

# Measurement of the Ferrite Content in Austenitic and Duplex Steel

Chemical, utility and other processing plants are often exposed to heat, aggressive media and high pressure. These circumstances require rust and acid resistant steel that can withstand mechanical stress at high temperatures. If the ferrite content is too low, the weld is susceptible to cracking under

heat, if the ferrite content is too high, the weld loses its strength and corrosion resistance. For duplex steel, a lack of ferrite in the area of the weld seam is an indicator of susceptibility to cracking under tension or vibration.



# Features, Measurement Method, Application Example

## Features

- Non-destructive measurement of the ferrite content in a range of 0.1 to 110 FN or 0.1 to 80% Fe in austenitic and duplex steel.
- Simple measurement, even for complex specimen geometry.
- Battery or line operation.
- Large LCD display for characteristic measurement and statistical values as well as pictograms for status display and text lines for operator instructions.
- RS232 interface for data transfer to PC or printer.
- Automatic measurement acceptance at probe contact or with external start.
- Acoustical signal at measurement acceptance.
- Statistical evaluation of test series and display of min., max. and mean value, number of measurements, standard deviation as well as date and time.
- Outlier control for automatic elimination of erroneous measurements
- Input of specification limits.
- Free-running display with additional presentation of the measurement as analog bar between selected specification limits.
- Memory capacity for max. 10,000 measurements in 1,000 blocks in up to 100 applications. Fixed or free block size selection.
- Measurement units selectable between WRC-FN and %Fe.
- 5 Display languages selectable.
- No influence of the electr. conductivity of the specimen.
- Only one calibration required for the entire practically relevant measurement range from 0.1 to about 90 FN. Measurement accuracy according to ANSI/AWS A4.2M/A4.2:1997 standard.
- Calibration with standards traceable to TWI secondary standards or with customer-specific standards.

## Standard-Compliant Measurements

The FERITSCOPE® MP30 is suitable for measurements according to the Basler Standard or according to DIN 32514-1.



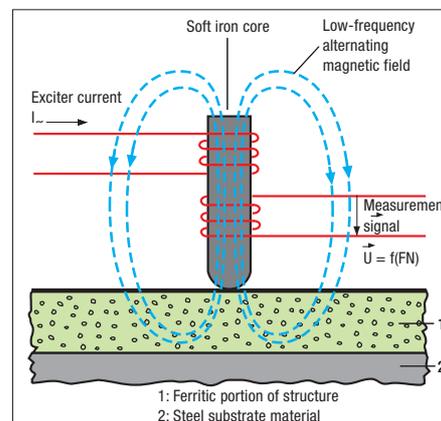
FERITSCOPE® MP30 on support stand with measurement probe EGAB1.3-Fe and printer FMP3040.



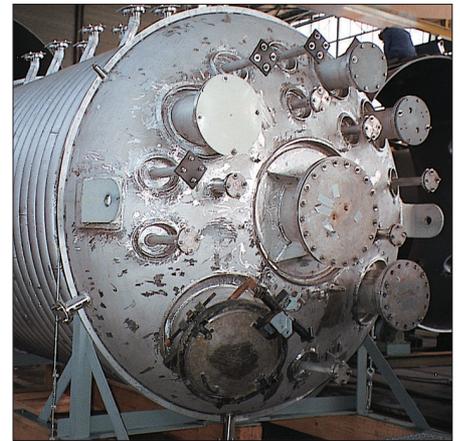
The portable FERITSCOPE® MP30 together with a probe, e.g., EGAB1.3-Fe, 2 calibration standard sets, the line adapter and the charger fit in the practical carrying case.

## Measurement Method

The FERITSCOPE® MP30 measures according to the magnetic induction method. A magnetic field generated by a coil enters into interaction with the magnetic components of the specimen. The changes in the magnetic field induce a voltage proportional to the ferrite content in a second coil. This voltage is then evaluated. All magnetic components of the otherwise non-magnetic structure are recognized, that is, in addition to delta ferrite and other ferritic components transformation martensite is also recognized.



Basic operation of the magnetic induction measurement method, using the example of an austenitic plating.



## Application Example

Increasingly, the chemical and petrochemical industries use duplex steel, e.g., for the reactor made of high corrosion resistant duplex stainless steel shown above. A ferrite deficiency in the weld beam may lead to cracks under the influence of tension or vibration. However, when welding duplex steel, it is easy to bring the ferrite content in the welding area to unfavorable values, either because of unsuitable welding additives or through wrong heat application or removal. Only a measurement on site can ensure that the processing steps did not change the optimal ferrite content resulting in a decrease of the mechanical or corrosion resistant properties.

## Ordering Information

Portable instrument	Order no.
FERITSCOPE® MP30 Shipping content: protective cover, case, battery and operator manual	602-815

Probes	Type	Order no.
	EGAB1.3-Fe Cable length 1.5 m (59")	602-221
	EGAB1.3L-Fe Cable length 5 m (197")	602-608
	EGABI1.3-150-Fe Cable length 1.5 m (59") L = 150 mm (5.9")	602-706
	EGABI1.3-260-Fe Cable length 1.5 m (59") L = 260 mm (10.2")	602-392
	EGABW1.3-Fe Cable length 1.5 m (59")	602-304

Calibration standard sets	Order no.
Corrective calibration standard set KAL-NS %Fe-WRC 0.3/10 includes standards with about: 0.4, 2 and 9 FN (0.4, 2.5 and 10.5 %Fe)	602-279
Corrective calibration standard set KAL-NS %Fe-WRC 1.5/30 includes standards with about: 2, 9 and 33 FN (2.5, 10.5 and 30 %Fe)	602-239
Corrective calibration standard set KAL-NS %Fe-WRC 10/80 includes standards with about: 9, 33 and 110 FN (10.5, 30 and 80 %Fe)	602-277
Master calibration standard set KAL-MS %Fe-WRC includes standards with about: 0.5, 2, 13, 33, and 90 FN (0.5, 2.5, 14.5, 30 and 63 %Fe)	602-776

Accessories	Order no.
NiCd battery 9V	600-225
Charger for NiCd battery	600-226
Line adapter MP30/40 (9V/220VAC)	602-819
Support stand for portable instrument	600-025
Carrying box MP for portable instrument	602-891
Carrying case MP0D/30/40	602-120
Carrying bag for portable instrument and printer FMP3040 or FMP3041	
Printer FMP3040, 230 VAC, thermal printer	602-890
Printer FMP 3041, 110 VAC, thermal printer	602-889
Printer paper for printer FMP3040 or FMP3041, VE 10 rolls	600-410
Interface connecting set MP 3 m (118") cable length and adapter part AT/XT	602-341
Software MP-NAME, English PC software for assigning names of applications and blocks	602-966
Software PC-Datex, German PC software for transferring data from instrument to Excel spreadsheet	602-465
Software PC-Datacc, German PC software for transferring data from instrument to Access database	603-028

## Calibration/Standards

To obtain comparable results, the instruments must be calibrated with standards that are traceable to internationally accepted secondary standards. For this reason, the IIW (International Institute of Welding, UK) developed secondary standards that have been established by TWI (The Welding Institute, UK) according to methods described in DIN EN ISO 8249 and ANSI/AWS A4.2.

Helmut Fischer offers certified calibration standards for the corrective and master calibration that are traceable to the TWI secondary standards. The standards in the Fischer calibration standards sets carry both the ferrite numbers FN and the %Fe values.

Influences of the component geometry (strong curvature, thickness of ferrite-containing coating, etc.) can be taken into account through corrective calibrations with customer-specific calibration standards or with correction factors (included with shipment). Normalization and corrective calibration are stored application-specific in the respective application memory of the instrument.



Fischer calibration standard set with certificate.



TWI secondary standard set.