

KORMAG MAGNETIC SCANNER

Tank bottom testing with the magnetic flux leakage (MFL) method

SCANNER DESIGN AND PRINCIPLE OF OPERATION

1. Principle of magnetic measurement

The KORMAG magnetic scanners are used for testing the bottoms of the tanks made of the steel with magnetic properties. The wall thickness measurement is based on the magnetic flux leakage MFL (*Magnetic Flux Leakage*) method.

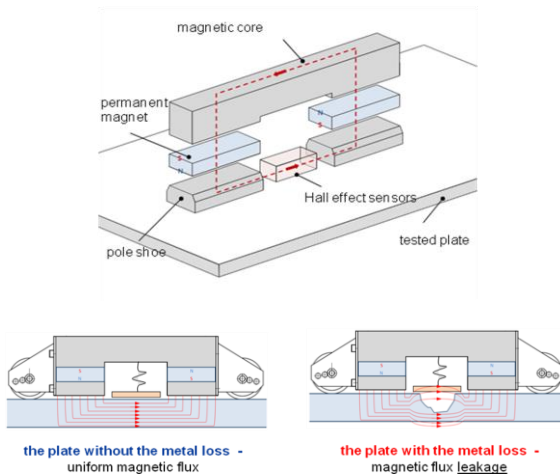
The MFL method involves the saturation of the wall with a strong magnetic field and simultaneous measurement of the induction components B in its close vicinity.

A defect causes a local flux leakage and the leakage value depends on the defect volume.

2. Design of the scanner measuring system

The KORMAG scanner is a mobile measuring trolley which consists of the following parts:

- magnetizing system,
- measuring system,
- control and power supply electronic module.



Principle of operation of the KORMAG magnetic scanner

Depending on the scanner model, the **magnetizing system** consists of a varying number of magnetic cores built on the basis of strong neodymium magnets which via steel pole shoes induce a strong magnetic field in the tested wall which causes its magnetic saturation.

The **measuring system**, featuring the Hall effect sensor matrix, measures and records in the unit's internal memory two induction vector components: parallel (B_x) and perpendicular (B_z) to the tested plate.

The measurement and analysis of the two flux leakage components allow to determine the size and location of defect.

The **control and power supply electronic module** controls the measuring process, records and transmits the data measured during the inspection run to the internal unit's memory (flash card).

The power supply of the scanner measuring system and the control module which comprises 3 lithium batteries ensures about 70 hours of continuous operation of the scanner.

TYPES AND USE OF THE KORMAG SCANNERS

1. KORMAG MSC02

16 measuring channels

Small size of the scanner allows the measurement in the poorly accessible locations in the tested facility, i.e. near the obstacles on the tank bottom, at the bottom edges, near the side walls.



2. KORMAG MSC04

36 measuring channels

Due to the measuring strip width, it is suitable for testing large flat steel surfaces.



3. KORMAG MSC07

48 measuring channels

An onboard computer allows displaying and analysing data during inspection.

An electric drive gives high measurement efficiency.



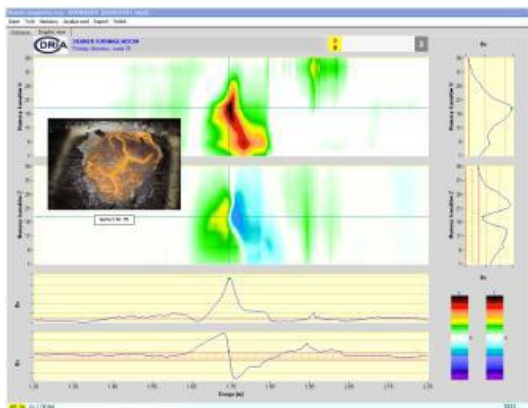
MFL INSPECTION SOFTWARE

Each of the presented models has its own version of the MFL inspection software which performs the following functions:

- remote control of the measuring process** (by the USB connection),
- data transmission/ saving** on the computer hard disk (USB),
- presentation of the two leakage field components** (B_x and B_z);
 - a) colour maps (C-scan) for all measuring channels
 - b) cross sections (B-scan) for any of the channels.
- analysis of measured data** based on the neuron network structures to determine the actual size of detected defects.

TECHNICAL SPECIFICATION OF THE KORMAG MAGNETIC SCANNERS

Parameter	KORMAG MSC02	KORMAG MSC04	KORMAG MSC07
No. of measuring channels	16	36	48
Measuring path width [mm]	80	180	300
Area of one measuring point [mm ²]	5.0	5.0	6.25
Min. detectable depth of the defect [% WT] (detection threshold for the dia 12.6 mm spherical defect)	20	20	20
Accuracy of the defect depth measurement	+/- 0.2 WT	+/- 0.2 WT	+/- 0.2 WT
Wall thickness range [mm] (allowing the detection and measurement of the defect depth)	12	12	17
Maximum wall thickness [mm] (allowing detection of defects)	17	17	20
Optimum measuring speed [m/s]	0.5	0.5	0.5
Measuring capacity (8h)	100 m	180 - 200 m ²	300 - 400 m ²
Power supply	3 lithium batteries (3.6 V /14 Ah)	3 lithium batteries (3.6 V /14 Ah)	2 gel batteries (rechargeable)
Drive	manual	manual	assisted by electric motor
Continuous operation [h]	70	70	70



Typical magnetic imaging of the detected defect with the MFL scanner software



KORMAG MSC04 tool during an inspection run



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