

Coil modules

VE

HLE



Revisions

Edition	Description
10.2009	-
07.2010	Table of revisions
01.2013	Cable in chapter 2.1, Addition for pacemaker in 7.2
04.2016	General revision: Safety, Intended Use, Installation, Operation, Demagnetization, Maintenance, Troubleshooting, Specifications
03.2016	New connection box with light
07.2018	Improvement Ventilation
07.2018	Additions Residual risk and decommissioning
08.2018	Revision
11.2018	Changed text for demagnetizing

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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Information, drawings and images in this manual serve exclusively the explanation of the operation and handling of the designated machine. This manual is subject to change without notice.

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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.



Indicates danger for persons with a cardiac pacemaker.

1.2 Information on restrictive risks



Persons with cardiac pacemaker must not use the device.



Modification, repairs and opening of the device only by skilled personell.

- Wait 10 minutes for capacitor discharge before opening.



High voltages can lead to lethal electric shock and burns.

Opening of the device only by skilled personell.

- No physical contact to energized parts.



Modification of the machine leads to loss of warranty.

- Modification can lead to body injury and property damage.
- Modification of the parametrization can lead to overheating and shutdown.
- 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	0.1 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 cm² and carried out at around 30 cm from the source (position of the head of the operator).
- The NISV limit holds for pregnant employees.

1.4.6 Shielding chambers

A Maurer Magnetic shielding chamber significantly reduces stray flux.

- Elimination or strong reduction of safety distances for operators
- Elimination of EMC disturbances to preceding or succeeding processes

2 Intended use

MM VE-X / HLE-X coil modules are developed, produced and sold by Maurer Magnetic AG. They are used to demagnetize ferromagnetic parts.

The number X describes the number of built in capacitors.

- VE2 / HLE2 coil modules are equipped with 1 or 2 capacitors
- VE4 / HLE4 coil modules are equipped with 3 or 4 capacitors
- In case of high requirements HLE coils are equipped with an additional capacitor box with up to 15 capacitors. In this case, the coil module is not equipped with capacitors.

2.1 Compatibility MM power modules

Type	MM DN	MM DM, MM DM-P
MM VE	X	-
MM HLE	-	X

Table 4: Compatibility MM power modules

3 Description

3.1 Scope of delivery

- Coil module
- Connection cables

3.2 Overview

Maurer Magnetic designs VE and HLE coil modules according to customer requirements with regard to field strength, active opening and cycle times.

VE and HLE coil modules are identical and differ only with regard to the connectors.

- Coil module housings are electrically isolated. High voltages may occur inside the housing.
- Coil modules are protected from overheating with a thermal switch.

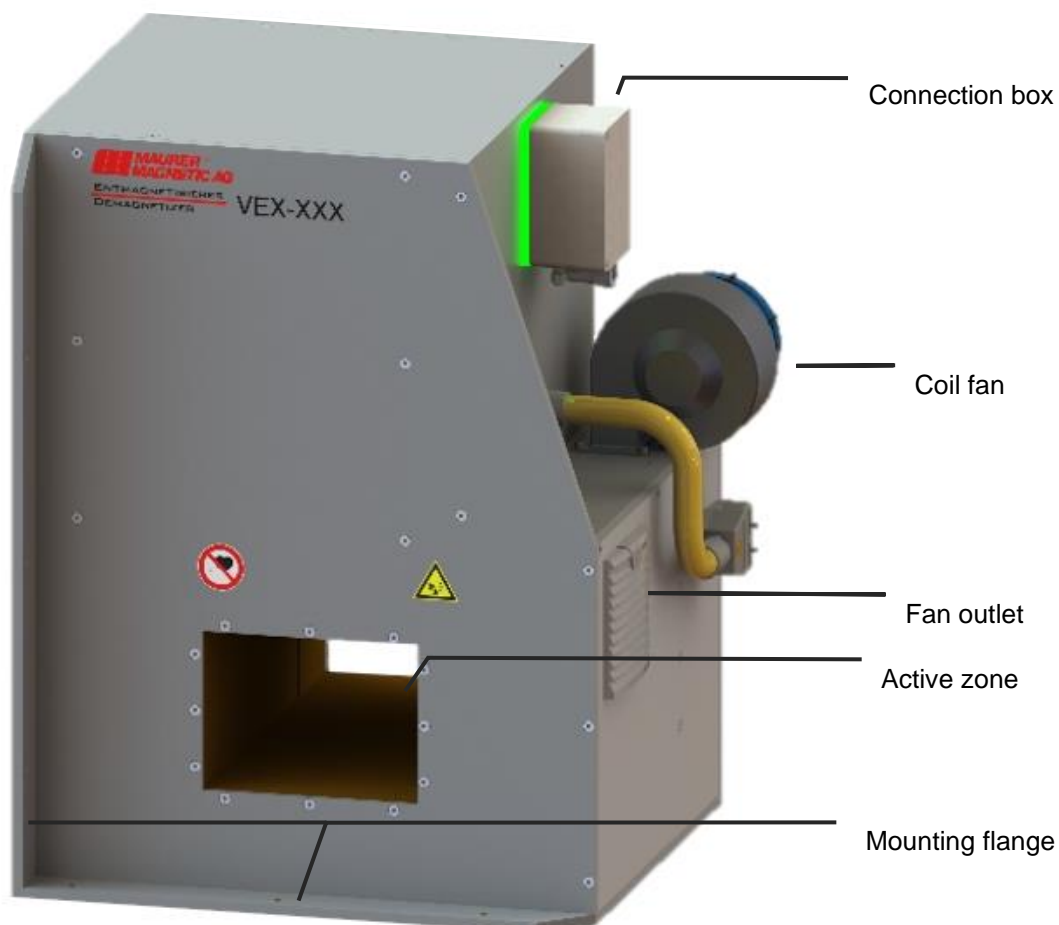


Image 1: Coil module VE

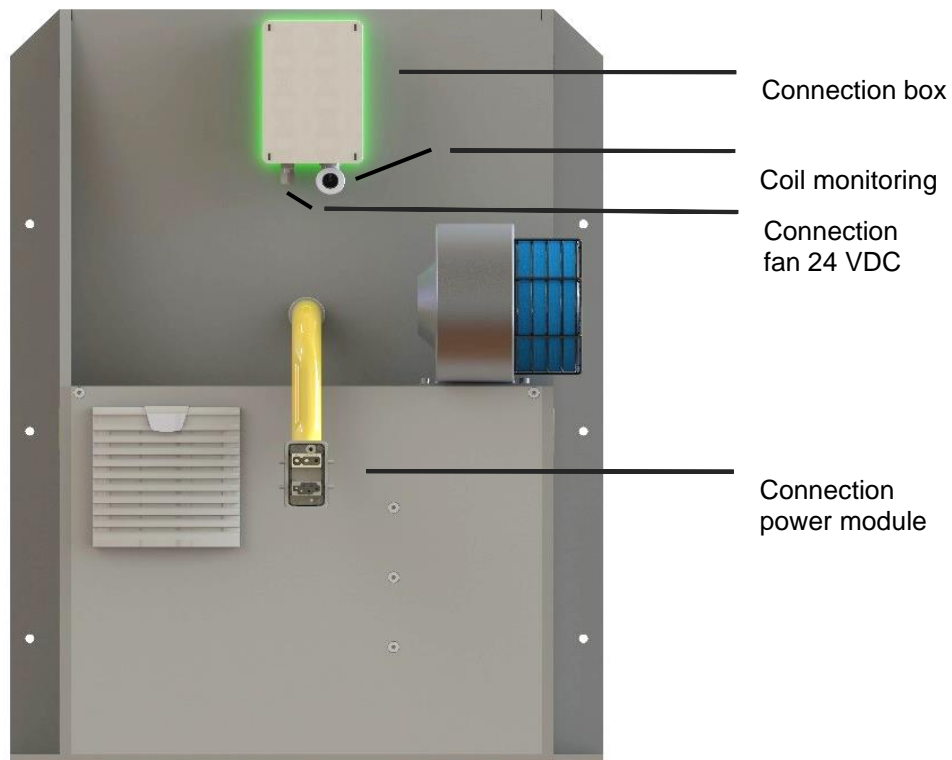


Image 2: Connection (View right)

4 Installation



Mount device on and flat ground, stable and flat surface.

- Ensure safe operation of device at all times.
- Operate power module only upright. Do not operate in horizontal position.



Installation and automation elements in the vicinity of the coil are not allowed to be of ferromagnetic material.



Coil operation can cause vibrations. Fix coil module sufficiently.



When demagnetizing heavy objects, high forces can arise between the object and the coil module. The coil module and the objects are to be fastened accordingly in such cases. Otherwise, there is a risk that the object will be thrown around by the resulting forces.



Components which are above the center of the coil during the pulse are drawn to the coil blanket. This may happen when using a conveyor belt or a component carrier.



Installation and commissioning of the device only by skilled personell.

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



Improper connection can damage the machine.

- Installation with off-state power source
- Installation with main switch off

4.1 Transport



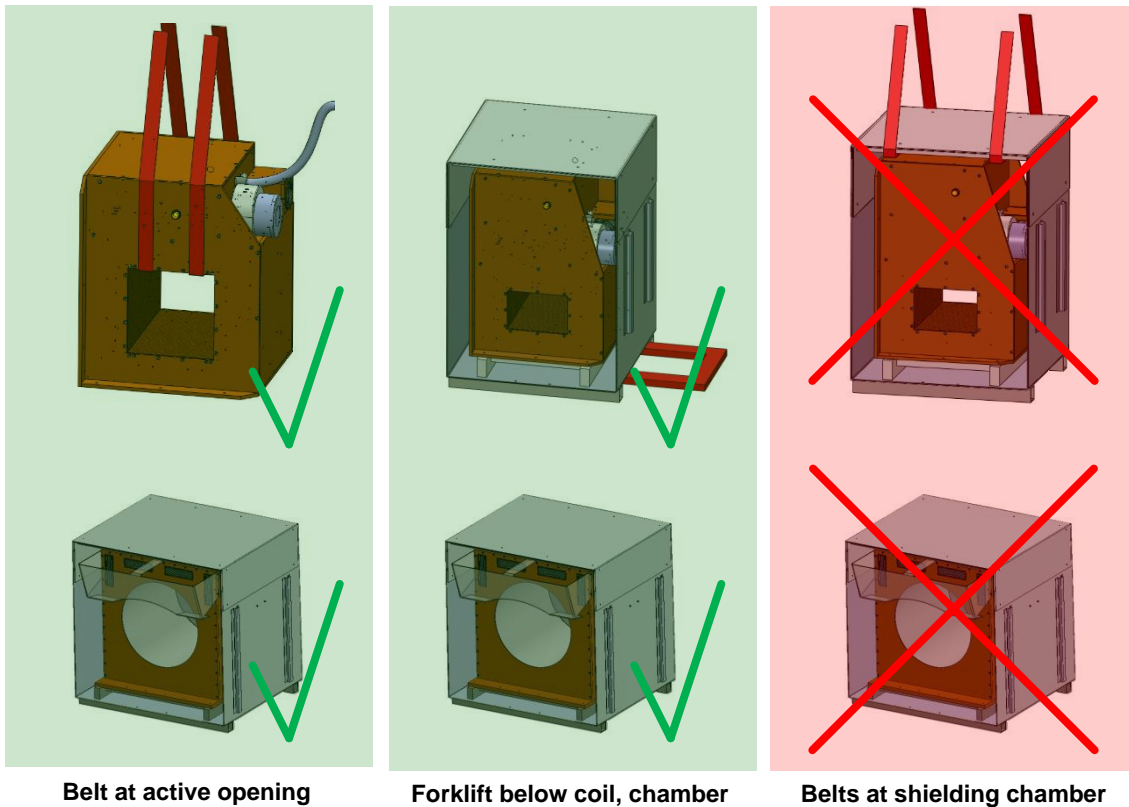
Do not lift components of more than 25 kg by hand. Coils weigh 50-300 kg.



Do not lift coils mounted in shielding chambers on the shielding chamber.

- Lift with support from below.

Do not lift coils mounted in shielding chambers on the shielding chamber. Lift with support from below.



Belt at active opening

Forklift below coil, chamber

Belts at shielding chamber

Image 3: Transport coil module

4.2 Installation

4.2.1 Procedure

See manual power module.

4.3 Mounting



Constructions elements e.g. for handling or installation in the vicinity (smaller ~0,5m) of the coil are not allowed to be of ferromagnetic material.

- Use of ferromagnetic material can affect demagnetization negatively
- Use aluminium, austenitic stainless steel or plastic material

When mounting the coil make sure to demagnetize parts in longitudinal flow (see chapter 7.). Contact Maurer Magnetic AG for questions.

For fixing the coil modules holes are available at the lower mounting flange. The coil is held from below and fixed with these holes. Additionally the coil can be fixed with the holes on the flanges on the side.

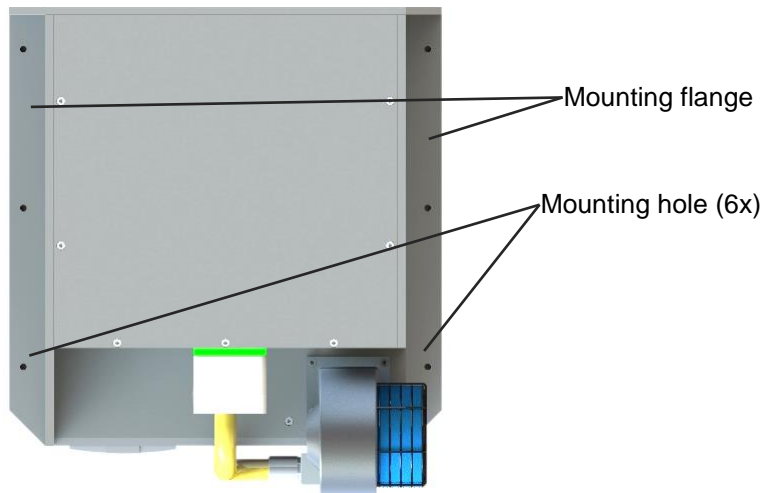


Image 4: Mounting of VE/HLE without shielding chamber

4.3.1 With shielding chamber

The coil module is placed in the shielding chamber. The shielding chamber is equipped with identical boreholes.

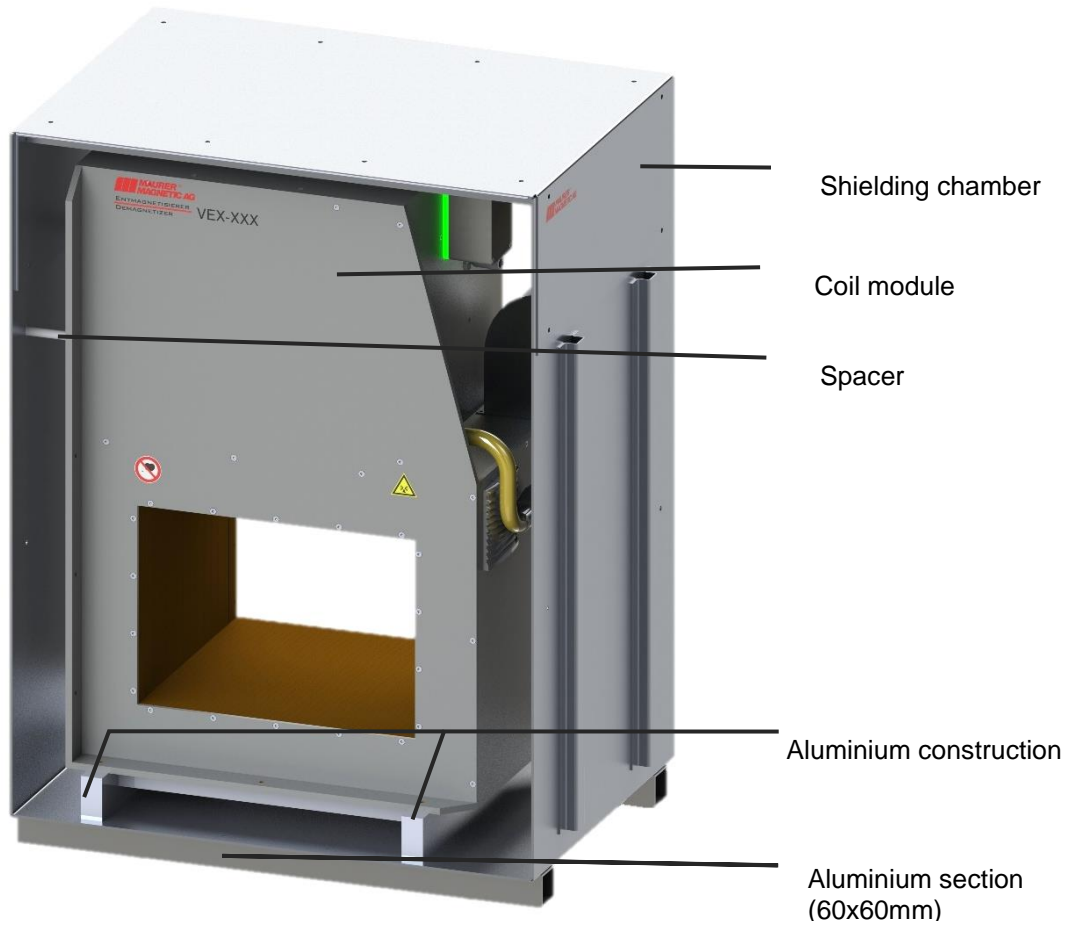


Image 5: Coil module in shielding chamber with aluminium constructions

The coil module is fixed with a suitable aluminium construction and two spacers to the shielding chamber. The shielding chamber is mounted on two aluminium sections. Aluminium construction, shielding chamber and aluminium sections have each four identical holes and are fixed to the coil with these holes.

The holes can be used for fixation.

4.4 Connection



Connection and disconnection of the coil module only with main switch off.



The connection of the Coil monitoring M8 is required for operation.



Consider ranges operating voltages, currents and frequencies in chapter 10.

4.4.1 Coil module connection (power)

The coil is connected with a HAN plug or directly on the frequency inverter.

Plug configuration according to attached wiring diagram.

4.4.2 Connection with capacitor box



High voltages occur on the connection between capacitor box and coil module!



Image 6: Capacitor box

The capacitor box is used if capacitors cannot be placed in the coil module or for coils with very high field strengths and high active openings.

The capacitor box is connected via HAN plug or directly onto the frequency inverter. For the connection to coil module each phase is separately protected in a flexible PMA tube.

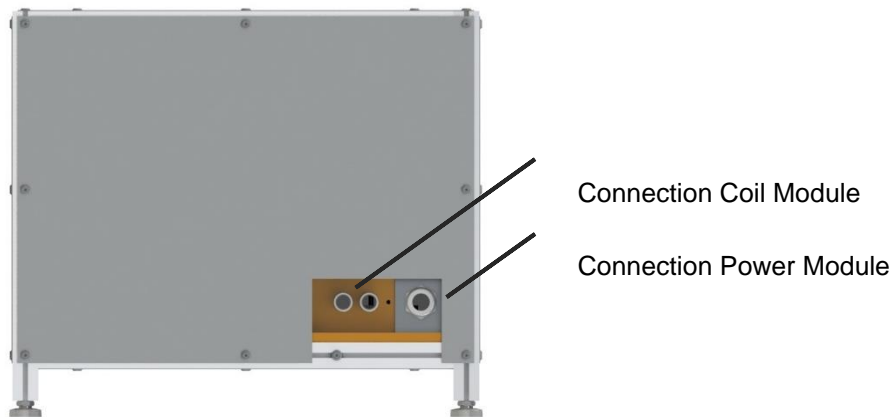


Image 7: Capacitor box

4.4.3 Coil monitoring



Connection of Coil monitoring is required for operation!

Connect Coil monitoring connector with the power module. It serves to operate the coil operation lamp as well as the well as the over temperature protection. Connection is required to start a pulse.

Plug configuration according to attached wiring diagram.

The coil is connected with a M8 plug or directly to terminals in the power module.

4.4.4 Connection Fan 24 VDC

Plug configuration according to attached wiring diagram.

The coil is connected with a plug adapter or directly to terminals in the power module.

4.5 Modification



Modification of the machine leads to loss of warranty.

- Modification can lead to body injury and property damage.
- Modification of the parametrization can lead to overheating and shutdown.
- Agreement of modification only by Maurer Magnetic AG in writing.

VE and HLE coil modules can be automated and integrated in many ways without modification. In case of questions regarding automation and integration contact Maurer Magnetic AG.

5 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.



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



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.
- Components which are above the center of the coil during the pulse are drawn to the coil blanket. This may happen when using a conveyor belt or a component carrier

5.1 Procedure

See manual power module.

6 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.

- High current flow during demagnetization
- Physical contact to energized parts can be lethal.
- Disconnection during pulse results in damaging of the connector.
- Wait 10 minutes for capacitor discharge before opening.



Interruption (switch-off) of power supply during demagnetization leads to immediate disruption of the pulse.

- 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).



During demagnetization high forces act on ferromagnetic objects.

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Cycle times below the specified minimal cycle time lead to overheating of the coil. When the coil is overheated pulse triggering is disabled. („Ready“ lamp dark / No „Ready“ Signal). The operation lamp on the coil lights red. After cooldown pulse triggering is enabled again.

6.1 Operation modes

6.1.1 Pulse operation



In principle objects in the coil should not be moved during demagnetization. In certain cases slow movement of the object is acceptable. Contact Maurer Magnetic AG.

See manual power module.

6.1.2 Continuous operation

Depending on the configuration continuous operation is possible. The machine has to be configured accordingly by Maurer Magnetic AG before delivery.

6.2 Controls

6.2.1 Lamp Operation

For signal description see manual power module.

Yellow

Active. Demagnetizing field is generated.

Green

Ready.

Blue

Reset required:

Red flashing

Coil is overheated. Pulse triggering impossible.

Yellow flashing

Warning of coil overtemperature. Pulse triggering remains possible.

6.3 Safety control



Interruption (switch-off) of power supply during demagnetization leads to immediate disruption of the pulse.

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

See manual power module

7 Demagnetization

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

7.1 Residual magnetism

7.1.1 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.

7.1.2 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.

7.2 Pulse Demagnetization

7.2.1 Best practices

- Demagnetize parts in longitude orientation. This is especially important for oblong parts.

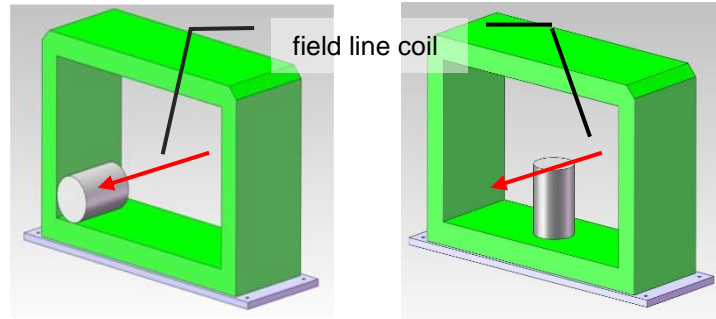


Image 8: Demagnetization in longitude (left) and transverse (right) orientation

- Because of higher field strength, it's better to place parts in coil corner.
- Place coil to align the of the field lines of the coil rectangular to the external field (earth's magnetic field)
- Use shielding chamber to shield external fields (earth's magnetic field)
- Reduce amount of ferromagnetic material in the coil. Demagnetize fewer parts per pulse.
- Processing with multiple demagnetization pulses in different positions can improve results in the following cases:
 - If the part is significantly longer than the depth of the coil: Use multiple pulses distributed over the length of the object.
 - If the object is rotated in between pulses.
- If residual magnetism is still not reduced, contact Maurer Magnetic AG.

8 Maintenance



Maintenance, repairs and opening of the device only by skilled personell.

- Wait 10 minutes for capacitor discharge before opening.

8.1 Daily maintenance interval

8.1.1 Visual inspection

- Supply line (incl. strain relief)
- Cooling fans

8.2 Monthly maintenance interval

8.2.1 Visual inspection

- Housing damages
- Contamination: Strong contamination can lead to short-circuit and outage of the demagnetizer.
- Breakaway torque of supply line screws. Poor contacts can lead to heat up and fire.

8.2.2 Functional inspection

- Selector switches, control elements, emergency stop/emergency stopping equipment
- Signal and warning lamps
- Verification demagnetization by measuring residual magnetism on demagnetized objects

8.3 Yearly maintenance interval

8.3.1 Functional inspection

- Verification maximal current (see Troubleshooting)

8.4 Wear- and spare parts

On request

8.4.1 Fuse protection

See manual power module

8.5 Decommissioning

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

8.5.1 Disassemble

The following steps are necessary for proper dismantling:

- Switch off the system and secure it against unauthorised restarting.
- Wait at least 10 minutes after switching off to ensure a safe discharge of the capacitors.
- Disconnect the power supply to the power module
- Disconnect all other loads from the power module (control cable connection box of the coil and the fan, control box, safety scanner, capacitor box, etc.).

8.5.2 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 machine at a scrapping off plant or an approved collection point. Before the machine is disposed of, the following materials must be removed and handed over separately to the various disposal points in compliance with the legal requirements for environmental hygiene:

- Electrical and electronic components: Remove electrical components in the control cabinet and in the coil. Pay attention to occupational safety: Support and secure heavy parts before disassembly.
- Disassemble and dispose of metal parts separately: e.g. copper (such as strands of the control cabinet wiring and wire of the coil), sheet metal (e.g. control cabinet), aluminium (e.g. top-hat rails in the control cabinet), scrap metal (various screws etc.)
- Disassemble plastic parts and hard fabric plates (spool housing, spool insert, etc.)

If uncertainties arise during disposal, please contact a scrapping off company or an approved collection point.

9 Troubleshooting

See manual power module.

10 Specifications

10.1 General

10.1.1 Dimensions

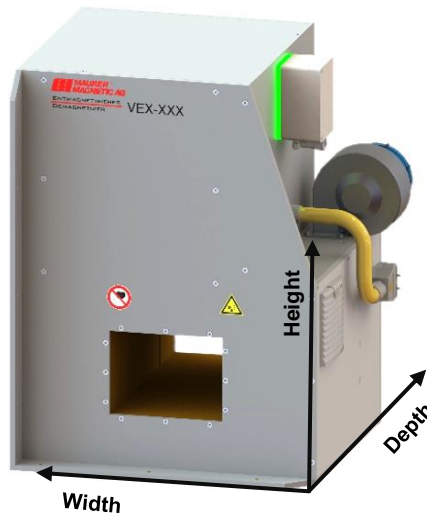


Image 9: Dimensions

VE4-225

	Dimensions (without baseplate) [mm]			Active opening [mm]		IP protection	Weight [kg]
	Width	Height	Depth	Width	Height		
VE-4	610	788	500	280	155	20	165

Table 5: Dimensions

10.1.2 Field strength

VE-4 with power module DN1850	
Field strength	225 kA/m

Table 6: Field strength

10.1.3 Cycle times



Cycle times below the specified minimal cycle time lead to overheating of the coil. When the coil is overheated pulse triggering is disabled. („Ready“ lamp dark / No „Ready“ Signal). The operation lamp on the coil lights red. After cooldown pulse triggering is enabled again.

Pulse operation with power module DN1850	
VE-4	22 s

Table 7: Cycle time

10.2 Control Signals

10.2.1 Coil monitoring

The interface Coil monitoring monitors the coil temperature switch and operates the operation lamp.

Connection via M8 plug or terminals. Plug configuration according to electric circuit diagram.

	Voltage range	current
Coil monitoring	0...24 VDC	<100mA

Table 8: Coil monitoring

10.3 Environmental conditions

	VE / HLE
Temperature range ¹	-0 °C to 40 °C

Table 9: Environmental conditions

¹ If temperature above 40°C the minimal cycle time is reduced.

11 Warranty

Maurer Magnetic AG guarantees operation of the delivered demagnetization units. The warranty is equivalent to the warranty / guarantee supplement valid at order date

The warranty expires in case of damage to the device by third-party components. Use only components (coil modules, demagnetization cables, power units) from Maurer Magnetic AG.

The warranty expires in case of equipment damage through inappropriate combination of components. Maurer Magnetic AG components (coil modules, demagnetization cables, power units) are commissioned combined internally and parameterised accordingly. They must be used exclusively in combination expressly provided for.

Maurer Magnetic AG cannot be held liable for direct or indirect damage, as well as consequential damage resulting from the use of the device.

The MM VE and MM HLE 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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