# KOERZIMAT 1.097 MS

MS measuring systems



proof.

# Content

# Application

In the production of steels, hard metals and powder metallurgical components, magnetic quantities such as coercive field strength HcJ, weight-specific saturation polarization σs and volume-specific saturation polarization Js correlate with a large number of important process parameters and material properties.

With the KOERZIMAT 1.097 MS, FOERSTER offers a measuring system for the precise, automatic and fast measurement of the weight-specific saturation polarization σs and the volume-specific saturation polarization Js. The largely geometry-independent (i.e. no predefined shape required) measurement in an open magnetic circuit allows complex-shaped samples in particular to be examined.

**Test method**
- Pull-off method according to IEC-60404-14

**Measured variable**
- Magnetic dipole moment j [Vsm] or [T*m³]
- Weight-specific (alternatively: mass-related) saturation magnetization density σs [T*m$^3$ /kg]
- Volume-specific saturation polarization Js [Tesla]
- Magnetic material content MA [%]
- Tungsten dissolved in cobalt W [%]
- Magnetic phase of a steel alloy MP [%]

**Applications**
- Testing of hard metals according to ASTM B886
- Control of the degree of sintering in the carbide sintering process
- Control of the carbon balance / degree of carbonization [Eta phase] in hard metals
- Determination of the tungsten content dissolved in cobalt in hard metals
- Determination of the free iron, cobalt or nickel content in powders / hard metals
- Determination of the saturation polarization Js in Tesla on soft magnetic circuit components
- Indirect density control on soft magnetic materials produced by powder metallurgy
- Research and development of new alloys and magnetic components
- Determination of the theoretical magnetic phase of a steel alloy according to Hoselitz
- Indirect determination of martensite / austenite / ferrite on stainless / duplex steels

# Mode of action and function

The KOERZIMAT 1.097 MS systems consist of a strong permanent magnet (Halbach system) with a large air gap for holding the samples.

A pneumatic or manual guide mechanism with a sample pusher positions the sample in the homogeneous field area of the magnet. When the sample is pulled out, the magnetic dipole moment j is measured using the Helmholtz measuring coils and a fluxmeter.

A precision balance is required to determine the weight/volume-specific saturation polarization. The mass of the sample is determined and automatically transferred to the KOERZIMAT controller. To determine the volume-specific saturation polarization Js, the volume or density of the sample is also required.

**Sample mass and sensitivity of the measuring system**
Depending on the measuring range, the following maximum sample masses can be measured:
-        Pure cobalt (Co)        16 g (standard)        40 g (extended)
-        Pure iron (Fe)        12 g (standard)        30 g (extended)

The lowest limit for the sensitivity of the sample mass:
-        Pure cobalt (Co)        0.5 mg (MS 31 × 69)        0.1 mg (MS 26 × 60)

# KOERZIMAT 1.097 MS 31 × 69

**Features**

- High sensitivity for small samples ≥ 1 g
- Very large sample chamber up to approx. 200 g sample mass
- Compact, lightweight design thanks to Halbach system
- Pneumatically actuated sample pusher
- Geometry-independent measurement
- Automatic slider compensation
- Holding and fixing the samples using test inserts
- Traceable calibration to national standards [PTB]
- Accessory kit with inserts for test recording
- Sample chamber approx. 41 × 58.5 × 23 mm
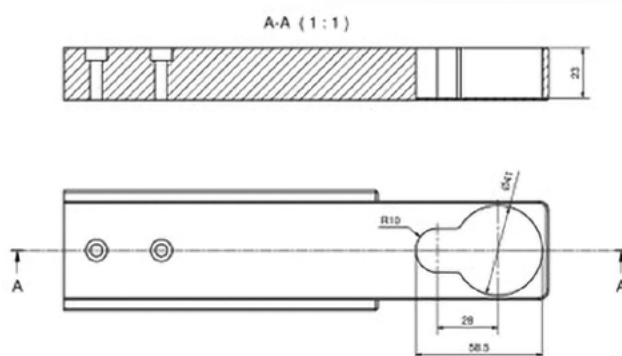
# KOERZIMAT 1.097 MS 26 × 60

**Features**

- Highest sensitivity for the smallest samples ⩾ 0.5 g
- Large sample chamber up to approx. 50 g sample mass
- Compact, lightweight design thanks to half-axis system
- Manually operated sample slide
- Sample pusher for round bars Ø 3–10 mm / 10–15 mm
- Geometry-independent measurement
- Automatic slider compensation
- Holding and fixing the samples using test inserts
- Traceable calibration to national standards [PTB]
- Accessory kit with inserts for test recording
- Sample space approx. 30 × 40 × 18 mm
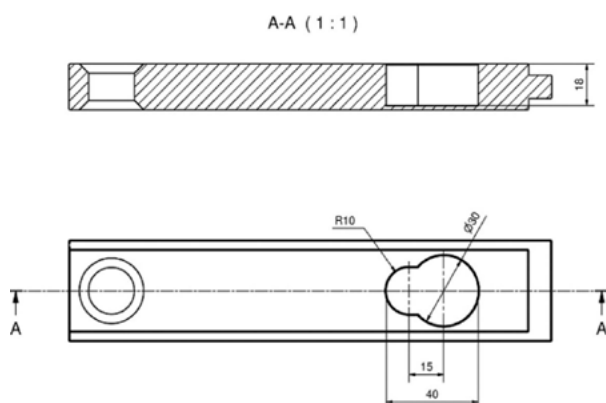
# KOERZIMAT Controller / Software MS

The compact KOERZIMAT controller with MS software forms a single unit as a display and user interface for measuring saturation polarization. The KOERZIMAT MS software runs under Windows Pro 10 (Windows 8 and 11), providing intuitive functionalities and thus positively influencing the workflow.

The data from all measurements are saved in database files (FOERSTER's own format from software version 6.0) and can be printed out in a report or exported as a text file for further processing.



**Features**

- User interface in the languages: German, English, Japanese
- WINDOWS 10 country settings / languages - switchable online
- Touchscreen operation
- Clearly structured display fields for measurement settings, results displayed as a list
- Measurement series curve, histogram, sorting groups, statistics
- Generating, printing, and exporting measured values / statistics
- Password-protected user levels for the administration of functions / user rights
- FOERSTER's own database format as software version 6.0, storage of measurement data and parameters
- Synchronization of the database with simultaneous MS and HCJ measurement
- Data export via data interface in XML format (from software version 6.1)
- Remote client program included in scope of delivery

# Technical Data

**KOERZIMAT 1.097 MS 31 × 69**

|  | Value |
|---|---|
| Display elements | 8 LEDs for status display |
| Largest test mass | approx. 200 g |
| Sample room dimensions (W × L × H) | 41 × 58.5 × 23 mm |
| Magnetic flux density (in the geometric center) | ⩾1,05 T |
| Homogeneous area | Ø = 32 mm, h = 21 mm |
| Temperature coefficient | $12.5 \times 10^{-11}$ Vsm/K ≈ 0.625 mg Co/K |
| Noise | $5 \times 10^{-11}$ Vsm ≈ 0.25 mg Co |
| Sensitivity | $1 \times 10^{-10}$ Vsm ≈ 0.5 mg Co<br>e.g. 1 g sample with 10 % cobalt content (100 mg) is 200 times higher than the sensitivity of the system |
| Measurement uncertainty for calibration with Ni standard | < 0.5 % of the measured value |
| Linearity (% of measuring range end value) | ± 0.1 % |
| Temperature range | +5 °C to +45 °C |
| Measuring time | approx. 10 s (without mass or weight determination) |
| LAN interface | 100 MBit |
| Interface I/O port | 15-pin (start button and 4 PLC inputs / outputs 24 V) |
| Power supply | Plug-in power supply 100 to 240 V, 50/60 Hz |
| Power consumption | approx. 2 W |
| Compressed air connection | via quick coupling on filter regulator unit 6 bar |
| Dimensions measuring system (W × H × L) | approx. 265 × 280 × 460 mm |
| Mass | approx. 29 kg |
| Protection class | IP53 |
| Test standards / test methods | IEC 60404-14 / ASTM B886 |

**KOERZIMAT 1.097 MS 26 × 60**

| | Value |
|---|---|
| Display elements | 8 LEDs for status display |
| Largest test mass | approx. 50 g |
| Sample room dimensions (W × L × H) | 30 × 40 × 18 mm |
| Homogeneous area | Ø = 26 mm, h = 16 mm |
| Magnetic flux density (in the geometric center) | ≥1,00 T |
| Temperature coefficient | $2.5 \times 10^{-11}$ Vsm/K ≈ 0.125 mg Co/K |
| Noise | $1 \times 10^{-11}$ Vsm ≈ 0.05 mg Co |
| Sensitivity | $2 \times 10^{-11}$ Vsm ≈ 0.1 mg Co<br>e.g. 1 g sample with 10 % cobalt content (100 mg) exceeds the sensitivity of the system by a factor of 1000 |
| Measurement uncertainty for calibration with Ni standard | < 0.5 % of the measured value |
| Linearity (% of measuring range end value) | ± 0.1 % |
| Temperature range | +5 °C to +45 °C |
| Measuring time | 3 s (without mass or weight determination) |
| Interface: LAN | 100 MBit |
| Power supply | Plug-in power supply 100 to 240 V, 50/60 Hz |
| Power consumption | approx. 2 W |
| Dimensions measuring system (W × H × L) | approx. 172 × 217 × 230 mm |
| Mass | approx. 13.9 kg |
| Protection class | IP 53 |
| Test standards / test methods | IEC 60404-14 / ASTM B886 |

## Standard function packages

**KOERZIMAT 1.097 MS 26 × 60**

consisting of:
- KOERZIMAT 1.097 MS 26 × 60 mm
- Accessory Kit 26 × 60

**KOERZIMAT 1.097 MS 31 × 69**

consisting of:
- KOERZIMAT 1.097 MS 31 × 69 mm
- Accessory Kit 31 × 69

**KOERZIMAT Controller + KOERZIMAT MS Software**

consisting of:
- 23.8" Full HD (1,920 × 1,080, 16:9) Touchscreen
- Processor: Intel Core i5-12500, 3,0 GHz
- RAM: 8 GB (1 × 8 GB) DDR4-Memory without ECC
- Hard Disk: 256 GB SSD
- Intel UHD Graphics 770
- 1 × DisplayPort, 1 × HDMI
- 1 × LAN, 1 × USB 3.2 Typ C, 4 × USB 3.2 type A
- Bluetooth, WLAN
- Optical mouse with USB cable
- Keyboard USB
- Language change
- Windows 10 Pro 64-bit
- KOERZIMAT MS software with dongle (compatible with Windows 8 and 11)

## Additional software option

**KOERZIMAT MS Software -Magnetic Phase-**

[Not included in the standard KOERZIMAT MS software]

## Calibration standards

**Calibration standard MS Nickel**

σs ≈ 690 × 10-7 T*m/kg³

with factory certificate

## Analytical balance / density kit

**MX204 analytical balance**
incl. draft shield - Make: METTLER TOLEDO
Weighing range: up to 220 g
Readability: 0.1 mg

**Density kit for MX204**
Make: METTLER TOLEDO

## Optional sample slides for KOERZIMAT 1.097 MS 26 × 60

**Sample pusher for round rods with Ø 3–10 mm**
**Sample pusher for round rods with Ø 10–15 mm**

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