Training Session On Feritscope® MP30

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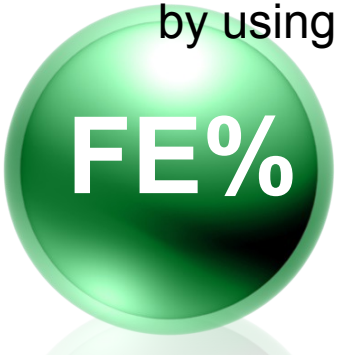
UNIT OF MEASUREMENT

FN (Ferrite Number) is an improvement over FE% (Percent ferrite)

by Increasing accuracy and consistency

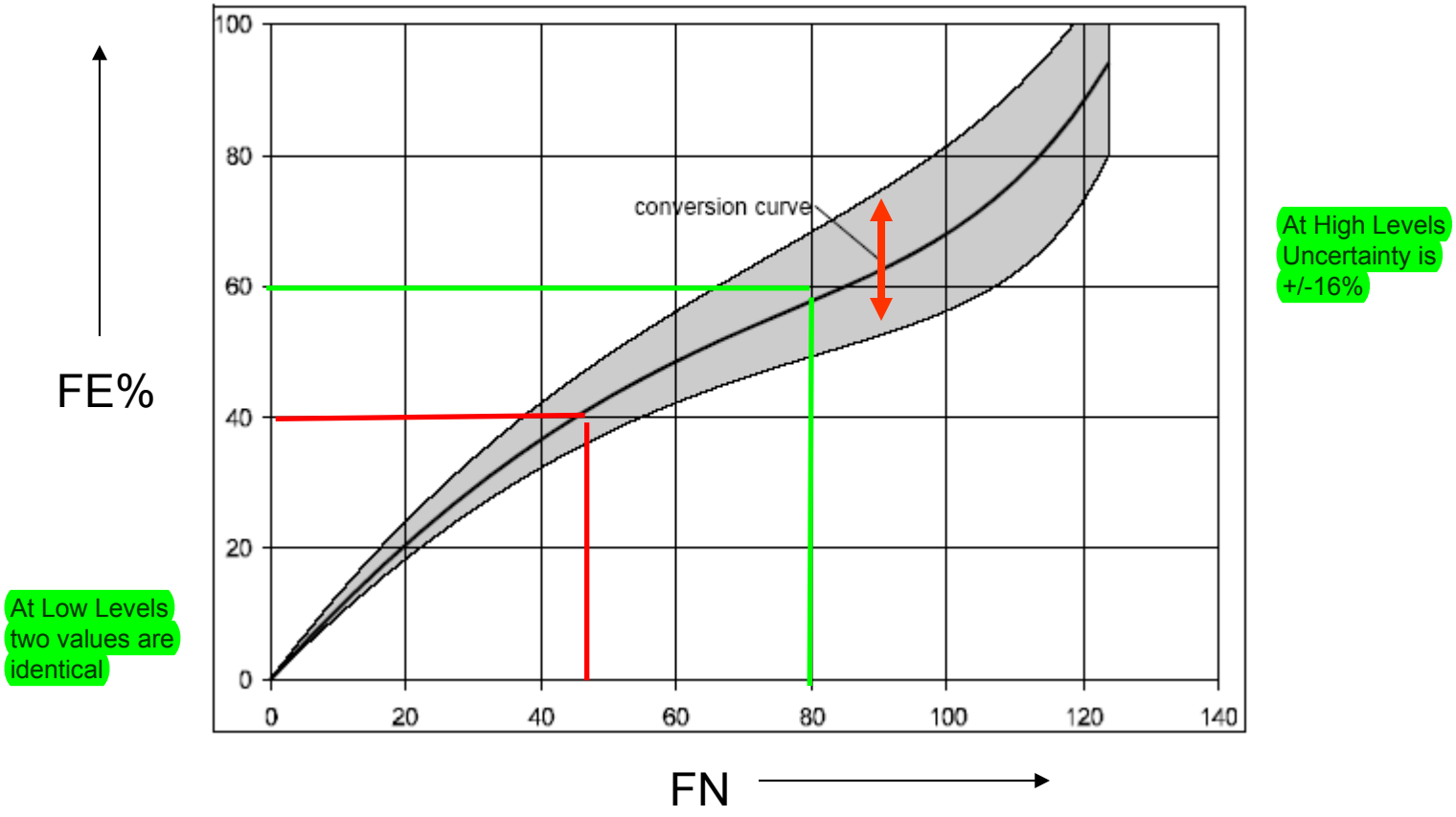
It is an arbitrary standard to measure ferrite in S.Steels

FE% (Percent ferrite) is computed by conversion of FN to FE% by using conversion curve.

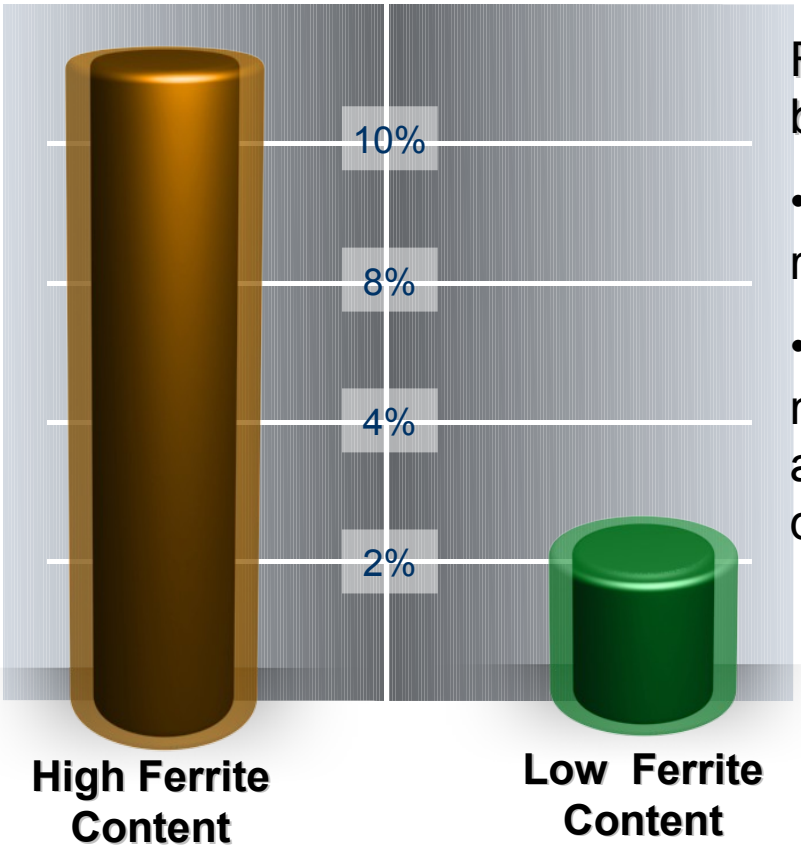


At low levels FE% and FN are identical but at high levels two values diverge significantly

CONVERSION OF FN TO FE%



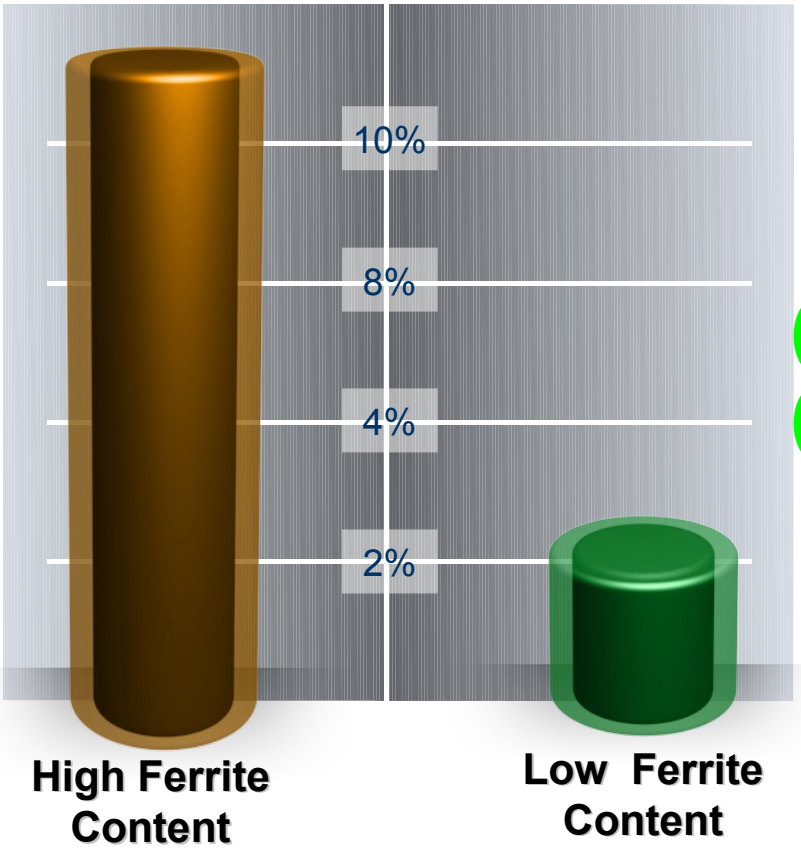
Importance of Ferrite Content



Ferrite contents in Stainless steels could be harmful as well as useful.

- **High ferrite content** can lower corrosion resistance at high temperature.
- **Ferrite levels greater than 10%** - weld metal transforms to brittle sigma phase and results in reduction of weld metal ductility and impact strength.

Importance of Ferrite Content



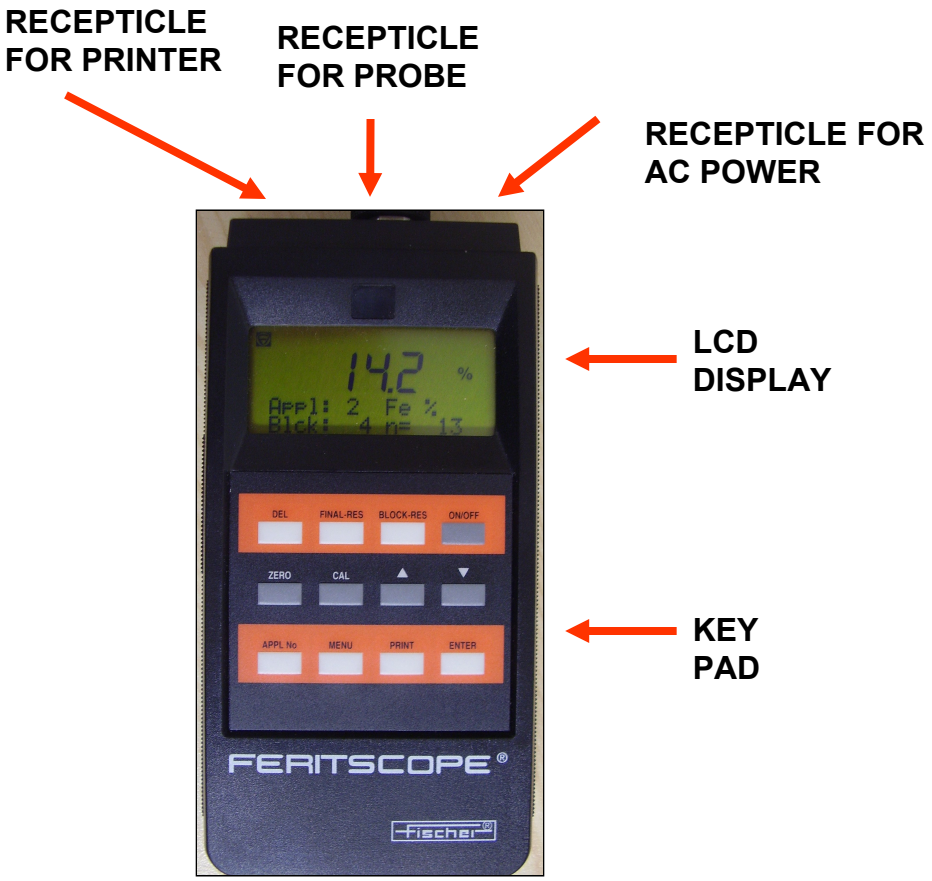
In Benefits- a ferrite level of at least **3FN** will eliminate fissuring (starting points of cracks) in weld metal deposited by E308,E308L,E316,E316L

4FN- recommended for E309

5FN- for E318 and **6FN** in E347

As per BP19-2-1 ferrite levels between 4 and 10% are called for in austenitic stainless steels

Ferrite Scope MP30 Equipment and Accessories

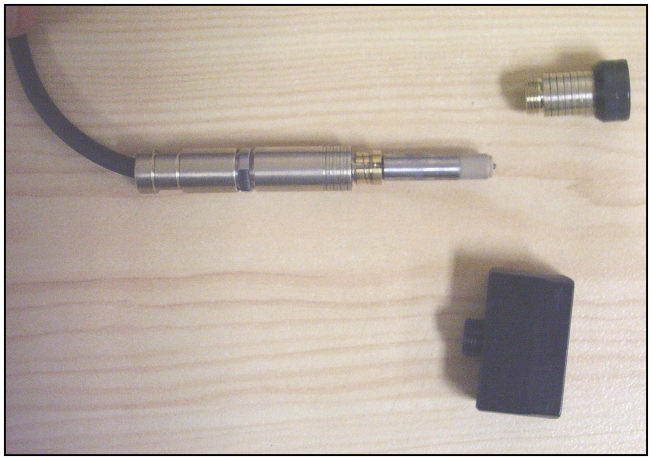


The FERITSCOPE® MP30

is suitable for ferrite content measurement in

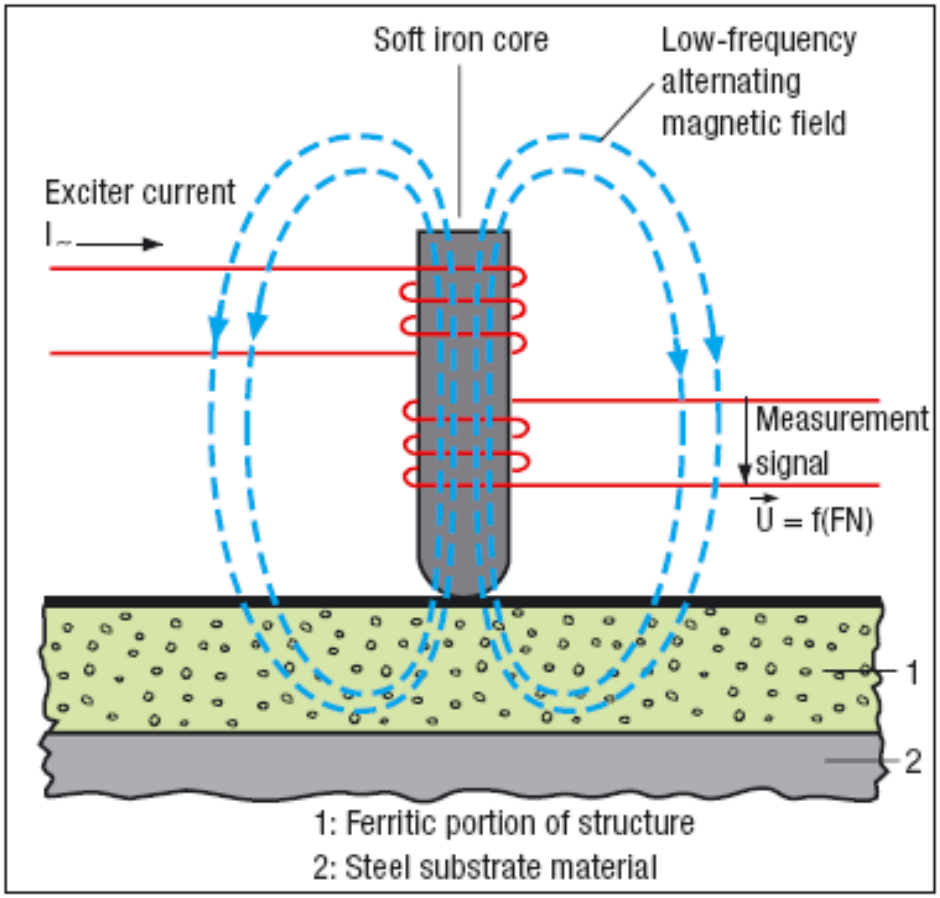
- Weld metal
- Clad layers of austenitic or Duplex stainless steel
- Determination of the ratio of martensite in austenitic stainless steels.

Ferrite Scope MP30 Equipment and Accessories



- PROBE WITH CONNECTORS
- BATTARY
- CALIBRATION SAMPLES

Operating Principle



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

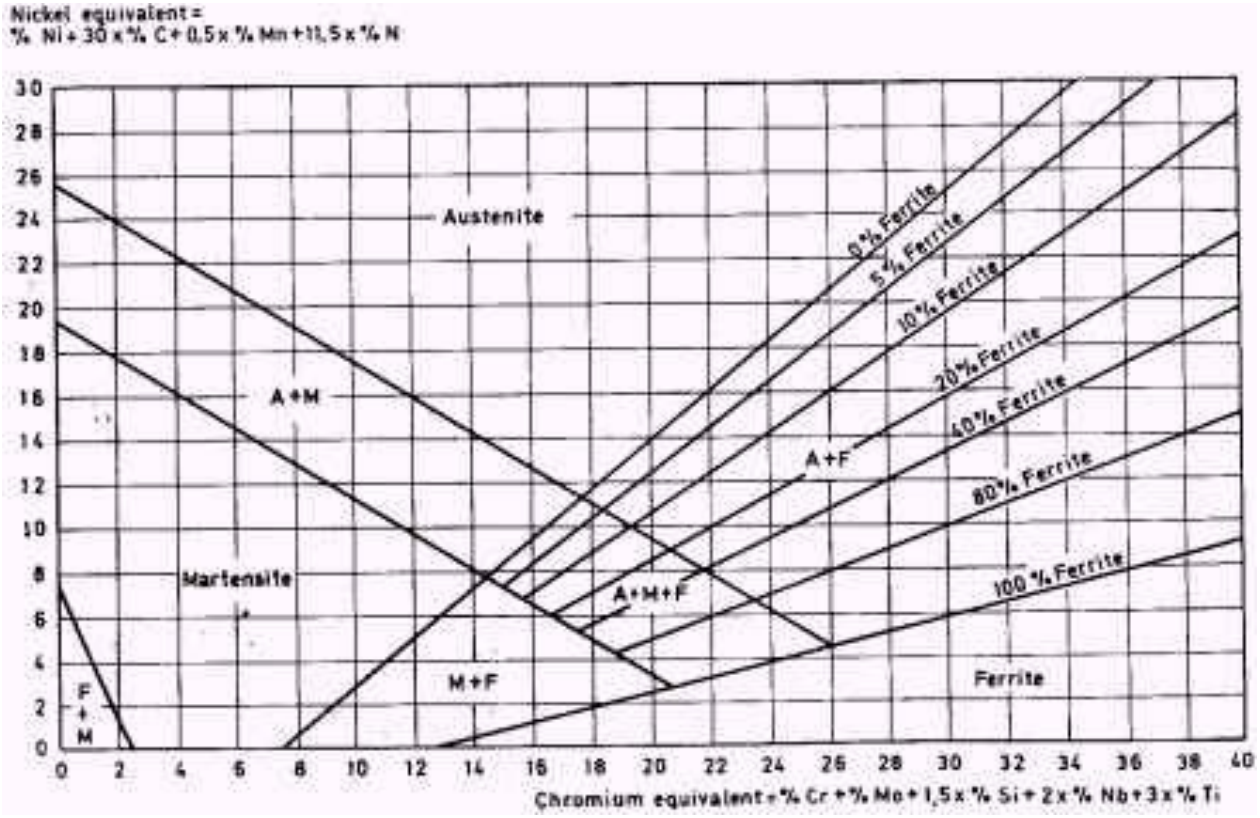
Influence of Allowing Elements (Schaeffler diagram)

Austenite-forming elements

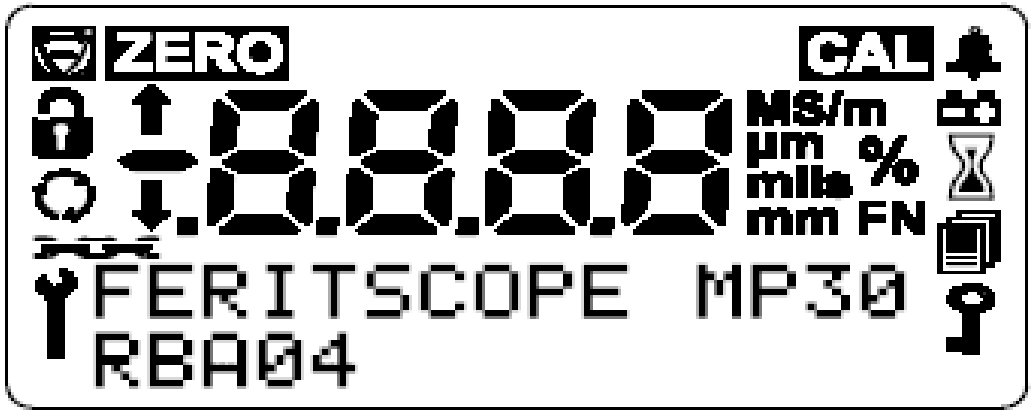
The elements **C**, **Ni** and **Mn** are the most important ones in this group

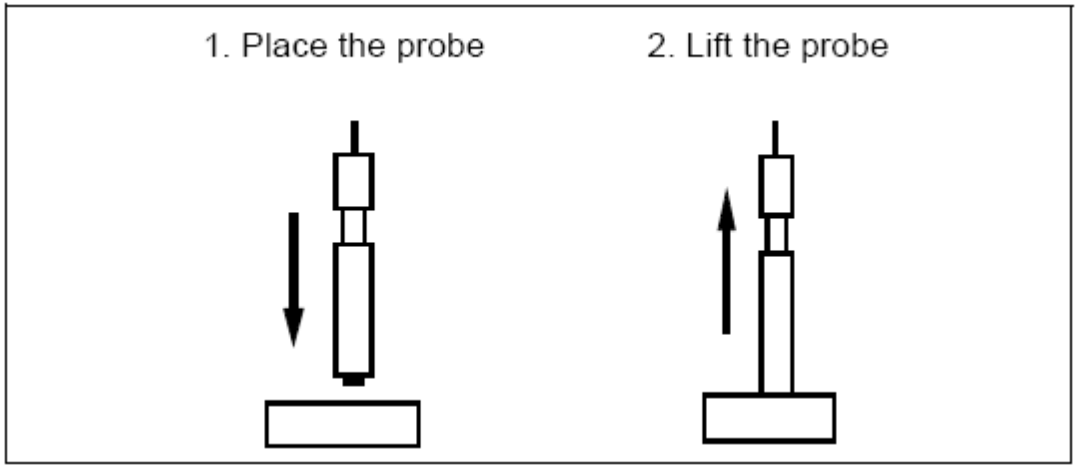
Ferrite-forming elements

The most important elements in this group are **Cr**, **Si**, **Mo**, **W** and **Al**.



Equipment Display and Taking Measurement





The probe has to be lifted at least 50 mm (2") from the measuring object between readings.
Do not hover above the measuring object with the probe!

Performing a Measurement:

1. Switch the instrument on: **ON/OFF**
2. Select the desired application:
   APPL No ➛ ▲ , ▼ ➛ **ENTER**
3. Measuring: Place the probe vertically on the measuring object

Deleting Erroneous Measurements:

Single measurements during measurement:
DEL (last value) ➛ **DEL** (previous value) ➛ ...

All measurements of the last open block:
BLOCK-RES ➛ **DEL**

All measurements of the current application:
FINAL-RES ➛ **DEL** ➛ **DEL**

Overwriting Erroneous Measurements:

1. Select the desired block: **BLOCK-RES** ➛ ▼ ➛ ▼, ▲ ➛ ... (Please note: ▲ in the last block exits the evaluation!)
2. Select the erroneous measurement:
   MENU ➛ ▲ ➛ ▲ , ▼ ➛ ...
3. Overwrite the erroneous measurement:
   DEL ➛ perform measurement ➛ **MENU**
4. Exit the evaluation:
   ▲ ➛ ... ➛ ▲ (continue the current block) or **ENTER** (start a new block)

Applications:

Creating an Application:

1. Select an application:
   APPL No ➛ ▲ , ▼ until [Not opened] appears ➛ **ENTER**
2. Perform several measurements on the base ➛ **ENTER**

Deleting an Application:

1. Select the application to be deleted:
   APPL No ➛ ▲ , ▼
2. Delete the application: **DEL** ➛ **DEL**
3. Select another application:
   ▲ , ▼ ➛ **ENTER**

Overwriting an Application:

1. Select the application to be overwritten:
   APPL No ➛ ▲ , ▼ ➛ **ZERO**
2. If [New probe ?] appears: **DEL**;
   otherwise: after step 1 immediately step 4
3. If [Delete measure ?] appears:
   DEL (deleting the measurements) or
   ENTER (keeping the measurements);
   otherwise: after step 2 immediately step 5
4. Perform several measurements on the base ➛ **ENTER**

Normalization / Corrective Calibration:

Normalization:

ZERO ➛ perform several measurements on the base ➛ **ENTER**

Corrective Calibration:

1. **CAL** ➛ perform several measurements on the base ➛ **ENTER**
2. Perform several measurements on standard 1
3. Set the ferrite content: ▲ , ▼ ➛ **ENTER**
4. If a 2/3 point calibration is desired: Perform several measurements on standard 2 ➛ set the ferrite content: ▲ , ▼ ➛ **ENTER**; otherwise: after step 3 immediately step 6
5. If a 3 point calibration is desired: Perform several measurements on standard 3 ➛ set the ferrite content: ▲ , ▼; otherwise: after step 4 immediately step 6
6. **ENTER**

Measurement Accept Signal:

Enabling: **ON/OFF + ▲**
Disabling: **ON/OFF + ▼**

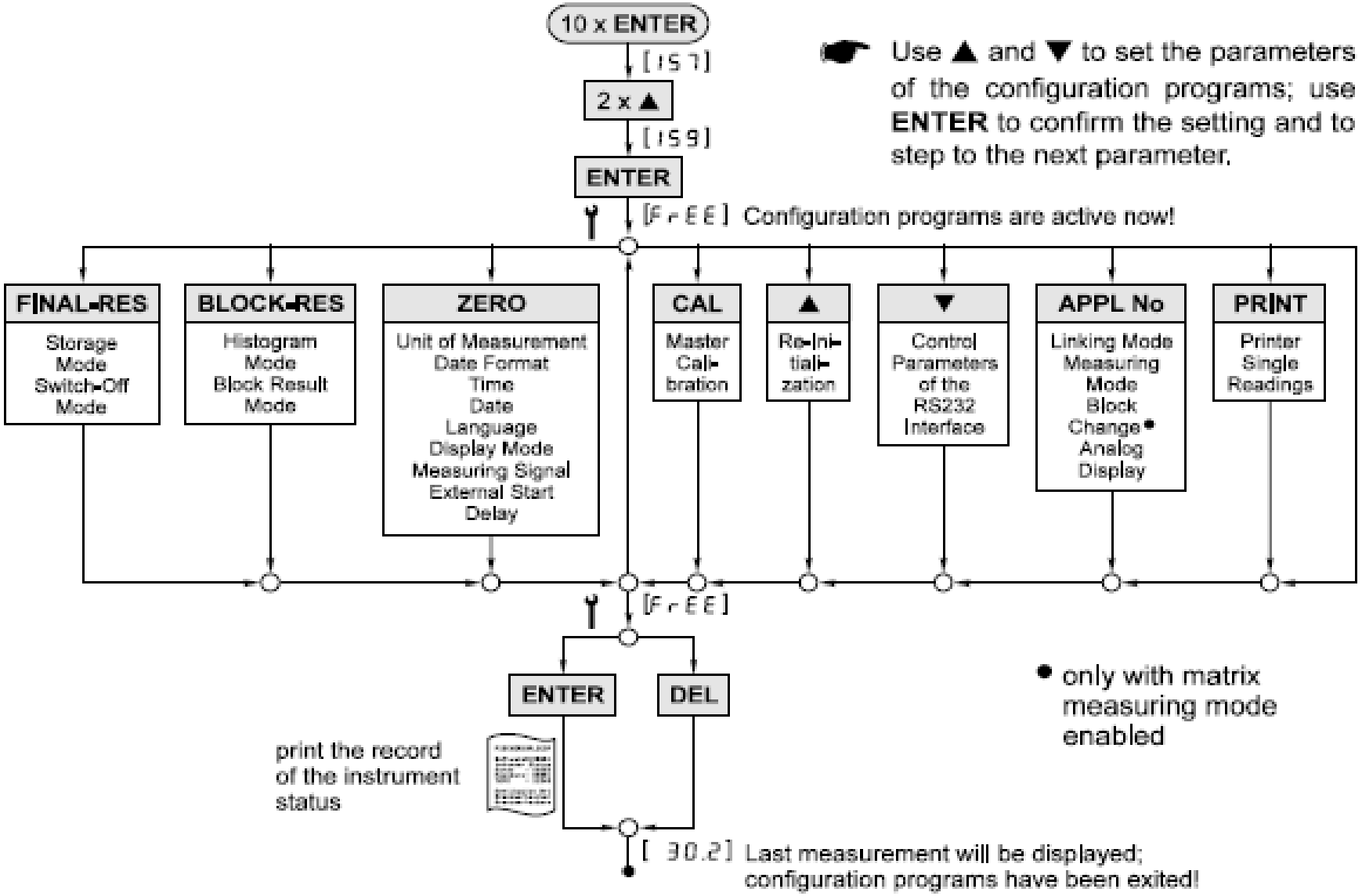
Setting the Date and Time:

ON/OFF + ZERO → ▲, ▼ → ENTER → ...

Restricted Operating Mode:

Enabling: **ON/OFF + DEL** (🔒 appears with restricted operating mode enabled)
Disabling: **ON/OFF + ENTER**

Configurations Program Overview



Equipment and Instrument Safety

- Avoid excessive hot operating environments. Temperature easily rise above 60C in direct sunshine. Storage temperature (5 to 60C)
- Do not place the probe on hot surfaces (0 to 45C)
- Avoid direct contact with fluids. Danger of short circuit.
- Equipment is not acid resistant.
- Protect instrument from static charges.
- Avoid hard impacts on probe and equipment
- Place the probe rapidly but gently on surface of the material to be inspected
- To reduce wear and tear on calibration standard, use them only for normalization and corrective calibration and not for test measurements.
- Don’t use scratch the calibration standards. Corroded, soiled or scratched standards should be replaced with new ones.

Correction Factors

- The following factors effect the ferrite content measurement with the ferrite scope MP30

  - Curvature of the measuring object
  - Thickness of the measuring object
  - Layer thickness
  - Distance of the measuring position to the edge.

The effects of these factors can be corrected for by multiplying he measured ferrite content with the corresponding correction factors

$$Fe_t = Fe_m \cdot correction\ factor$$

Fe_t true ferrite content
Fe_m measured ferrite content

Correction Factor Is Required?

Generally, a correction of these influences is required only if:

- the diameter of the curvature is smaller than **50 mm (2")**

(for measuring objects with convex curvature)

or

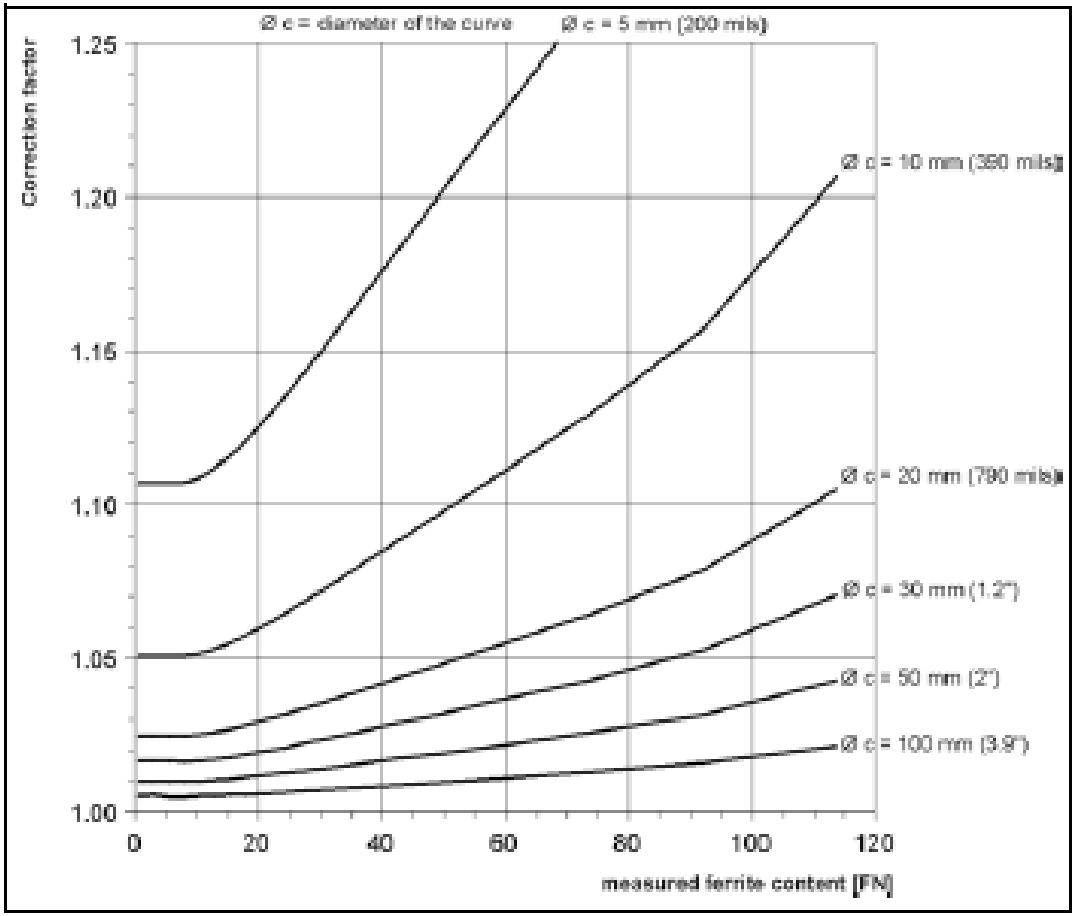
- smaller than **80 mm (3.2")** (for measuring objects with concave curvature),

or

- the thickness of the measuring object is smaller than **2 mm (80 mils),** or the layer thickness is smaller than **2 mm (80 mils),** or

- the distance of the measuring position to the edge is smaller than **2 mm (80 mils).**

Correction Factor Curve



$$Fe_t = Fe_m \cdot correction\ factor$$

Fe_t true ferrite content

Fe_m measured ferrite content