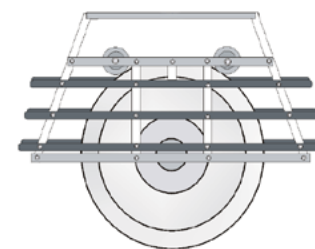




Operating Manual



MINDEN 1000 / MINDEN 1300
Magnetising Coil



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This operation manual must be kept at the place of work and be accessible to operators and maintenance personnel at all times.

Commission no. _____

Series no. _____

1. GENERAL SAFETY INSTRUCTIONS



WARNING: Strong magnetic fields can have serious health effects and can interfere with pacemakers and other medical implants, e.g. insulin pumps.

Observe the general and local regulations for the prevention of accidents.

Maintain a safe distance during magnetisation.



WARNING: UV Lamp

Ultraviolet radiation may result in damage to the skin and eyes. Do not look directly into a UV light source. Avoid skin contact. Wear skin and eye protection as needed.

UV lamps should only be operated:

- by trained personnel
- with undamaged and correctly mounted filter.
-



CAUTION: Heavy workpieces can crush hands. Do not reach between the magnetising coil and the test piece during lifting and lowering. Use appropriate hand protection.



CAUTION - FIRE HAZARD: Test oils are highly flammable.

- Use flame-retardant test oils with a flash point > 100 °C.
- Have fire extinguishers at hand,
- Keep magnetising contacts clean at all times,
- Ensure compliance with instructions provided by the test liquid manufacturer.

1.1 EXPOSURE TO MAGNETIC FIELDS



WARNING: Strong magnetic fields can have serious health effects.

- Observe the specified safety distances and all access and operating restrictions!
- Do not carry out any modifications to the magnetising coil!
- Do not take any magnetic or electronic data storage media near the device!



WARNING: this machine could interfere with pacemakers and other implanted devices, e.g. insulin pumps.

Do NOT go near this machine if you:

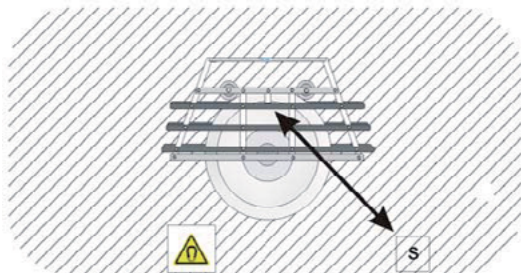
- have a pacemaker, insulin pump or other implanted device.
- are pregnant.
- under 16 years of age.

All personnel must maintain the following safety distances from the MINDEN coil during operation. **Safety distances are dependent on the output of the high current generator and the connected cables and components, and must be requested from the manufacturer of the high current generator.**

- People **without** body-implanted devices: _____ mm
- People **with** body-implanted devices (e.g. pacemakers): _____ mm

The grey shaded zone in the diagram below shows the area of increased exposure. The operator must determine, document and identify this area, and ensure that:

- only authorised and trained personnel are permitted in this areas, and
- the permitted values for short-time and partial body exposure are not exceeded, or
- personal protective equipment is worn to protect against exposure.



Important: magnetic fields can penetrate through walls!

The specified safety distance is determined by the limits for exposure to electromagnetic fields set out in:

- the accident prevention regulations BGV B11 dated June 2001, and
- the International Directive for the Limitation of Exposure by Temporary Change in Electrical, Magnetic and Electromagnetic Fields (ICNIRP), dated 1998.

According to Accident Prevention Regulation BGV B11, the ETB is assigned the magnetic exposure group 1. The exposure group 1 covers areas with controlled access, like workplaces.

In order to eliminate unnecessary risks for personnel, we recommend permitting access solely to:

- personnel with express authorisation and full awareness of the hazards involved, and
- personnel without any electronic or metallic implants.

The high current generator and connected cables and components radiate various levels of electromagnetic fields (EMF), depending on your connections and configuration. Therefore, our recommendations regarding safety distances should be viewed as a general guideline only. We recommend carrying out EMF metering at the workplace to determine the exact safety distances required.

2. DESCRIPTION OF THE COIL

2.1 INTENDED USE

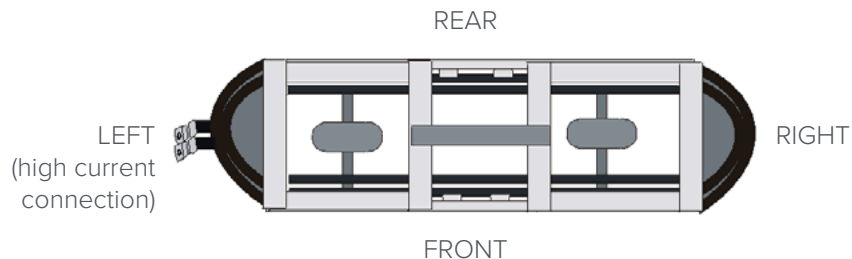
Operational safety of the MINDEN magnetising coil is only ensured if it is used for its intended purpose. The coil is exclusively intended for the non-destructive testing of magnetisable parts using the magnetic particle method (MPI testing).

The coil has been constructed according to the state of technology at the time of delivery, and is safe to operate in compliance with general safety and accident prevention regulations and the specific safety instructions included in this manual. However, hazards can still rise if the magnetising coil is operated incorrectly by untrained personnel or for any other use than its intended purpose.

Incorrect use of this machine use may lead to damage or injury and invalidates any warranty claim against Magnaflux GmbH (the manufacturer). The operator is solely responsible for the consequences of the machine being used contrary to its intended use and for actions not described in the manual. Magnaflux GmbH accepts NO responsibility for consequential loss.

2.2 LOCATION REFERENCES

All information regarding directions and locations given in this manual are based on the viewpoint of the machine operator.



2.3 FUNCTION

The MINDEN coil is a coil system, via which a magnetic field is generated.

Wheel discs must undergo the various tests upright and section by section, including the visual inspection. Tip: Inspect the workpiece in clockwise direction and mark the relevant test area.

The MINDEN coil can be operated in conjunction with a high current generator, e.g. Ferrotest, Ferrotest GWH, or Isotest.

2.4 BASE FRAME

The base frame is designed as a light-weight construction and consists of an aluminium frame, plastic strips and guide rollers.

The aluminium frame is equipped with clips to guide and hold the high current cables. Track and lateral rollers are attached to the aluminium frame to centralise the magnetising coil.

The ends of the high current cables are equipped with tubular cable lugs to connect the high current generator.

2.5 TECHNICAL DATA

The **MINDEN 1000** is suitable for use on for wheel discs with a running circle diameter up to 920 mm.

The **MINDEN 1300** is suitable for use on for wheel discs with a running circle diameter up to 1250 mm.

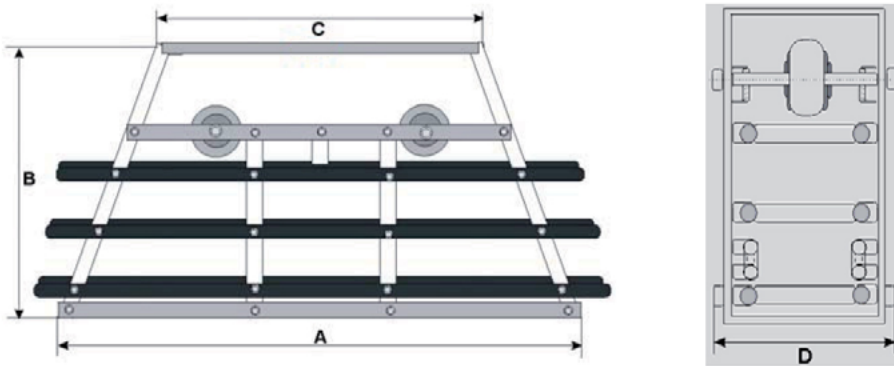
Connection options

- all DC generators
- all AC generators

Emissions

Compliant with the EMC Directive and current EMC standards for industrial applications.

Dimensions and weights



Dimensions (mm)	MINDEN 1000	MINDEN 1300
A	1300	1545
B	500	609
C	440	675
D	275	310
Approx. weight (kg)	15	20

Ambient conditions

Operating temperature	5 to 45 °C
Storage temperature	5 to 55 °C
Humidity during operation and storage	max. 90% relative humidity (non-condensing)

3. OPERATING THE COIL

- Connect the high current generator to the MINDEN coil
Note: High-current cables of different lengths can be used to connect the high current generator and the coil. Please ensure that connections are kept as short as possible.
- Lower the coil onto the part being tested
- Activate the high current generator by pressing the foot pedal switch.
- Spray your magnetic testing solution onto the workpiece in the area where it will be magnetised for testing.
- Stop spraying approx. 2 seconds before you start magnetisation.
- Existing cracks will appear in the form of caterpillar-like accumulations of test liquid on the test piece.
- Inspect under UV light (read and comply with the operating and setup instructions provided by the UV Light manufacturer.)

4. MAINTENANCE

4.1 INSPECTION AND MAINTENANCE SCHEDULE

At 8-hour intervals:

Check the settlement volume and indication ability of the test liquid. If necessary, drain and clean the tank and refill with fresh test liquid.

At 40-hour intervals:

• Clean the entire magnetising coil:

1. Switch off the coil and secure it against being restarted.
2. Soak a soft cloth in a mild industrial cleaning agent (do NOT use solvents, acids or bases) and wipe over the surface of the coil.

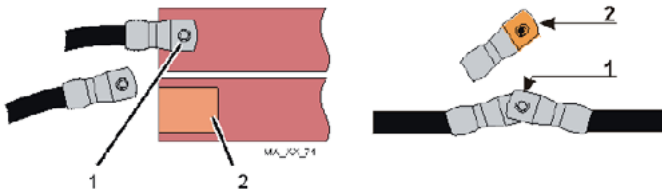
• Clean the high current cable connections:

3. Switch off the coil and secure it against being restarted.
4. Disconnect the connection to the high current cables.
5. Clean the contact points with medium-fine steel wool to a bright metal finish.
6. Apply a thin coat of contact grease to the contact points. MAGNAFLUX recommends Tun grease VC563.
7. Re-connect the high current cables.

• Check the intensity of your UV light and inspect the filter disk. Replace defective filters as needed.

At 160-hour intervals:

- Check high current cable clamps for proper guidance capability.
- Check guide rollers for smooth rotation
- Disconnect the high-current cables, clean the contact points and coat with contact grease.



- 1 - High-current connection
2 - Contact area

4.2 MEASURING MAGNETIC FIELD STRENGTH

The intensity and direction of the magnetic field are important parameters in magnetic particle inspection. Always check the magnetisation when setting up the coil to test a new workpiece.

The **FSM-2** tangential field strength meter (pictured opposite) is used for tangential measuring of magnetic field strength. The display on the FSM-2 can be switched to show the field strength in A/cm as an actual (RMS) or peak value.

Operating the FSM-2:

1. Magnetise your test workpiece.
2. Place the FSM-2's measuringprobe on the test piece.
3. Read magnetic field strength in A/cm on display.

For more information about the FSM-2, see the corresponding data sheet and operating manual.



4.3 CHECKING TEST LIQUID CONCENTRATION

The detectability of faults on workpieces decreases as the quality of the test liquid diminishes. The service life of test liquids depends on the inspection task and the condition of the workpieces. It is important to regularly check the indicating ability of your test liquid, particularly after prolonged work interruptions and after replacing the test liquid.

For optimised fault detection on workpieces, the test liquid concentration must exactly match manufacturer specifications.

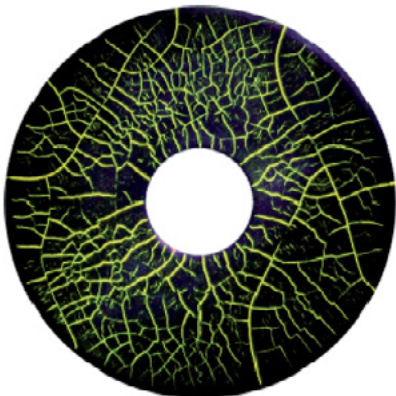
Centrifuge tube:

1. Fill the centrifuge tube with freshly mixed test liquid.
2. Allow the liquid to settle for 30 minutes.
3. Check the settled magnetic particles against the graduation marks on the centrifuge tube.



AS 5282 test ring:

1. Spray test ring evenly with test liquid.
2. Hold the ring by its edge and inspect under a UV light.
3. Compare indications with the illustrations in the manual (examples below).



Test liquid OK



Test liquid spent; time to replace

4.4 CHECKING UV INTENSITY

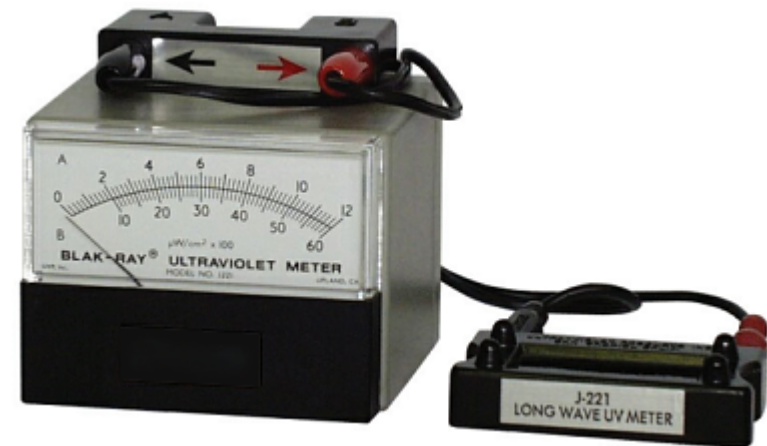
The detectability of defects can be significantly increased by using fluorescent magnetic test liquid and a UV light.

The light intensity of the UV lamp plays an important role. The light intensity should be approx. $1000 \mu\text{W}/\text{cm}^2$, although this can vary depending on individual test conditions and ambient light.

Light intensity can decrease noticeably as the lamp is used so it is important to regularly check the intensity of your UV lamps and replace them as needed.

J221 UV intensity meter:

1. Switch on UV lamp.
2. Wait for the lamp to reach maximum light intensity.
3. Hold the sensor of the UV meter under the lamp.
4. Check the intensity reading.



5. DECOMMISSIONING AND DISPOSAL

5.1 DECOMMISSIONING



DANGER: High electrical voltages can cause fatal electric shocks and burns.

The clamps on the drive controllers can carry dangerous voltage for **up to 3 minutes after disconnection**.

The socket inside the control cabinet **remains live even after the main switch is switched off**.

Work on the electrical system must only be carried out by a qualified electrician and in compliance with the standards applicable at the installation location.

Temporary decommissioning:

1. Switch off the high current generator.
2. Secure the high current generator against being switched back on.
3. Clean the coil.

Final decommissioning:

1. Switch off the high current generator.
2. Secure the high current generator against being switched back on.
3. Roll up the power supply cables and fasten securely.
4. Clean the coil.

5.2 DISPOSAL

Before disposal, check that all power supply connections to the coil have been disconnected.

Request information regarding locally applicable disposal regulations. Rechargeable batteries, dry-cell batteries, button cell batteries, paints, varnishes, chemicals (e.g. solvents, cleaning agents, etc.), adhesives, fluorescent tubes, energy-saving lamps, waste oil and oil filters are hazardous waste. These items and substances are harmful to health and the environment.

Procedure:

1. Switch off the high current generator.
2. Secure the high current generator against being switched back on.
3. Dismantle the coil.
4. Separate the coil's components by material:
 - Metals
 - Plastics
 - Composite materials
 - Electric assemblies
 - Consumables (e.g. lubricants, etc.)
5. Dispose of all components in accordance with local regulations.

EC/EU DECLARATION OF CONFORMITY FOR MAGNAFLUX STANDARD EQUIPMENT



We hereby declare that this equipment complies with the following EU Directives. The device has been tested and approved. Any modification made to the device without our written consent will invalidate this declaration.

Applicable EC/EU Directives:

Electromagnetic Compatibility (EMC) Directive 2014/108/EU

Equipment model: Magnetising coil

Equipment type: MINDEN

Applied harmonised standards:

EN 60204-1:2006

Other applicable standards and specifications:

DIN VDE 0100-410:2007, DIN VDE 0100-540:2007

Authorised person for documentation:

Mr. Georg Koch, Quality Management Officer

Address:

Magnaflux GmbH, Stockertstr. 4-8, D-73457 Essingen, Germany

Person responsible:

Sales/Design Manager
Mr. Silvio Georgi

Signature:

A handwritten signature in blue ink, appearing to read 'i.v. Georgi', with a long horizontal flourish extending to the right.

Date: 01/01/2018



Stockertstraße 4-8, 73457 Essingen, Deutschland

Telephone: +49 (0) 7365 81-0

Email: sales.de@magnaflux.com

Web: www.magnaflux.eu/de

Faraday Road, South Dorcan Industrial Estate, Swindon, SN3 5HE, UK

Telephone: + 44 (0)1793 524566

Email: sales.eu@magnaflux.com

Web: www.magnaflux.eu