as digital probe (D-F-ro), in which the measurement signal is already converted into the measured value directly in the probe |
| Restrictions | ■ Less suitable for measurements on convex curved 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).*<br>*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 ... 2500 µm (0 ... 98.43 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: ≤ 1.5 µm | ( 0 ... 3.94 mils: ≤ 0.06 mils) |
| | 100 ... 1000 µm: ≤ 1.5 % of nominal value | ( 3.94 ... 39.37 mils: ≤ 1.5 % of nominal value) |
| | 1000 ... 2500 µm: ≤ 3 % of nominal value | (39.37 ... 98.43 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 ... 2500 µm: ≤ 0.3 % of reading | (3.94 ... 98.43 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).*

*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 = 80 mm ± 6 mm (R = 3.15 " ± 0.24 ")

Measurement deviation of 10 % for R = 31 mm ± 1 mm (R = 1.2 " ± 0.039 ")

F20H and FW20H probes require a minimum of R = 25 mm (support stand necessary) (R = 0.98 ")

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

# Probes F20H / FW20 / D-F-ro

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

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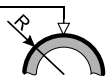
Curvature (R), measurement deviation from nominal value

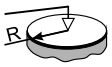
Measuring spot




No influence within the scope of trueness from R = 119 mm ± 5 mm (R = 4.69 " ± 0.2 ")
Measurement deviation of 10 % for R = 24 mm ± 1 mm (R = 0.95 " ± 0.039 ")
Probe needs a minimum of R = 1.5 mm (support stand necessary) (R = 0.06 ")

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

Measuring spot in the center of the circular surface

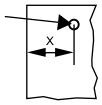



No influence within the scope of trueness from R = 13.6 mm ± 0.3 mm (R = 0.54 " ± 0.012 ")
Measurement deviation of 10 % for R = 6.8 mm ± 0.2 mm (R = 0.27 " ± 0.0079 ")

F20H and FW20H robes require a minimum of R = 7 mm (support stand necessary) (R = 0.28 ")
D-F-ro 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 = 4.4 mm ± 0.3 mm (X = 0.17 " ± 0.012 ")
Measurement deviation of 10 % for X = 1.4 mm ± 0.12 mm (X = 0.055 " ± 0.0047 ")

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

Measuring spot


No influence within the scope of trueness from D = 1.1 mm ± 0.12 mm (D = 0.043 " ± 0.0047 ")
Measurement deviation of 10 % for D = 0.6 mm ± 0.03 mm (D = 0.024 " ± 0.0012 ")

Base material

Influence on base material (FE) permeability in regard to Fischer calibration standards (master calibration): No influence within the scope of trueness from a ferrite content of 138.1 FN ± 0.05 FN onwards.
Measurement deviation of 10 % for ferrite content of 126 FN ± 0.2 FN.

Probe design

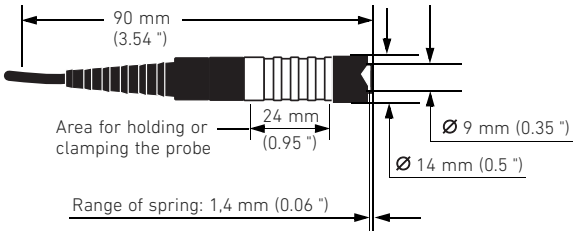
**F20H probe**

- Single pole axial probes with spring-loaded measuring system
- Humidity protection

Probe pole tip

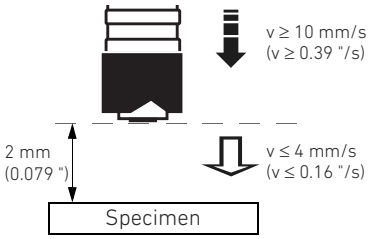
- wear-resistant
- material: hard metal
- radius: 2 mm (0.079 ")
- not replaceable

Dimensions




Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1]
Bending radius: ≥ 30 mm (1.18 ")

Approach and touchdown speed for automated measurement



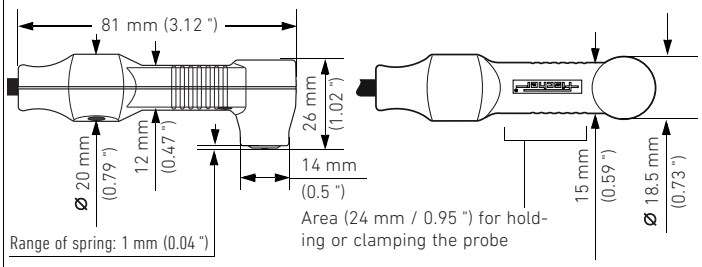

Lift-off distance between 2 measurements ≥ 10 mm (≥ 0.32 ")

**FW20 probe**

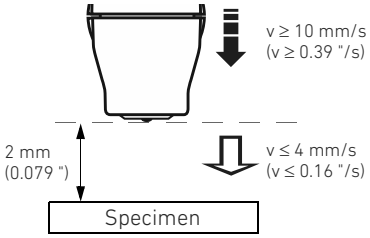
- Single pole angle probe with spring-loaded measuring system
- Humidity protection

Probe pole tip

- wear-resistant
- material: hard metal
- radius: 2 mm (0.079 ")
- not replaceable

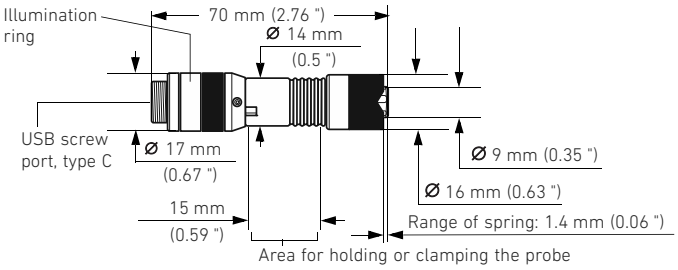
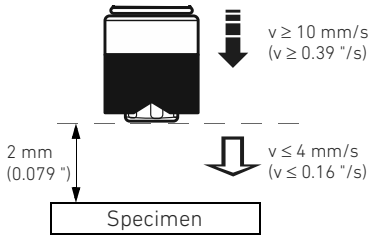



Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1]
Bending radius: ≥ 30 mm (1.18 ")




Lift-off distance between 2 measurements ≥ 10 mm (≥ 0.32 ")

# Probes F20H / FW20 / D-F-ro

| Probe design | Dimensions | Approach and touchdown speed for automated measurement |
|---|---|---|
| **D-F-ro probe**<br>■ Single pole axial probes with spring-loaded measuring system<br>■ Humidity protection<br>Probe pole tip<br>■ wear-resistant<br>■ material: hard metal<br>■ radius: 2 mm (0.079 ")<br>■ not replaceable |  <br>Probe cable length: 1.5 m (59.06 "), other cable lengths on request[1]<br>Bending radius: ≥ 30 mm (1.18 ") |  <br>Lift-off distance between 2 measurements ≥ 10 mm (≥ 0.32 ") |

| | | |
|---|---|---|
| Admissible ambient temperature at operation | -10 °C ... +40 °C (+14 °F ... +104 °F) | |
| Admissible specimen temperature | max. +40 °C (+104 °F) | |
| Measuring method | Magnetic induction test method according to ISO 2178, ASTM D7091 | |
| Calibration – Calibration foils | 1-Point calibration<br>*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<br>*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. 800 µm (31.5 mils) | Foil 1: ≤ 500 µm (19.7 mils); Foil 2: ≥ 900 µm (35.4 mils) |
| Probes work with | | |
| F20H and FW20H (analog probes) | ■ Hand-held instruments: all DUALSCOPE® and DELTASCOPE® instruments of the FMP series<br>■ F20H: all DUALSCOPE® and DELTASCOPE® instruments of the DMP series by using DMP-F-Probe-Adapter (1007336)<br>■ Bench top instruments: FISCHERSCOPE® MMS® PC and FISCHERSCOPE® MMS® PC2 both with PERMASCOPE® F-Probe module (604-293, 12-pin connecting socket) | |
| D-F-ro (digital probe) | ■ Hand-held instruments: all DUALSCOPE® and DELTASCOPE® instruments of the DMP series | |
| Scope of delivery | ■ All: Probe with connecting cable, 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))<br>■ F20H, additional: prism adapter for measurements on pipes and bars<br>■ D-F-ro: probe connecting cable with screwable USB C plugs | |
| Options | ■ Calibration foils: Various foil thickness are available up to 2000 µm (78.7 mils); suitable calibration foil thicknesses are specified in section Calibration – Calibration foils<br>■ Manufacturer Certificate M according to DIN 55350-18 (only in connection with measuring instrument)<br>■ Support stand V12 BASE, 604-420, with mechanical probe lowering device;<br>F20H: suitable probe clamp 602-370 included in support stand delivery<br>D-F-ro: suitable probe clamp 600-213;<br>FW20H: no probe clamp available<br>■ Support stand V12 MOT, 604-374, with motorized probe lowering device for highest repeatability;<br>F20H: suitable probe clamp 602-370 included in support stand delivery<br>D-F-ro: suitable probe clamp 600-213;<br>FW20H: 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-F-ro: max. cable length 3 m (118 "), it not allowed to use a USB connection cable to connect probe to instrument!*