

MMS[®] Inspection DFT

Coating Thickness Measurement on Virtually all Metals

- Non-destructive measurements
- Universal applicable coating thickness gage
- Easy and convenient operation
- Compact and robust case



Scale 1:1

Description

Gage properties	<p>The gage models MMS Inspection DFT measure coating thicknesses easily, quickly, non-destructively and with the precision that is typical for all Fischer instruments.</p> <ul style="list-style-type: none"> • Ideal for onsite applications due to the compact size, the light weight and the robust and durable instrument design • Probe integrated in the gage for single-handed operation • IP65, dust-tight and water repellent and resistant • The 3-point-support ensures a stable and sure positioning on the surface • Intuitive operation of the menu navigation and graphic display • The measurement presentation flips automatically and thus allows optimum reading in different measuring positions • Different languages selectable • Automatic selection of the measuring method corresponding to the base material (only for gage type FE+NF) • Patented conductivity compensation for measurements on non-magnetic base materials • Diversity of variants; You can select your suitable gage according to your requirements from 3 variants with different features. You will find an overview in the sections "Variants" and "Order Information".
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Applications

	Steel, iron, cast iron base materials (FE)	Non-ferrous metal base materials (NF)*
Examples	<ul style="list-style-type: none"> • Zinc, chromium, copper, paint, varnish or plastic on steel, iron or cast iron (NF, NC/FE) 	<ul style="list-style-type: none"> • Paint, varnish or plastic coatings on aluminium, copper or brass (NC/NF) • Anodized coatings on aluminium
*Only measurable with variant type FE+NF		
The gages are applicable for measurements both on smooth and rough surfaces		

Variants

<p>All gage variants available in 2 types:</p> <ul style="list-style-type: none"> • FE: Measurements on ferrous base materials (Fe) • FE+NF: Measurements on both as measurements on ferrous (FE) as well as on non-ferrous metal base materials (NF) 	<p>Start</p> <p>Entry level gage with small data memory for max. 10,000 measured readings in one batch and USB interface for data transfer.</p>	<p>Enhanced-USB</p> <p>Ggageage with large data memory for 250,000 measured readings in 2500 batches, USB interface for data transfer and batch template package Industrial with 4 batch types for quick and easy creation of measurement task files (batches).</p> <p>Individual upgrades are possible for this device model, see following section</p>	<p>High-USB</p> <p>High-end gage with large data memory for 250,000 measured readings in 2500 batches, USB interface for data transfer as well as batch template packages Industrial and Corrosion for easy and fast creation of measurement task files (batches). The package Corrosion contains 5 batch types with preconfigurations especially for coating thickness measurement in the corrosion protection area, e.g. according to the measuring regulation SSPC PA2.</p>																		
	<p>Upgrade packages for variants</p> <table border="1"> <thead> <tr> <th rowspan="2">Upgrade packages</th> <th colspan="2">Enhanced-USB</th> <th colspan="2">High-USB</th> </tr> <tr> <th>FE</th> <th>FE+NF</th> <th>FE</th> <th>FE+NF</th> </tr> </thead> <tbody> <tr> <td>Gage type FE+NF</td> <td>●</td> <td></td> <td>●</td> <td></td> </tr> <tr> <td>Batch Template Package Corosion</td> <td>●</td> <td>●</td> <td></td> <td></td> </tr> </tbody> </table>			Upgrade packages	Enhanced-USB		High-USB		FE	FE+NF	FE	FE+NF	Gage type FE+NF	●		●		Batch Template Package Corosion	●	●	
Upgrade packages	Enhanced-USB		High-USB																		
	FE	FE+NF	FE	FE+NF																	
Gage type FE+NF	●		●																		
Batch Template Package Corosion	●	●																			

Batch Template Packages

Only available for gage variants Enhanced-USB and High-USB

Industrial

Corrosion

Only available for gage variants High-USB and Enhanced-USB with upgrade Batch Template Package Corrosion

Templates for Creation Measurement Tasks

The packages contain various batch types. That are batch templates with especially designed measurement tasks for specific coating thickness measurement applications.

Template package contains following batch types:

- *Individual*
Batch template for free configuration: All metrological standard functions are available and calibration method Zero + 1 Foil is used
- *Elementary*
Template with minimum configuration: No further metrological function settings (customizable), only calibration method Zero is used
- *Smooth Surface*
Preconfigured batch template for measurements on smooth surfaces: Settings of tolerance limit values (customizable) and calibration method Zero + 1 Foil is used.
- *Rough Surface*
Preconfigured batch template for measurements on rough surfaces: Display and storage of the mean value of a given number (n) of measurements (customizable, single readings are also stored) and the calibration method Zero + 2 Foils is used.

Template package containing batch types with especially designed measurement tasks for measurements of corrosion-protective coatings. The template package contains following batch types:

- *Individual*
Batch template for free configuration: All metrological standard functions are available and calibration method Flexible is used
- *IMO PSPC*
Preconfigured batch template containing 90/10 rule, calibration method and evaluation for coating thickness measurement according to requirements of "Performance Standard for Protective Coatings" of the International Maritime Organization (IMO PSPC), calibration method 2 Foils is used
- *SSPC PA2*
Preconfigured batch template with settings (partly customizable), calibration method and evaluation regulations for coating thickness measurement according to guideline SSPC-PA2 of the Society for Protective Coatings (SSPC), calibration method 2 Foils is used
- *ISO 19840*
Preconfigured batch template with settings (partly customizable), calibration method and evaluation regulations for coating thickness measurement according to standard ISO 19840, calibration method 2 Foils is used
- *AS 3894.3*
Preconfigured batch template with settings (partly customizable), calibration method and evaluation regulations for coating thickness measurement according to Australian standards AS 2331.1.4 and AS 3894.3-B, calibration method 1 Foil is used
- *SIS 184160*
Preconfigured batch template with settings (partly customizable), calibration method and evaluation regulations for coating thickness measurement according to Swedish standard SIS 184160, calibration method 2 Foils is used

Metrological Standard Functions

Measurement Tasks

Batch	File containing all metrological function settings and the linking to calibration necessary for the measurement task as well as the measured readings and evaluations
Block creation	Measured readings grouped in measurement blocks
Tolerance limits/Nominal thickness	Adjustable, depending on the selected batch type for the gage variants Enhanced-USB and High-USB
Offset value/Correction value	Adjustable, is deducted automatically from the measured reading. Thus, one obtains the thickness of the top coating if for instance the interim coating is known.
Measurement reading acquisition	Automatic upon placement of the gage probe

Metrological Standard Functions

Measurement Tasks

Measurement reading storage	On/Off switchable
Measurement units	µm/mm or mils/inches
Measurement modes	<p><i>Single reading mode</i> After each placing of the gage probe the measuring reading is displayed and stored automatically.</p> <p><i>Free running mode</i> After placing the gage probe the continuous display of the measured readings appears without automatic storage. Useful for quick checking of coating thicknesses over a defined surface area, e.g. in tank construction.</p> <p><i>Scan mode</i> While the measuring gage probe moves over the surface, the gage automatically records single readings until it lifts off. These values are used to calculate the mean value and the standard deviation. Only the mean value and the standard deviation are stored. Useful to determine the coating thickness over surface areas.</p>
Resolution of measurement reading	Low (up to 1 decimal place), Medium (up to 2 decimal places), High (up to 3 decimal places)
Air reference value acquisition	During measurement, the air reference value is used to reference the zero point determination. Regular measurement of the air reference value is necessary to achieve high measurement accuracy. Automatic capture of the air value always when the gage probe is lifted from the surface.
Calibration	For a correct measurement of the coating thickness, the gage must record the properties (permeability, electrical conductivity, geometry) of the test piece. This adjustment is carried out by a calibration. A calibration is specified by the reference specimen (comparable in shape, material, permeability/electrical conductivity to the test piece) and by the foil standards used (calibration method).

Calibration Methods

Only available for gage variants Enhanced-USB and High-USB

- **Flexible**
Adjustment of the gage to geometrical form and base material of the test piece: Zero point determination and adjustment to up to two coating thickness values by using calibration foils. On recalibration, the individual calibration steps can be skipped.
- **Zero only**
Adjustment of the gage to the base material and the geometry shape of the test piece
- **1 Foil**
Adjustment of the gage to test piece: Adjustment to a coating thickness value by using 1 calibration foil (especially for measurement tasks in the corrosion field)
- **2 Foil**
Adjustment of the gage to test piece: Adjustment to 2 coating thickness values by using 2 calibration foils (especially for measurement tasks in the corrosion field)
- **Zero + 1 Foil**
Adjustment of the gage to the base material and the geometry shape of the test piece: Adjustment to the base material and to 1 coating thickness value by using 1 calibration foil
- **Zero + 2 Foil**
Adjustment of the gage to the base material and the geometry shape of the test piece: Adjustment to the base material and to 2 coating thickness values by using 2 calibration foils

General Features

Test methods

Gage type FE and FE+NF

- Magnetic induction method (ISO 2178, ASTM D7091, measurement of non-magnetic coatings on magnetic substrates)

Gage type FE+NF

Automatic selection of the test method corresponding to the base material

- Eddy current method (ISO 2360, ASTM D7091, measurement of non-conductive coatings on non-magnetic substrate metals)

Factory Calibration

Each individual gage is factory calibrated at several reference points with the greatest care to ensure the highest possible degree of trueness.

Data memory

The memory content is preserved even when there is no voltage supply; subsequent viewing of the measured single readings and evaluations

- Gage variant Start with memory capacity of max. 10,000 measured readings in 1 batch
- Gage variants Enhanced-USB and High-USB with memory capacity of 250,000 measured readings in 2500 batches
- Data memory for up to 100 calibrations

Evaluation

Statistics

- Batch template package Industrial and gage variant Start: Display of mean value, standard deviation, min/ max values and number of measurements per block, per batch, coefficient of variation, number of measured values lower/upper the set limit values
- Batch template package Corrosion: Depending of the selected measuring regulation; e.g. for SSPC-PA2, display per measurement location (Spot)/area section (Area): Number of (Spots), mean value, coefficient of variation, min./max. values, Range, measured readings < 80 %/> 120 % of limit values (coating thickness restriction level 3)

Graphic Presentations

- Histogram
- Run-Chart, showing the progress of measured readings

Probe

Single tip axial probe with spring-loaded measuring system and with wear-resistant probe tip built-in into gage

Probe tip radius: 2 mm, Probe tip material: Hard metal

Measurement interval

More than 140 measurements per minute

Display of measurement acquisition

Audible by a short beep and visual by colored illuminated LED; gage variants Enhanced-USB and High-USB: additional by gage vibration

Display for limit monitoring

- Limit violation: Audible by 2 short beeps and visual by red illuminated LED; gage variants Enhanced-USB and High-USB: additional by gage vibration
- Measured readings between the limits: Audible by 1 short beep and visual by green illuminated LED; gage variants Enhanced-USB and High-USB: additional by gage vibration

Languages

German and English

Presettings for batches

Only available in gage variants High-USB and Enhanced-USB

Each new batch is created with a preset measurement unit and resolution for the displayed measured value. For the gage variants High-USB and Enhanced-USB with upgrade Batch Template Package Corrosion, the batch template package is also preselected here. You can adapt these presettings to your requirements. However, you can also change the unit of measurement and the resolution for the measured value display at any time in the batch that has already been created.

Display

- Graphic display with automatic flipping measuring presentation view (deactivatable) to read measurement results in many different gage positions
- Setting of brightness and contrast (definable for Office, Sunlight and Night)

Data transfer

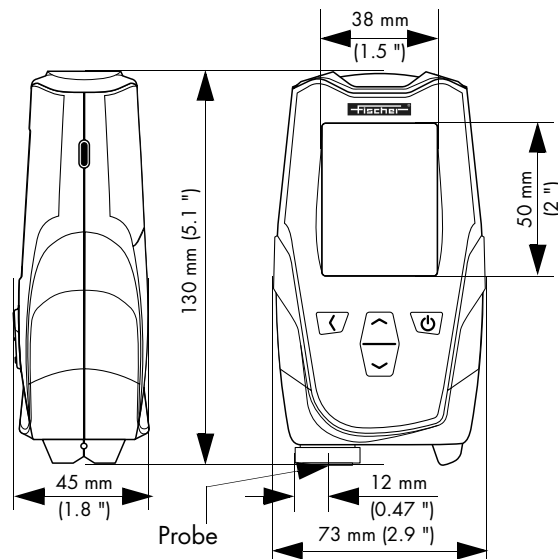
- USB: Data transfer of single readings to a PC, Data import to MExcel via PC-Datex software; You can gratis download the PC-Datex program from Fischer-Homepage

General Features

USB port	2.0 Type C <ul style="list-style-type: none">• For service purpose• For connection to PC for data transfer, max. cable length: 3 m (118 inches)
Admissible ambient temperature range during operation	0 ... +60 °C
Surface temperature	max. + 60 °C
Protection class	IP65
Weight (incl. batteries)	about 251 g
Power supply	<ul style="list-style-type: none">• 2 batteries: Mignon, Alkaline or Lithium, LR6 - AA, 1.5 V• 2 rechargeable batteries: Mignon, NiMH, HR6 - AA
Battery life Specifications valid for +20 °C (+68 °F) ambient temperature and Alkaline batteries used	> 8 h for continuous measuring, brightness set to sunlight

Dimensions

Gage



* The following specifications are valid for measurements by using the Single reading measurement mode

The values for measurement range, trueness, repeatability precision and measurement errors 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).

Measurement Ranges*

Steel, iron, cast iron base materials (FE)

Non-ferrous metal base materials (NF)

0 ... 2500 µm (98.4 mils)

0 ... 2000 µm (78.7 mils)

Trueness*

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

Steel, iron, cast iron base materials (FE)

Non-ferrous metal base materials (NF)

0 ... 75 µm: ≤ 1.5 µm
 75 ... 1000 µm: ≤ 2 % of nominal value
 1000 ... 2500 µm: ≤ 3 % of nominal value

0 ... 50 µm: ≤ 1 µm
 50 ... 1000 µm: ≤ 2 % of nominal value
 1000 ... 2000 µm: ≤ 3 % of nominal value

0 ... 2.9 mils: ≤ 0.06 mils
 2.9 ... 39.4 mils: ≤ 2 % of nominal value
 39.4 ... 98.4 mils: ≤ 3 % of nominal value

0 ... 2 mils: ≤ 0.04 mils
 2 ... 39.4 mils: ≤ 2 % of nominal value
 39.4 ... 78.7 mils: ≤ 3 % of nominal value

Repeatability Precision*

Based on Fischer factory calibration standards, 5 single readings per standard and 20 °C (68 °F) for specimen and ambient temperature

Steel, iron, cast iron base materials (FE)

Non-ferrous metal base materials (NF)

0 ... 50 µm: ≤ 0,25 µm
 50 ... 2500 µm: ≤ 0,5 % of reading

0 ... 100 µm: ≤ 0,5 µm
 100 ... 2000 µm: ≤ 0,5 % of reading

0 ... 2 mils: ≤ 0.01 mils
 2 ... 98.4 mils: ≤ 0.5 % of reading

0 ... 3.9 mils: ≤ 0.02 mils
 3.9 ... 78.7 mils: ≤ 0.5 % of reading

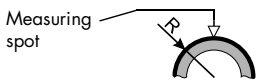
Influence*

Steel, iron, cast iron base materials (FE)

Non-ferrous 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".

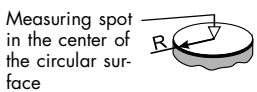
Curvature (R), measurement error from nominal value with reference to master calibration on flat surface



No measurement error within the trueness as of R = 75 mm ± 5 mm (2.95 " ± 0.2 ")
 Measurement error 10 % for R = 15 mm ± 1 mm (0.59 " ± 0.04 ")
 A minimum of R = 2 mm (0.08 ") is required

No measurement error within the trueness as of R = 550 mm ± 60 mm (21.65 " ± 2.36 ")
 Measurement error 10 % for R = 109 mm ± 8 mm (4.29 " ± 0.32 ")
 A minimum of R = 2 mm (0.08 ") is required

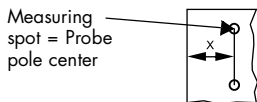
Edge distance (R), specification from probe tip center, measurement error from nominal value



A minimum of R = 12 mm (0.47 ") is required
 No measurement error within the trueness

A minimum of R = 12 mm (0.47 ") is required
 No measurement error within the trueness

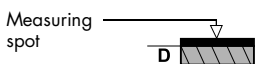
Edge distance (X), specification from probe tip center, measurement error from nominal value



A minimum of X = 12 mm (0.47 ") is required
 No measurement error within the trueness

A minimum of X = 12 mm (0.47 ") is required
 No measurement error within the trueness

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



Steel, iron, cast iron base materials (FE)
 No measurement error within the trueness as of D = 0.86 mm ± 0.09 mm (33.85 mils ± 3.54 mils)
 Measurement error 10 % for D = 0.44 mm ± 0.02 mm (17.32 mils ± 0.79 mils)

Copper base material (Cu)
 No measurement error within the trueness as of D = 0.09 mm ± 0.009 mm (3.54 mils ± 0.35 mils)
 Measurement error 10 % for D = 0.035 mm ± 0.002 mm (1.38 mils ± 0.079 mils)

Influence*

	Steel, iron, cast iron base materials (FE)	Non-ferrous metal base materials (NF)
<p>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".</p>		
Base material	<p>Steel, iron, cast iron base materials (FE)</p> <p>Influence on base material (FE) permeability in regard to Fischer calibration standards (master calibration): 137 FN ± 0.2 FN Measurement error of 10 % for ferrite content of 122 FN ± 1.1 FN</p>	<p>Non-ferrous metal base materials (NF)</p> <p>Influence of the el. conductivity of the base material (NF) in the range from 30 to 100 % IACS: Measurement error ≤ 2 %, valid for the total measurement range</p>
Temperature	no influence	<p>In a range of ± 20 °C: ± 3 µm In a range of ± 68 °F: ± 0.12 mils</p>

Scope of Supply

Gage; 2 batteries; USB cable type C to type A (1 m (39.4 inches)); guideline; calibration set suitable to gage type

- Calibration set for gage type FE
 (Test plate NF/FE (603-477) and 3 calibration foils (ca. 25 µm/0.98 mils (505-953), 75 µm/2.95 mils (505-955) and 540 µm/21.26 mils (505-965))
- Calibration set for gage type FE+NF
 (Test plates NF/FE (603-477) and ISO/NF (603-478) as well as 3 calibration foils (ca. 25 µm/0.98 mils (505-953), 75 µm/2.95 mils (505-955) and 540 µm/21.26 mils (505-965))

Order Information

Gage	MMS Inspection DFT					
Variant	Order No.	Type	Batch Template Package	Interface	Memory capacity	Upgrade
Start	606-026	FE	Industrial	USB	max. 10,000 measured readings in 1 batch	
	606-029	FE+NF				
Enhanced-USB	606-027	FE	Industrial	USB	250,000 measured readings in 2500 batches	●
	606-030	FE+NF				
High-USB	606-028	FE	Industrial + Corrosion	USB	250,000 measured readings in 2500 batches	●
	606-031	FE+NF				

Upgrade Packages for Variants Enhanced-USB and High-USB

Upgrade Packages	Order No.	Suitable for gage type (variants)
Gage type FE+NF	606-037	FE (Enhanced-USB and High-USB)
Batch Template Package Corrosion	606-039	FE and FE+NF (Enhanced-USB)

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