

VARIOMAG[™]

**Magnetic Stirrer
MONO DIRECT**

Operating Manual
50108844 Issue 02.2007



Analyze • Detect • Measure • Control[™]

Thermo
SCIENTIFIC

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Thermo Electron LED GmbH is legal successor of H+P Labortechnik AG.

Thermo Electron LED GmbH

Robert-Bosch-Straße 1
D-63505 Langenselbold

Germany national toll free:

Phone Sales: 0800 1536376

Phone Service 0800 1112110

Fax: 0800 1112114

Germany international:

Phone: +49 6184 906940

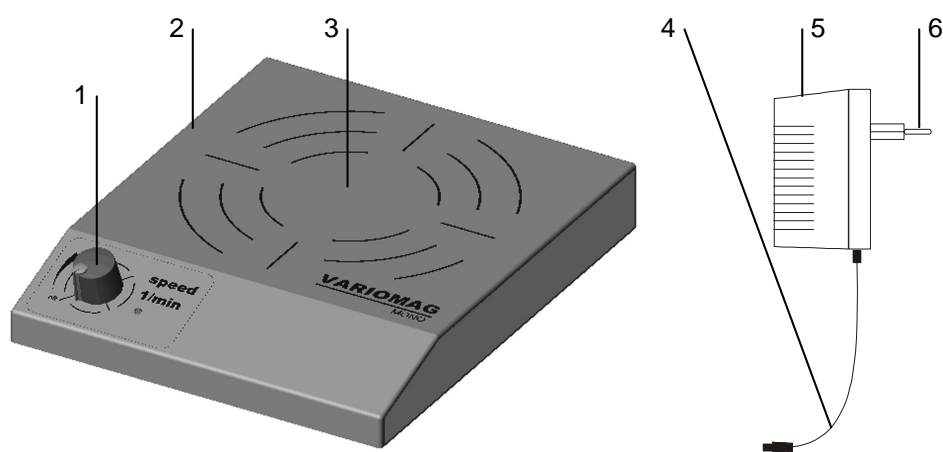
Fax: +49 6184 907474

E-mail: info.labequipment.de@thermofisher.com

For further help see: www.thermofisher.com

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| 1 | Rotation speed control button | 4 | Secondary power cable |
| 2 | Magnetic stirrer | 5 | Power supply unit |
| 3 | Stirring point | 6 | Mains plug |

Figure 1: The **MONO DIRECT** magnetic stirrer with plug-in power supply unit

User considerations

Correct use

The direct-controlled magnetic stirrer **MONO DIRECT** is designed for laboratory use to stir liquids.

It is fitted with one stirring point. The stirrer can be employed for chemical, microbiological, biotechnical or medical purposes.

The stirrer is suited to operation in the following areas:

- On the laboratory bench,
- In cold chambers,
- In laminar flow equipment,
- In safety laboratories and sterile rooms.

Incorrect use

The magnetic stirrer **MONO DIRECT** must not be operated in hazardous locations.

The stirrer must not be operated in a water bath.

Do not stir flammable liquids with a low boiling point.

The suitability of the direct-controlled magnetic stirrer **MONO DIRECT** for use in incubators is limited, because the stirring power cannot be adjusted as necessary. Moreover, the integrated electronics heat the magnetic stirrer additionally.

Pictographs

You will find the following pictographs in this operating manual



DANGER

This sign refers to dangerous voltages.



DANGER

This sign refers to hazardous situations.
Hazards to human life are indicated by "LIFE HAZARD".



CAUTION

This sign indicates danger to equipment and machinery.



INFORMATION

This sign indicates easier working practices.



Indicates an operating step.



Indicates alternatives.

1 Safety considerations

For your own safety, you should observe the following safety warning signs.

The warning signs indicate potential sources of danger.

They also inform on how correct action can avert danger. You will find these warning signs wherever there is a risk of dangerous situations.



DANGER

Supply voltage and supply frequency must be within the range specified for the power supply unit (5).



DANGER

The MONO DIRECT magnetic stirrer (2) must not be immersed in water or cleaning solutions.



DANGER

**Defective secondary power cables (4), defective mains plugs (6) or defective mains cables must be replaced by original parts obtained from the manufacturer or their representative.
Return the defective power supply unit (5) to our customer service for repair.**



DANGER

**Magnetism.
Magnetic or metallic parts (e.g. data carriers, pacemakers, watches) can be affected by magnetic fields.
Keep such parts away from the magnetic stirrer (2) and the magnetic stirring bars.**



CAUTION

The equipment must not be operated in hazardous locations.



CAUTION

**Do not place hot stirring vessels on top of the magnetic stirrer (2).
Maximum temperature: +56 °C.**



CAUTION

**Permitted ambient conditions:
Cf. Technical specifications.
Avoid extreme temperature changes.
The power supply unit (5) must not be run in humid rooms, or set up in water splash zones.**



CAUTION

The magnetic stirrer (2) must be switched off before connecting or pulling the connector.



CAUTION

Do not use chlorine-based cleaning agents, cleaning wool, cleaning agents containing metal parts or ammonium when cleaning the equipment.
Such agents can damage the surface of the equipment.



CAUTION

In case of repair, the equipment must only be opened by an authorized service agent.



CAUTION

Do not allow AlNiCo5 type magnetic stirring bars to remain in an alternating magnetic field if they cannot rotate freely. Do not subject the magnetic stirring bar to a strong inverse magnetic field. This may result in destruction of the magnetic stirring bar.



INFORMATION

The length of the magnetic stirring bar must not exceed 80 % of the vessel diameter. In the case of circular and triangular magnetic stirring bars, the length must not exceed 50 mm.
Do not use cylindrical stirring bars with a center ring, or elliptical stirring bars with a round cross-section.



INFORMATION

Some magnetic stirring bars (especially triangular bars) may have a critical resonance frequency at lower rotation speeds. This may cause the magnetic stirring bar to wander away from the turning center and carry out periodic oscillations. Avoid this rotation speed setting when the problem occurs. Quickly travel through this problem range when adjusting the rotation speed.

2 Equipment description

Figure 1 shows the components together with their position numbers.

The direct-controlled **MONO DIRECT** magnetic stirrer is equipped with one stirring point (3).

Power is supplied through the power supply unit (5). The secondary power cable (4) of the power supply unit (5) is connected to the jack (2) at the back of the magnetic stirrer.

The plug-in power supply unit (5) supplies **MONO DIRECT** with a maximum of 5 watts of stirring power. The power can be reduced to 1 watt using the adjustment knob on the back of the power supply unit (5). Use more power for larger quantities and more viscous liquids and reduced power for long-term operation without heat generation

The magnetic stirrers is designed to handle the following stirring volume:

MONO DIRECT: 1 to 3.000 ml

The drive and electronic control unit are sealed into the housing of the magnetic stirrer (2). The housing is completely sealed. The magnetic stirrer (2) is cleared for use in safety laboratories and sterile rooms. The drive is constructed without the use of moving parts and therefore totally wear-free. In contrast to mechanical drives, it will not generate circulating air between the housing and the environment.

You can adjust the rotation speed between 130 and 1,000 rpm with the rotation speed control button (1). After a run-up time of approximately 15 seconds, the magnetic stirring bar rotates with the preselected speed.

Stirring vessels and magnetic stirring bars are not included in scope of delivery.

3 Function

The magnetic stirrer **MONO DIRECT** is used for chemical, microbiological, biotechnological, pharmaceutical and medical purposes, e.g.:

- Growing microorganisms (e.g. aerating and growing bacteria cultures),
- Dissolving nutrient media and solids,
- To prevent the settling of suspended matter,
- Titration.

You can stir liquids in various shapes of vessel (e.g. Erlenmeyer flasks, beakers). As the rotation speed can be variably adjusted, liquids can be moved both gently as well as vigorously mixed.

The stirring vessel contains a magnetic stirring bar. When the stirring vessel is placed on the stirring point (3), an electromagnetic field will move the magnetic stirring bar.

The direct-controlled **MONO DIRECT** is robust, handy magnetic stirrer for routine laboratory tasks. It is very small and requires very little space.

The suitability of the direct-controlled magnetic stirrer **MONO DIRECT** for use in incubators is limited, because the stirring power cannot be adjusted as necessary. Moreover, the integrated electronics heat the magnetic stirrer additionally.

4 Startup procedure



DANGER

Supply voltage and supply frequency must be within the range specified for the power supply unit (5).



DANGER

Magnetism.

Magnetic or metallic parts (e.g. data carriers, pacemakers, watches) can be affected by magnetic fields.

Keep such parts away from the magnetic stirrer (2) and the magnetic stirring bars.



CAUTION

The equipment must not be operated in hazardous locations.



CAUTION

Permitted ambient conditions:

Cf. Technical specifications.

Avoid extreme temperature changes.

The power supply unit (5) must not be run in humid rooms, or set up in water splash zones.



CAUTION

The magnetic stirrer (2) must be switched off before connecting or pulling the connector.

- ◆ Turn rotation speed control button (1) to position OFF (i.e. counterclockwise).
- ◆ Connect the secondary power cable (4) unit to the connector on the back of the magnetic stirrer.
- ◆ Connect the mains plug (6) to the mains socket.

5 Stirring operation

5.1 Stirring vessels

You should use stirring vessels which are circular in shape, and made of glass, nonmagnetic metal or plastic. Walls should be of an even thinness. Flat-bottomed glass vessels (not concave) and smooth surfaces improve the running quality of the magnetic stirring bars.

When stirring larger volumes of liquid, you should use stirring vessels having a relatively small diameter and a thin bottom.

5.2 Magnetic stirring bars

Thermo recommends the following magnetic stirring bars:

Type	Size (mm)	Material	Order No.
KOMET 15	(Ø x L) 9 x 15	SmCo	50087924
KOMET 30	(Ø x L) 12 x 30		50087930
KOMET 50	(Ø x L) 21 x 50		50087909



INFORMATION

The length of the magnetic stirring bar must not exceed 80 % of the vessel diameter. In the case of circular and triangular magnetic stirring bars, the length must not exceed 50 mm.
Do not use cylindrical stirring bars with a center ring, or elliptical stirring bars with a round cross-section.



INFORMATION

Some magnetic stirring bars (especially triangular bars) may have a critical resonance frequency at lower rotation speeds. This may cause the magnetic stirring bar to wander away from the turning center and carry out periodic oscillations. Avoid this rotation speed setting when the problem occurs. Quickly travel through this problem range when adjusting the rotation speed.

Thermo has developed new magnetic stirring bars of the **KOMET** series, which contain a high-quality super-strong samarium-cobalt magnet (Figure 2). **KOMET** shows a strong magnetic force. The stronger attraction to the magnetic alternating field provides the stirring bar with very efficient stirring properties. Even if there are greater distances (e.g. in high measuring cylinders) the stirring force will be maintained. The stability of the stirring bar will not be impaired if the vessel has a curved bottom. The strong magnetic coupling in samarium-cobalt magnets will also increase friction. The standard design of the **KOMET** magnetic stirring bar is therefore unsuitable for stirring liquids containing particulate matter (such as mud) or for stirring in vessels with a rough interior surface.

Some of the **KOMET** stirring are specially fitted with a wear-resistant glide ring for use under excruciating circumstances, such as when stirring vessels feature rough plastic or stainless-steel bottoms or if the media to be stirred contain solids (Figure 3).

Any risk of demagnetization by external magnetic fields is completely eliminated. All **KOMET** series stirring bars can be readily recognized by their two conical ends.

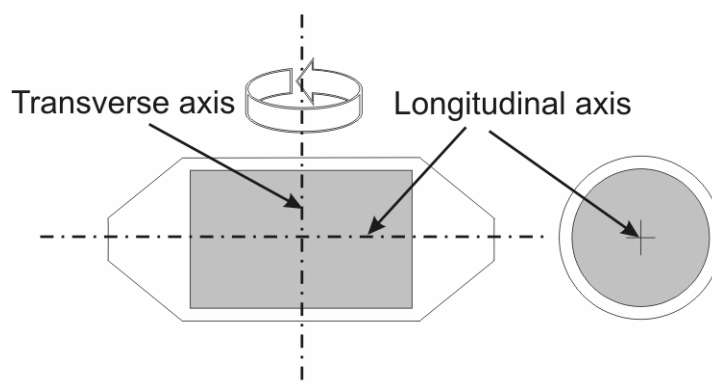


Figure 2: **KOMET** stirring bar
Side view (left) and cross-section through central portion (right)

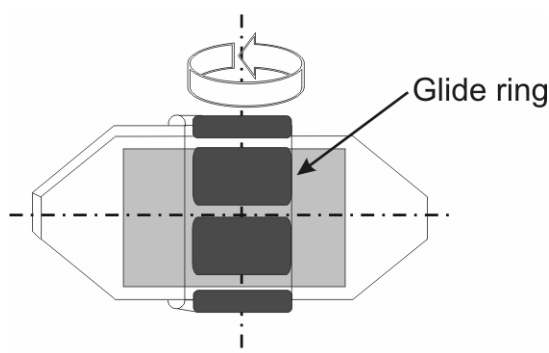
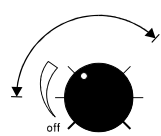
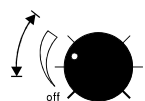
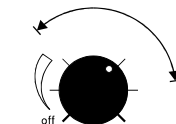


Figure 3: **KOMET** stirring bar with glide ring

5.3 Recommended rotation speed ranges

We recommend the following rotation speed ranges for various applications:

Application	Speed range
Microbiological and biotechnological applications:	
Aeration of bacteria cultures Growth of bacteria cultures Dissolving nutrient media, intensive aeration of bacteria cultures	
Routine laboratory work:	
Prevent accretion of suspended matter Titration Dissolving solids	 

5.4 Stirring



CAUTION

**Do not place hot stirring vessels on top of the magnetic stirrer (2).
Maximum temperature: +56 °C.**

- ◆ Fill stirring vessels no more than half full (high rotation speed range), or three-quarter full (low rotation speed range).
- ◆ Place a magnetic stirring bar into every stirring vessel.
- ◆ Turn rotation speed control button (1) to position OFF (i.e. counterclockwise).
- ◆ Centre the stirring vessel onto the stirring point (3).
- ◆ Turn the rotation speed control (1) clockwise until a slow speed is attained. The magnetic stirring bar moves to the centre of rotation.
- ◆ Select the desired speed using the rotation speed control (1).

After approximately 15 seconds, the magnetic stirring bar rotates with the preselected speed.



If you want to stop stirring:

- ◆ Turn the rotation speed control button (1) to position OFF.

5.4.1 Power adaptation

The plug-in power supply unit (5) supplies **MONO DIRECT** with adjustable stirring power. The power can be selected using the adjustment knob on the back of the power supply unit (5). You have a choice of 1 and 5 watts of stirring power (Figure 4).

- ◆ When stirring small volumes and you do not want the standing surface to heat up:
Turn stirring power control button (7) to position "1 Watt".
With this setting, the temperature of the standing surface will not exceed 27 °C.
- ◆ When stirring larger volumes:
Turn stirring power control button (7) to position "5 Watt".

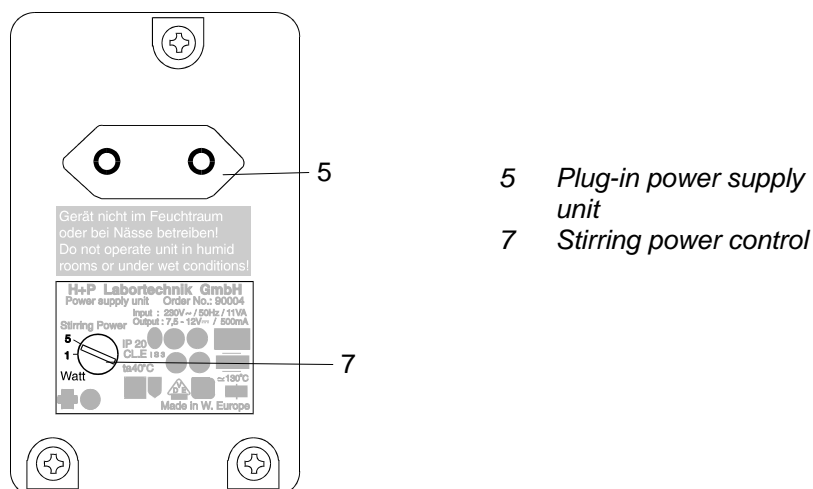


Figure 4: Plug-in power supply unit with preselectable stirring power, back

5.4.2 Tips on stirring

⇒ **If rotation of the magnetic stirring bar is uneven or jerky:**

Reaction between the alternating magnetic field and the magnetic stirring bar is too strong.

- ◆ Increase the rotation speed, or
- ◆ Use a smaller magnetic stirring bar, or
- ◆ Increase the gap between the vessel and the stirring drive (2).

To achieve this, place e.g. a glass slab or a nonmagnetic metallic plate between stirring vessel and magnetic stirrer (2).

⇒ **If the magnetic stirring bar cannot be centred, or constantly wanders off centre:**

Reaction between the alternating magnetic field and the magnetic stirring bar too weak, or the base of the stirring vessel is concave or too thick.

- ◆ Move the stirring vessel a little back and forth and recentre it on the stirring point (3).
- ◆ Reduce the rotation speed, or
- ◆ Use a longer magnetic stirring bar or one with a larger diameter (e.g. the elliptical or **KOMET** magnetic stirring bar), or
- ◆ Use a smaller stirring vessel with a thin-walled, flat base, or
- ◆ Reduce the filling level in the stirring vessel.

⇒ **If the stirring action is too weak:**

- ◆ Use a **KOMET** stirring bar.
- ◆ Use a longer magnetic stirring bar, or a stirring vessel of smaller diameter.

6 Maintenance and cleaning



DANGER

The MONO DIRECT magnetic stirrer (2) must not be immersed in water or cleaning solutions.



CAUTION

**Do not use chlorine-based cleaning agents, cleaning wool, cleaning agents containing metal parts or ammonium when cleaning the equipment.
Such agents can damage the surface of the equipment.**

The equipment is maintenance-free.

Clean the surfaces of the magnetic stirrer (2) at regular intervals.

For this purpose you can use

- water containing a surfactant detergent additive,
- isopropanol.
- ♦ Turn the rotation speed control button (1) to position OFF.
- ♦ Disconnect the power supply unit (5) from the power-line and from the magnetic stirrer (2).
- ♦ Clean the surfaces of the magnetic stirrer (2).



DANGER

**Defective secondary power cables (4) defective mains plugs (6) or defective mains cables must be replaced by original parts obtained from the manufacturer or their representative.
Return the defective power supply unit (5) to our customer service for repair.**



CAUTION

In case of repair, the equipment must only be opened by an authorized service agent.

In case of necessity to repair the equipment, it should be returned to an authorized servicing agent. The equipment must be clean and free from harmful substances.

To avoid transport damages during the shipment, please send the equipment correctly packed in the original packing.

Please always enclose the filled out return delivery note.

If necessary ask for the return delivery note at Thermo (address: see inside of the cover sheet).

When ordering spares, please state equipment type and serial number.

You can obtain further technical documents (e.g. circuit diagrams, board data) for your engineers by contacting the address on the inside of the cover sheet.

7 Troubleshooting

- **Rotation of the magnetic stirring bar is always irregular:**

It is unavoidable that magnetic stirring bars will age with time, for example through sterilization, use at excessive temperatures, or mechanical stress (such as when you drop it). This may adversely affect the stirring bar's magnetic properties.



CAUTION

Do not allow AlNiCo5 type magnetic stirring bars to remain in an alternating magnetic field if they cannot rotate freely. Do not subject the magnetic stirring bar to a strong inverse magnetic field. This may result in destruction of the magnetic stirring bar.

- ◆ Remove and replace the magnetic stirring bar with a new one.

Or:

- ◆ Use the **KOMET** series of super-strong magnetic stirring bars offered by Thermo (see Chapter 5.2). They are made from high performance Samarium-Cobalt magnets. Any risk of demagnetisation by external magnetic fields is completely eliminated.

- **The rotation speed control button (1) slips:**

- ◆ Tighten screw on rotation speed control button (1).

8 Technical specifications

Type		MONO DIRECT
Order-No.: (incl. power supply)	Version DE Version US Version GB Version JP Version AU	50094711 50095601 50096203 50095921 50097289
Stirring points		1
Stirring volume	ml	1 – 3.000
Stirring power	W	1 / 5
Speed range	rpm	130 – 1.000
Speed regulation for alternating loads		none
Dimensions (W x D x H)	mm	180 x 215 x 35
Weight	kg	1.4
Housing		Stainless steel, powder-coated, grey
Permissible operation conditions (only stirrer)		-10 °C to +40 °C at max. 95 % relative humidity
Permissible storage conditions		-40 °C to +70 °C at 10 % to 95 % relative humidity 500 to 1,060 hPa barometric pressure
Operating voltage	VDC	8 - 12
Protective system (acc. to DIN 40050)		IP 32
Unit design		compliant with IEC 1010

Subject to technical alterations

8 Technical specifications

Power supply		Technical specification
Type		plug-in power supply unit
Order No.:	Version DE Version US Version GB Version JP Version AU	50087986 50087990 50093115 50087989 50087987
Input voltage/frequency	VAC/Hz	DE: 230/50-60 US: 115/50-60 GB: 230/50-60 JP: 100/50-60 AU: 240/50-60
Output voltage	VDC	8-12
Length of the cable	m	Secondary cable 2 m
Mark of conformity		VDE / SEV / GS
Protection (DIN 40050)		IP 20
Electromagnetic compatibility		VDE 0871
Permissible operation conditions		+10 °C to +40 °C at 30 % to 75 % relative humidity 700 to 1,060 hPa barometric pressure
Permissible storage conditions		-40 °C to +70 °C at 80 % to 95 % relative humidity 500 to 1,060 hPa barometric pressure

Subject to technical alterations

9 Warranty

VARIOMAG magnetic stirrers have a modular construction and offer the greatest possible degree of trouble-free operation, thanks to their maintenance-free stirring and magnetic drives.

If despite our strict quality controls a system component should ever fail to work perfectly, it can be repaired or replaced by our after-sales service without difficulty. Please retain your invoice, which will be needed when presenting any warranty claims.

Two years full warranty on all system components!