Demagnetization cable K8/10, K5/6, AK7/2.5-22-T

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Translation from German manual

Revisions

Edition	Description
11.2008	-
01.2013	Conditions of warranty updated, Text corrected
03.2014	Cable type K10/1.5 added, additional examples
05.2014	Correction on pages 6 and 10
11.2018	General Revision

General Information

- This manual contains information for safe operation of the machine/machine components.
- Read the manual of all machine components.
- Respect accident prevention regulations.
- Respect local regulations.
- This manual is a translation of the German original.
- In case of questions regarding Installation, commissioning, operation or intended use contact Maurer Magnetic. Contact information on the last page

Liability

Liability is restricted to the intended use. Any other liability is explicitly excluded.

Improper installation, operation, maintenance or use of the machine can lead to body injury and property damage. Maurer Magnetic AG cannot be held liable for losses, consequential damages or cost resulting from or linked with improper installation, operation, maintenance or use.

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1 Safety instructions

1.1 Symbols:

Indicates situations with risk for body injury and property damage by electromagnetic radiation

Indicates situations with risks by high electric voltages.

Indicates situations with risk of burns.

Indicates situations that demand special attention.

Identifies hazards of injury to extremities.

Indicates danger for persons with a cardiac pacemaker.

1.2 Information on restrictive risks

Persons with cardiac pacemaker must not use the device.

The demagnetization cables may only be manipulated by skilled personnel.

- Secure or switch off the power module before the manipulation (see manual for power module)

High voltages can lead to lethal electric shock and burns.

- The demagnetizing cables may only be handled by skilled personnel
- Do not touch the demagnetizing cable if the power module is not switched off or secure.

Modification of the product leads to loss of waranty.

- Modification can lead to body injury and property damage.
- Approval of modification only by Maurer Magnetic AG in writing.

Only operate device in restricted zone, accessible by authorized personell only.

1.3 Notes on restrictive risks

Please refer to the manual of the power module for further information.

1.4 Safety of electromagnetic fields

The following information about limits and measurements are for an assistance only. Maurer Magnetic AG can't take liability for the correctness. For binding limits and measures consult the national regulations directly. Responsibility for compliance with national regulations lies with the operating company.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) issues recommendations on limits to electromagnetic fields. National regulations are based on these recommendations (e.g. BGV B11 in Germany). In most cases there are different limits for the public and for the workplace. Generally limits are set as an exposure averaged over the entire body.

A diagram with the field exposure measurement of your device can be found in the included documentation folder.

1.4.1 International: reference levels, ICNIRP

Limits according to the currently valid Guidelines: Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz), 1998.

Frequency	General public exposure	Occupational exposure
16 ⅔ Hz	0.3 mT	1.5 mT
25 Hz	0.2 mT	1.0 mT
50 Hz	0.2 mT	0.5 mT
1-8 Hz	40 / f^2 [mT]	200 / f^2 [mT]
8-800 Hz	5 / f [mT]	-
8-820 Hz	-	25 / f [mT]

Table 1: Limits according to ICNIRP (RMS), Table 4

1.4.2 EU: Directive 2013/35/EU

Within the European Union the following Action Levels (ALs) are set within Directive 2013/35/EU

Frequency	Low ALs	High ALs	ALs for exposure of limbs
16 ⅔ Hz	1.5 mT	18 mT	54 mT
25 Hz	1.0 mT	12 mT	36 mT
50 Hz	1.0 mT	6 mT	18 mT
1 – 8 Hz	200 / f^2 [mT]	300 / f [mT]	900 / f [mT]
8 - 25 Hz	25 / f [mT]	300 / f [mT]	900 / f [mT]
25 - 300 Hz	1 / f [mT]	300 / f [mT]	900 / f [mT]

Table 2: Action levels to occupational exposure, Table B2, 2013/35/EU (RMS)

Annotation:

- The Directive 2013/35/EU sets minimal requirements for occupational exposure. Member states can set stricter regulations.
- Low ALs indicate limits for sensory effects.
- High ALs indicate limits for health effects.

1.4.3 Effects on implants

The German statutory accident insurance regulates in BGI/GUV-I 5111 exposure of people with cardiac pacemakers or similar devices.

Frequency	Danger zone (RMS)	Danger zone (PEAK)
16 ⅔ Hz	0.2 mT	
25 Hz	0.13 mT	
50 Hz	0.065 mT	
0 - 300 GHz	0.065 * 50 / f mT	73 * 50 / f A/m

Table 3: Limits according to BGI/GUV-I 5111 (RMS)

1.4.4 Switzerland: public exposure (NISV)

According to the regulation about the protection from non-ionizing (NISV, 814.710) public limits are equal to the ICNIRP limits in Table 1 (public exposure).

1.4.5 Switzerland: occupational exposure (SUVA)

According to the SUVA occupational limits 2015 occupational limits are equal to the ICNIRP limits in Table 1 (occupational exposure).

Annotation:

- In practice a measurement is averaged over 100 cm^2 and carried out at around 30 cm from the source (position of the head of the operator).
- The NISV limit holds for pregnant employees.

2 Intended use

The demagnetizing cables are products developed and distributed by Maurer Magnetic AG. They are used to demagnetize ferromagnetic parts. The cables may only be used together with the mobile power unit type MM DM.

The demagnetizing is carried out with the "Maurer-Degaussing-Technology" patented by Maurer Magnetic AG, a controlled, short-term alternating magnetic field.

3 Description

3.1 Demagnetization cable K8/10-30

Parameter	Description
Number of conductors	8, effective number of turns increases by factor 8
Conductor cross-section	10mm
Length	30m
Suitable adaptor cable	A8/10-1.4
Temperature monitoring	None

The cables are heating up when used excessively and can be damaged. Temperatures above ~70 C° of the cable coating must be avoided

3.2 Demagnetization cable K5/6-15

Parameter	Description
Number of conductors	5, effective number of turns increases by factor 5
Conductor cross-section	6mm
Length	15m
Suitable adaptor cable	A5/6-1.6
Temperature monitoring	None

The cables are heating up when used excessively and can be damaged. Temperatures above ~70 C° of the cable coating must be avoided

3.3 Demagnetization cable AK7/2.5-22-T

Parameter	Description
Number of conductors	7, effective number of turns increases by factor 7
Conductor cross-section	2.5mm
Length	22m
Suitable adaptor cable	Cable alreay equipped with adapter
Temperature monitoring	60°C Temperature sensor

The cables are heating up when used excessively and can be damaged. The cable is equipped with a safety switch which triggers at a temperature of 60°C. Operaton can be resumed after the cable has cooled down.

4 Commissioning

Indicates danger for persons with a cardiac pacemaker. See chapter 1.4.

Installation and commissioning of the device only by skilled personell.

- Connect only to power source with correctly installed protection conductor.
- Connect with regard to local regulations.

The coil module generates an alternating magnetic field. Further information on safety of magnetic fields in chapter 1.4.

During demagnetization high forces act on ferromagnetic objects.

- Objects are attracted into the coil
- Objects are attracted by each other
- Objects are attracted by the coil wall
- Keep extremities away from the immediate vicinity of the coil.
- Operators should stay away from the immediate vicinity of the coil.

Keep items with sensitivity to magnetic fields (credit cards, watches, etc) at safe distance (~1m).

Before each use, the cables must be checked for damage and, if necessary, repaired.

Wear gloves during operations and manipulations with cables.
The demagnetizing cables are not allowed to be touched during the demagnetizing process.

4.1 Installation

Connect adaptor cable to the demagnetization cables. Make sure that the connection is correctly plugged together.

Then connect the HAN plug of the adaptor cable to the mobile power unit “MM DM”. (Consult manual MM DM)

During initial commissioning of the demagnetization cable, power of the MM DM should be increased in 30% steps up to full power. This loads the demagnetization system and allows to check the behaviour of the system at full load.

5 Operation

Indicates danger for persons with a cardiac pacemaker. See chapter 1.4.

Operate device only in enclosed premises accessible only by authorised personell.

Connection and disconnection of the coil module only with main switch off or in secure mode.

- Physical contact to energized parts can be lethal.
- Disconnection during pulse results in damaging of the plug connection.

Interruption (switch-off) of power supply during demagnetization leads to immediate disruption of the pulse. The demagnetizer can be damaged

- Parts in the vicinity of the coil are magnetized and need to be demagnetized once more.

Coil and ferromagnetic material in the vicinity of the coil can heat up during operation. Physical contact can lead to burns.

The coil module generates an alternating magnetic field. Further information on safety of magnetic fields in chapter 1.4.

Keep items with sensitivity to magnetic fields (credit cards, watches, etc) at safe distance (~1m).

When working manually on the demagnetzing cables, always switch on the manipulating switch on the power unti or switch off the system with the main switch.

During demagnetization strong forces can act on ferromagnetic objects. There is a danger of crushing!

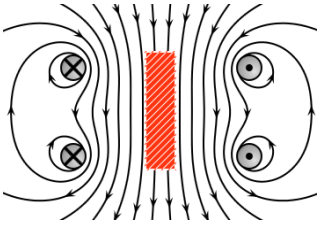
- Objects are attracted into the coil
- Objects are attracted by each other
- Objects are attracted by the coil wall
- Keep extremities away from the immediate vicinity of the coil.
- Operators should stay away from the immediate vicinity of the coil.

In case of excessive load, the voltage applied to the demagnetizing cable can penetrate the obect to be demagnetized

- Ensure that no person touches the object during the demagnetization
- Check demagnetization cable for overheating and damage before each demagnetization process.

5.1 Handling of demagnetization cables

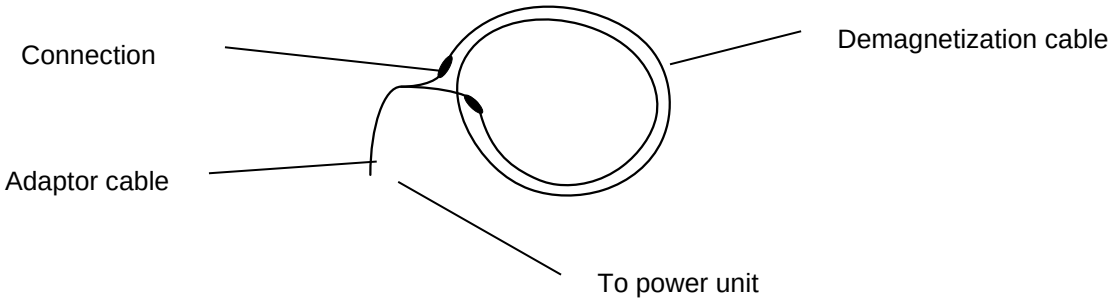
The type of wrapping of a component plays an important role with regard to the demagnetization quality. On the one hand, the field strength has to be taken into account, whereby the basic rule is: a higher field strength generates a better result. The field strength is influenced by the number of turns and by the current. The more windings (more cable or tighter winding), the more field. The current is regulated with the power controller (0...100%) on the MM DM.



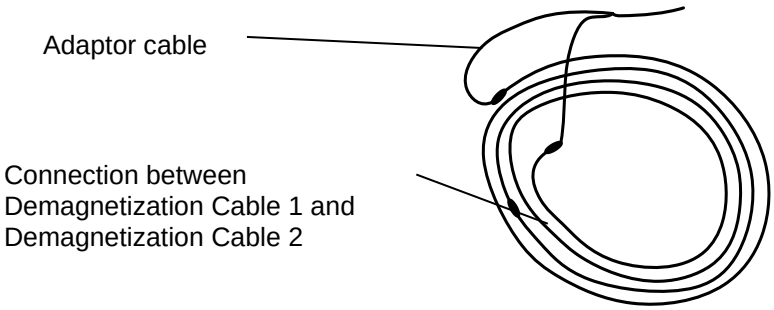
On the other hand, the course of the field lines in the component must be observed. The course of the field lines is achieved with the suitable alignment of the cable to the component. It is important to ensure that the field lines are on the long side of the component as shown in the picture.

The effective number of windings of the demagnetizing cables depends on the cable type and the number of conductors. This means that if you wrap around an object once, this effectively corresponds to 8 turns for cable K8/10-30, 5 turns for cable K5/6-15 and 10 turns for cable K10/1.5-15. This allows the otherwise high winding effort to be reduce.

This winding corresponds to two windings:

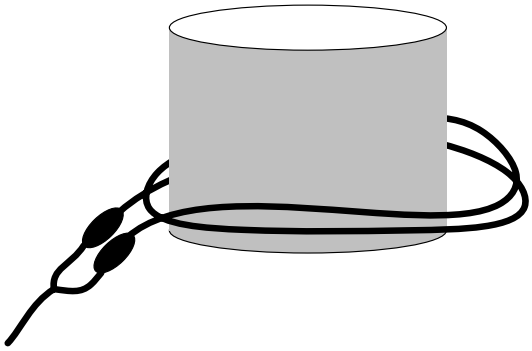


Winding with two demagnetization cables:

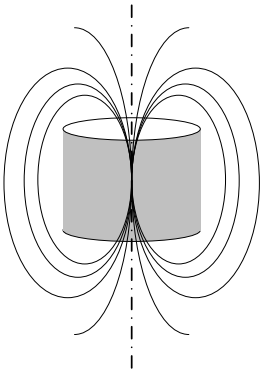


5.2 Winding parts using the flexible coil

Winding a coil around the part:



Lines of flux produced:

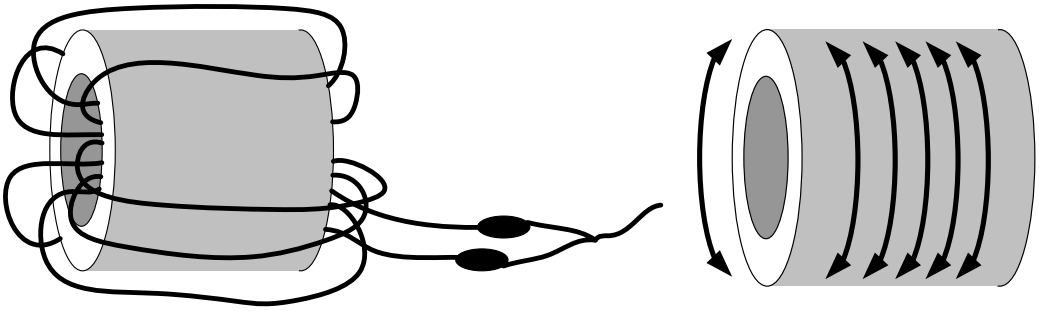


Observations on this type of winding:

- Realisation of this type of winding is not time consuming.
- The magnetic circuit is open, i.e. the lines of flux return outside the part. Unlike a closed magnetic circuit (see below), low field strengths are produced
- Can always be used
- On longer parts, distribute winding longitudinally
- Important: With longer parts, align the longitudinal direction perpendicular to the earth's magnetic field. Else the earth's magnetic field element will be "imprinted" during demagnetization.

Winding a coil through the part:

Lines of flux produced:



Observations with this type of winding:

- Realisation of this type of winding is time-consuming.
- The magnetic circuit is closed; hence maximum field strengths can be expected. As a rule, this improves demagnetization.
- Can only be used with certain parts.
- Distribute cable as even as possible on the part to achieve a homogeneous field distribution

Other examples of winding

Demagnetisation in narrow spaces:

5.3 Hints for better demagnetization results

The surrounding magnetic field can negatively influence the demagnetisation due to the field induction in the component. Therefore, elongated parts (length/thickness > 4) should be demagnetized perpendicular to the ambient field.

We recommend that the operator of the system examines the prevailing field conditions in order to determine the best orientation for demagnetization (e.g. with a compass or field meter). Demagnetization parallel to the ambient field causes the earth field component in the demagnetized part to induce field lines and thus to increased residual magnetism after demagnetization.

Ideal earth field direction according to arrow (90° to the longitudinal direction of the component)

- Multiple demagnetizing in different orientations
- Set other demagnetizing programs on the power section and vary the performance
- Use more cables to achieve more windings
- Change winding technology

Hint:

For large parts in the earth's magnetic field (usually the case, unless shielding is provided), results below 4A/cm are difficult to achieve due to the earth field induction in the component. In small gaps an even higher magnetism is often possible. This can be caused by the earth magnetic field induced in the part and does not necessarily mean that the component is not well demagnetized.

6 Demagnetization

Detailed information about Demagnetization and the measurement of residual magnetism is found here: http://maurermagnetic.ch/007_E_demagnetization_white_papers.html

6.1 Residual magnetism

6.1.1 Origins

Reasons for residual magnetism in ferromagnetic objects are manifold. A selection of industrial processes leading to residual magnetism is listed below:

>100 A/cm	Crack testing (magnetic powder and flux leakage testing)
	Usage of lifting magnets or handling magnets (permanent and electric)
	Usage of chucking equipment (permanent and electric)
50 A/cm	Application of magnetic bases (e.g. gauge bases)
	Welding processes (DC and AC current)
	Processing with magnetized tools, magnetic chuck etc.
20 A/cm	Handling with magnetic tools, e.g. lifters etc.
	Electrical and electro-discharge processes (chrome plating, ECM, EDM ...)
10 A/cm	Certain PVD coating processes (e.g., magnetron sputtering)
2-5 A/cm	Forming processes (structural change in the material)
< 2 A/cm	Vibrations + magnetic field of earth

Values are rough orientation values. Values highly depend on object size.

6.1.2 Measurement of residual magnetism

Maurer Magnetic AG produces and sells measurement devices to measure magnetic field.

- „M-Test LL“ for residual magnetism from ferromagnetic parts
- „M-Test MK4“ for magnets

Further information and measuring devices can be found on www.maurermagnetic.ch.
For measuring of limits of 5 A/cm or below it is recommended shield the measurement environment from external fields with a Zero-Gauss-Chamber. Without shielding measurement values off well demagnetized parts can be above limits.

7 Maintenance

Damaged cables are not allowed to be used anymore

7.1 Maintenance

- The cables are subject to external signs of wear through use. Careful handling is worthwhile!
- Check and clean plugs and cable sheath regularly.
- The plugs or sockets of the flexible cables have a certain lifetime with regard to the mating cycles. Avoid unnecessary coupling of the cables.

7.2 Decommissioning

Authorised and competent persons may only carry out decommissioning. Always observe the accident prevention regulations!

7.2.1 Disassemble

The following steps are necessary for proper dismantling:

- Switch off the system and secure it against unauthorised restarting.
- Disconnect the power supply to the power module
- Then disconnect the demagnetizing cable from the switched-off power module and adapter plug.

7.2.2 Disposal

Resources and the environment can be saved by proper disposal. Please note that no components have been installed that require disposal in hazardous waste.
Dispose of the product at a scrapping off plant or an approved collection point. Disconnect the plugs before disposing the cables.Then feed the cables to a copper scrap collection point and dispose the plugs in the electrical scrap.

8 Troubleshooting

See manual power module.

9 Warranty

Maurer Magnetic AG guarantees the functionality of the demagnetization devices supplied. The warranty corresponds to the “Warranty” supplement valid at the time the order is placed.

The warranty voids for damages caused by non-proprietary components. Exclusive use of Maurer Magnetic components (coils, demagnetization cables, chokes, power modules) is necessary.

Maurer Magnetic AG is not responsible for damage incurred by inappropriate use, incorrect installation or disregard for the safety and maintenance regulations.

The company Maurer Magnetic AG is not liable for direct or indirect damages, as well as subsequent damages, caused by the false or improper usage of the machine.

The CT-U, CT-UDM und SE series loop demagnetizers conform to CE regulations.

A warranty extension must be agreed upon in writing.

Maurer Magnetic

Maurer Magnetic AG specializes in demagnetization.

We offer various products:

Measurement of residual magnetism

- Measurement devices
- Zero-Gauss-Chambers

MaurerClassic

- Hand-held demagnetizers
- Table/Plate-type demagnetizers
- Loop demagnetizers

MaurerClassic+

- Yoke and table top demagnetizers

Maurer-Degaussing-Technology

- Demagnetizers with FMT®-Technology
- Demagnetizers with CFT®-Technology
- Shielding chambers

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