Operation Manual

English

MAXdrive		**Order no.: 50001**
	with	
MAXcontrol		**Order no.: 94400**
FABdrive		**Order no.: 50101**
	with	
FABcontrol		**Order no.: 94402**

Includes:

Quick Start
Operation Manual
Technical Documentation
Specifications

Thank you for your confidence shown in us!
Congratulations to the purchase of your new product.
For any enquiries, questions or suggestions please do not hesitate to contact us at info@2mag.de.

2mag
Main competence of **2mag** is based upon mixing, tempering and measuring/controlling. In these fields we are offering support with our products to the modern laboratory within the standardized daily business as well as for the implementation of highly complex processes in the state-of-the-art research. Due to the fact that **2mag** is developing according to customer's needs, is manufacturing self-contained and under permanent quality control and is also selling on-site together with competent contact persons, we can guarantee our customer an outstanding quality and product performance.

Contents

A Quick start

1. Overview of your product

Magnetic stirrer MAXdrive with control unit MAXcontrol
Magnetic stirrer FABdrive with control unit FABcontrol

Image 1: 1-position magnetic stirrer MAXdrive with control unit MAXcontrol

Your product contains at despatch:

- A modern motor-driven magnetic stirring system (**MAXdrive** / **FABdrive**) consisting of a stainless steel stirring plate with 1 stirring point with fixed stirrer control cable (8-pin plug, with screw nut)
- An external control unit with one connector socket (**MAXcontrol** / **FABcontrol**) for connection of the stirrer control cable as well as a pluggable power cable (country-specific).

2. Application fields

2.1 Operator

The maintenance-free magnetic stirrers **MAXdrive / FABdrive** are used in the fields of chemistry, medicine, pharmacy, microbiology and biotechnology.
The operators are generally working in research and development, production and quality assurance, where magnetic stirrers with high power are needed for e.g. large volume (MAXdrive up to 250 litres / FABdrive up to 1,000 litres) or highly viscous media or for the stirring over long distances (up to 60mm).

2.2 Basic functions

Basic function is stirring of liquids in suitable and chemically resistible vessels as well as in fermenter systems.
The stirrer housing is tightly closed and can be cleaned under running water.
The maximum ambient temperature is +50°C in air.

2.3 Product combinations

In addition to the use at the conventional laboratory desk our products have also been tested for the application in

- Laminar flow devices
- Safety cabinets
- Safety cabins

2.4 Application not for the intended use

The magnetic stirrers **MAXdrive / FABdrive** are **explicitly not intended** for the application of:

- Stirring and warming of flammable liquids
- Warming of pressure-tight closed and NOT pressure-resistant vessels or glasses
  (e.g. Erlenmeyer flasks, lab flasks)
- At general danger of explosion

The **2mag** is offering special products for the just mentioned application combinations. More information for this can be found at www.2mag.de or at info@2mag.de

2.5 Vessels

Please only use round, chemical resistant and**,** where required**,** heat-resistant vessels made of glass or non-magnetic metal.
The vessels should have a thin, even wall thickness. Flat glass bottoms (without any curve to the inside) and smooth surfaces will improve the operating characteristic of the magnetic stirring bar.
Uneven surfaces would reduce the stirring power and would cause reaming up of the stirring bar's gliding surface.

Please always place the flasks in the magnetic centre of the magnetic stirrer. This will ensure the optimum stirring effect!

Do never use any pressure-tight closed flasks.

RISK OF BURSTING!

2.6 Stirring bars

In general, all stirring bars length and diameter can be used. But we recommend using the commercial stirring bars with Samarium Cobalt magnetic core (SmCo). By using this highly energetic magnetic material the maximum stirring power of the magnetic stirrer can be achieved, especially when mixing viscous media.

2.7 Tips and hints to the topic stirring

The mixing flasks should be filled max. up to the middle (high speed range) resp. up to ¾ (low speed range).

Never throw the stirring bar into the flask!

BURSTING RISK of the flask!
BURSTING RISK of the stirring bar's magnetic core!

At first, if applicable within your process, fill up your flask.
The liquid will cushion the sliding of the stirring bar.

Then, let the stirring bar carefully slide along the inner side of the bent flask onto the flask's bottom.

You will avoid possible glass breakage as well as non-visible breakage of the stirring bar's magnetic core by doing this!

Place the stirring flasks right in the centre of the stirring point.

In case the magnetic stirring bar won't start running:
The magnetic interaction between the magnetic field and the magnetic stirring bar might be too big. There will be high friction forces caused by high magnetic attractions which avoid the running of the stirring bar.

- Increase the distance between the flask and the magnetic stirring drive by placing a non-magnetic plate (attention: also do not use any aluminium!) between the magnetic stirring drive and the flask.

In case the magnetic stirring bar will not be centred or leaves the centre permanently:
The interaction between the alternating magnetic field and the magnetic stirring bar is too low.
Or the stirring bar has a bottom that is uneven or too thick-walled.

Move the flask slightly back and for and centre it again onto the stirring point of the stirrer surface.

- Reduce the speed or use a longer magnetic stirring bar or one with a larger diameter or
- Use a smaller flask with a thin-walled, even bottom or
- Reduce the filling amount in the flasks or
- Increase the stirring speed.
- Decrease/reduce, if possible, the distance between the flask and the magnetic stirrer or

In case the stirring activity is too weak:

- Use commercial magnetic stirring bars with SamariumCobalt-core.
- Use a longer stirring bar or a stirring flask with smaller diameter.

3. Installation

3.1 Safety advice

Please ensure the following basic conditions prior to installation:

The magnetic stirrer MAXdrive / FABdrive works with extremely powerful permanent magnets.
Cardiac pacemakers, data storage mediums, magnetic cards and other devices, which can be affected by magnetic fields, have to be kept away from the fields of the stirring unit as well as from the stirring bars.

The device must not be used in explosive rooms.
The control unit and the stirrer must not be dipped in water or any cleaning solutions.

Your supply voltage has to comply with the label of the control unit. The **control unit** has to be **switched off** before any power connection or power disconnection.

To increase the operation safety, the control unit should be placed apart from chemical materials and reactions as well as away from thermal influences.
For special requirements please contact info@2mag.de.

ATTENTION!
The control unit has to be switched off, BEFORE you connect or disconnect the plugs.

Always turn off the power switch (5) first before handling the connection cables.

3.2 Installation, connection to the control unit

Step by step instruction (please also see image 2)

- **Switch off the control unit MAXcontrol / FABcontrol BEFORE you handle the connection cables with the power switch (5) and disconnect the power cable (4)!**
- The stirrer control cable (1) of the magnetic stirrer MAXdrive / FABdrive has now to be connected to the 8-pin socket of the control unit (2).
  Please secure this plug connection by turning the screw nut situated at the plug. Only by this, a trouble-free operation can be guaranteed.
- Connect the power cable (4) to the power input (3) rear-side and afterwards to the power plug.
- The control unit is now connected to the magnetic stirrer and ready for operation.

Image 2: Installation, rear side of the control unit MAXcontrol / FABcontrol

Description functional elements of control unit - backside

1 Connector of the stirrer control cable
2 Socket for the stirrer control cable
3 Power socket
4 Power cable
5 Power switch
6 Control unit 2mag MAXcontrol / FABcontrol

4. Operating of the control unit

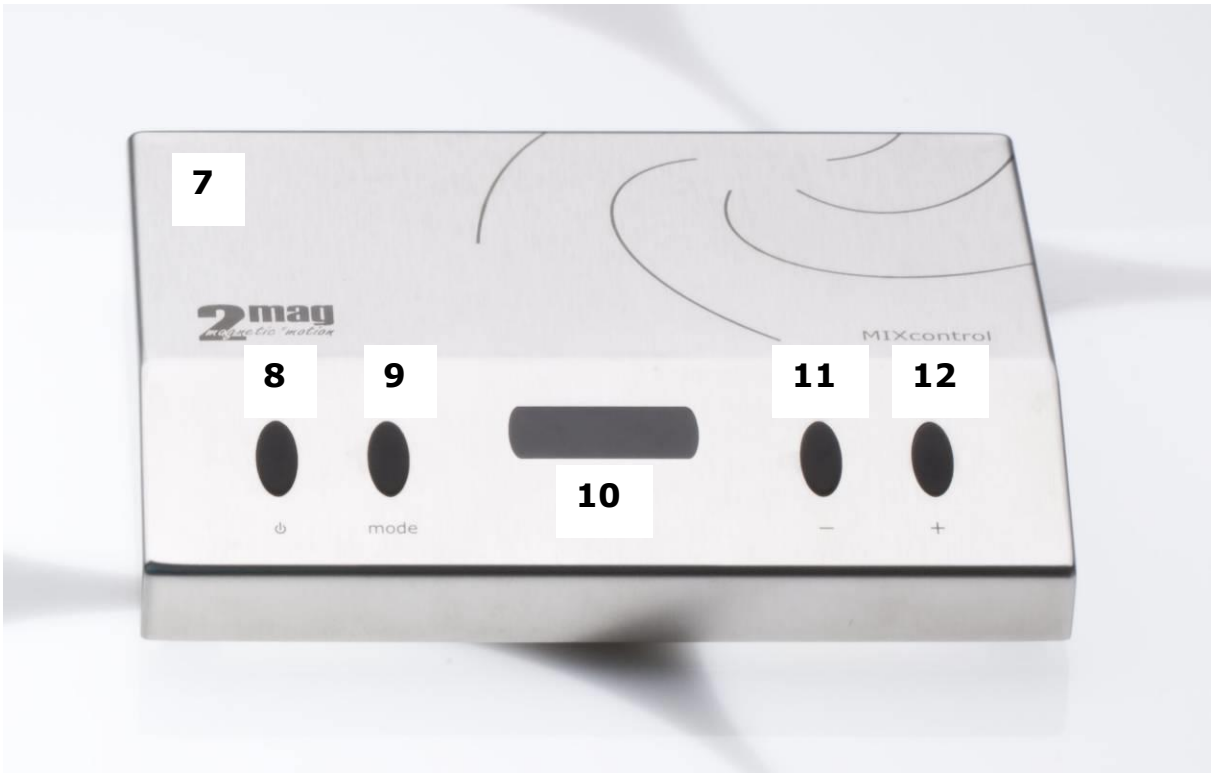

Image 3: Control unit MAXcontrol / FABcontrol

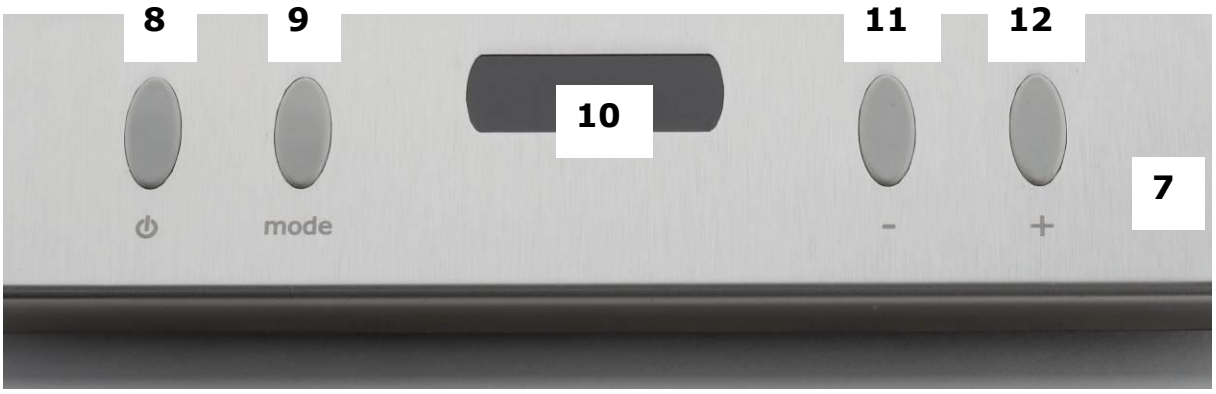

Image 3: Close-up, operating elements, control unit MAXcontrol / FABcontrol

4.1 Description operating elements

7 Control unit 2mag MAXcontrol / FABcontrol

Stirrer control

8 ON/OFF key for magnetic stirrer
9 MODE-key (M) for setting of speed, acceleration time of the magnetic stirrer and buzzer tolerance (available only for FABcontrol)
10 Display for speed, acceleration indicator and buzzer tolerance (only FABcontrol)
11 MINUS-key (-) for reduction of stirrer speed
12 PLUS-key (+) for increase of the stirrer speed

Operating of the control unit MAXcontrol / FABcontrol

After the cables have been installed correctly according to "**Installation, Connection to the control unit"**, the magnetic stirrer system MAXdrive / FABdrive will be ready for operation.

4.2 MAXcontrol - stirring operation and stirrer control

Turning On and Off
Please turn on the power switch (5) at the rear side of the control unit MAXcontrol.

Please press the On/OFF-key (8) once. The magnetic stirrer will be switched on by that. The current stirring speed will be shown in the display (10).
By pressing the ON/OFF-key (8) once more, the magnetic stirrer will be switched off again. The display indicator (10) expires.

SoftStart
After turning on the magnetic stirrer, the stirring bar will be, to increase the operating safety, defined first and then smoothly accelerated to the set speed.
The accelerating phase will be shown by the illumination of a dot at the right segment of the LED-display (10).

Stirrer speed adjustment
The speed of the magnetic stirrer can be adjusted by pressing the MINUS- (11) resp. the PLUS-key (12).
The adjusted speed will be shown in the display (10) when the magnetic stirrer is switched on. The speed range can be adjusted between 100 and 1.200 rpm in steps by 10.
By constantly pressing the MINUS- resp. the PLUS-keys, an accelerated adjustment of the speed can be achieved.

QuickSet
To enter the start- respectively maximum speed directly and quickly there is the Quickset-function available.
The use of the following described keys will be made with the stirrer turned on.
Setting the Start Speed
Press the MINUS-key (11) permanently and press shortly the ON/OFF-key (8) afterwards. The start speed "100" will be set.
Setting the Maximum Speed
Press the PLUS-key (12) permanently and press shortly the ON/OFF-key (8) afterwards. The maximum speed "1.200" will be set.

Acceleration adjustment – Variable SoftStart
A newly developed and extremely efficient magnetic stirrer will come into operation.
To raise the operation safety the acceleration of the magnetic stirrer can be set in steps by seconds from 20 to 99 seconds.
The indication of e.g. 20 sec. refers to the time period from the moment of switching on until the max. speed is reached.
A **fast acceleration** of the stirrer is recommended for small stirring amounts as well as aqueous media.
A **slow acceleration** is recommended for a safe increase of the stirrer's running with regard to large volume, highly viscous media and stirring over far distances. With this setting the possibility of a separation of the magnetic coupling during the acceleration phase is minimized.

The acceleration can be adjusted in four steps by using the MODE-key (9). The acceleration can be set in steps by seconds from 20 to 99 seconds by pressing the MINUS- (11) resp. PLUS-key (12) afterwards.

The current value is now shown on the display (10). "Ac 20" is the quickest acceleration, "Ac 99" is the slowest acceleration.
The display (10) will turn back to the current speed indicator after approx. 5 seconds. The acceleration adjustment is finished again at the time the speed range is shown.
The acceleration adjustment can also be finished immediately by pressing the MODE-key (9) again.

Display, Magnetic Stirrer
The display (10) provides as described above a description of:

- Current stirring speed (always with switched on magnetic stirrer)
- Set acceleration (after pressing the MODE-key (9))
- For checking, if the magnetic stirrer is switched on. The display will not be illuminated in case the stirrer is switched off.

The magnetic stirrer works with extremely strong permanent magnets.
Cardiac pacemakers, data storage mediums, magnetic cards and other devices, which can be affected by magnetic fields, have to be kept away from the fields of the stirring unit as well as from the stirring bars.

4.3 FABcontrol - stirring operation and stirrer control

Turning On and Off
Please turn on the power switch (5) at the rear side of the control unit FABcontrol.

Please press the ON/OFF-key (8) once. The magnetic stirrer will be switched on by that.
The current stirring speed will be shown in the display (10) → "**A.150**" → meaning: **ACTUAL speed is 150 rpm**.
By pressing the ON/OFF-key (8) once more, the magnetic stirrer will be switched off again. The display indicator (10) expires.
The MINUS- (11) resp. the PLUS-key (12) are blocked in this mode!

SoftStart
After turning on the magnetic stirrer, the stirring bar will be, to increase the operating safety, defined first and then smoothly accelerated to the set speed.
The accelerating phase will be shown by the illumination of a dot at the right segment of the LED-display (10).

Stirrer speed adjustment
The speed of the magnetic stirrer can be adjusted by pressing firstly the MODE-key (9) once and then the MINUS- (11) resp. the PLUS-key (12).
The adjusted speed will be shown in the display (10) → "**S.150**" → meaning: **SET speed is 150 rpm**.
The speed range can be adjusted between 100 and 990 rpm in steps by 10.
By constantly pressing the MINUS- resp. the PLUS-keys, an accelerated adjustment of the speed can be achieved.

QuickSet
To enter the start- respectively maximum speed directly and quickly there is the Quickset-function available.
The use of the following described keys will be made with the stirrer turned on.
Setting the Start Speed
Press the MINUS-key (11) permanently and press shortly the ON/OFF-key (8) afterwards. The start speed "100" will be set.
Setting the Maximum Speed
Press the PLUS-key (12) permanently and press shortly the ON/OFF-key (8) afterwards. The maximum speed "990" will be set.

Buzzer alarm
The integrated buzzer is giving an alarm signal in the case that the actual speed is below or above the set speed.

Tolerance of buzzer alarm
The set tolerance for giving an alarm is +/- 10 seconds regarding the set speed.
The tolerance of buzzer alarm can be adjusted by pressing firstly the MODE-key (9) twice and then the MINUS- (11) resp. the PLUS-key (12).
The tolerance will be shown in the display (10) → "**Al.10**" → meaning: **tolerance of buzzer alarm is +/-10 rpm**.
The tolerance can be adjusted between 5 and 50 rpm. "Al.0" sets the buzzer alarm off.

Acceleration adjustment – Variable SoftStart
A newly developed and extremely efficient magnetic stirrer will come into operation.
To raise the operation safety the acceleration of the magnetic stirrer can be set in steps by seconds from 20 to 99 seconds.
The indication of e.g. 20 sec. refers to the time period from the moment of switching on until the max. speed is reached.
A **fast acceleration** of the stirrer is recommended for small stirring amounts as well as aqueous media.
A **slow acceleration** is recommended for a safe increase of the stirrer's running with regard to large volume, highly viscous media and stirring over far distances. With this setting the possibility of a separation of the magnetic coupling during the acceleration phase is minimized.

The acceleration can be adjusted in four steps by pressing the MODE-key (9) three times.
The acceleration can be set in steps by seconds from 20 to 99 seconds by pressing the MINUS- (11) resp. PLUS-key (12) afterwards.

The current value is now shown on the display (10). "**Ac.20**" (→ meaning 10 sec. to maximum end speed) is the quickest acceleration, "**Ac.99**" (→ meaning 20 sec. to end maximum speed) is the slowest acceleration.
The display (10) will turn back to the current speed indicator after approx. 5 seconds. The acceleration adjustment is finished again at the time the speed range is shown.
The acceleration adjustment can also be finished immediately by pressing the MODE-key (9) again.

4.4 Quick-Manual FABcontrol, display functions and modes

Standard display mode
Standard → "**A.150**" → actual speed is 150 rpm.
"MINUS" (11) and "PLUS" (12) keys are locked in this display mode.

Speed setting mode
Pressing MODE key 1x → "**S.150**" → set speed is 150 rpm.
The set speed can be changed by pressing of "MINUS" (11) and "PLUS" (12) keys.
Set range: 100 - 990 rpm.

Buzzer alarm tolerance setting mode
Pressing MODE key 2x → "**Al.10**" → set alarm tolerance of the buzzer is +/- 10 rpm.
The buzzer alarm tolerance can be changed by pressing of "MINUS" (11) and "PLUS" (12) keys.
Set range: 5 - 50 rpm.

Acceleration (SoftStart) setting mode
Pressing Mode key 3x → "**Ac.20**" → set acceleration time of the stirrer is 20 seconds.
The acceleration time can be changed by pressing of "MINUS" (11) and "PLUS" (12) keys.
Set range: 20 - 99 sec.

Please note:
The display is always falling back to standard display mode after approx. 5 seconds not using the keys.

The display will not be illuminated in case the stirrer is switched off.

5 Maximum operation temperatures

Please note the **maximum operation temperature +50 °C** in air.

Operation in higher ambient temperatures can damage the stirring drive.

The magnetic stirrer works with extremely strong permanent magnets.
Cardiac pacemakers, data storage mediums, magnetic cards and other devices, which can be affected by magnetic fields, have to be kept away from the fields of the stirring unit as well as from the stirring bars.

B Maintenance, Cleaning and Care

Do not use any cleaning agent or cleaning rag that is based on chlorine with metallic components or ammoniac.
These agents may harm the surface.

The control unit must not be dipped in water or any cleaning solutions.

2mag devices are generally maintenance-free.

Due to their construction the **2mag** devices are very robust and designed for the professional daily use.

We recommend cleaning the devices' surfaces with e.g. cleaning agents containing tensides or isopropyl alcohol regularly.

BEFORE cleaning the surfaces, switch off the device with the power switch and pull off the power cable afterwards.

C Service case and customer service

During service, the device may only be opened by an authorized customer service.

In case of any defect on the device, please make sure to contact us first. We will be ready to offer help quickly and straightforward.

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Warranty:

Due to their construction, the **2mag** devices are very robust and designed for the professional daily use.

Should in any case, despite our strict quality control, a system part not work without any fault, it can be repaired or exchanged by our customer service without any problems.

We guarantee 3 years warranty on all material and manufacturing defects.

D Errors

The magnetic stirring bar is turning in an unbalanced way:
There is no denying that magnetic stirring bars are aging in the course of time. This may happen by e.g. sterilizing, usage at high temperatures or causing stress (dropping down). The magnetism can be decreased by this. Furthermore, large stirring bars can be demagnetized accidentally by unfavourable magnetic alternating fields.
This will result in the stirring bars' magnetic total losses.
Separate out these stirring bars and exchange them by new ones.

The magnetic stirring bar won't start running:
The electromagnetic interaction between the magnetic field and the magnetic stirring bar is too big. There will be high friction forces caused by high magnetic attractions which avoid the running of the stirring bar. Increase the distance between the flask and the magnetic stirring drive by placing a non-magnetic plate (attention: also do not use any aluminium!) between the magnetic stirring drive and the flask.

The control unit is not ready for operation despite the power connection has been made and the power switch had been turned on:
Please get into contact with us.

In general, we are ready to help you in case of problems.
For any enquiries, questions or suggestions please do not hesitate to contact us at info@2mag.de

E Technical details

Magnetic stirrer MAXdrive

	MAXdrive
Order no.	50001
Stirring points	1
Stirring volume/point	1 – 250 liters
Stirring power (max.)	60 watts
Speed range	100 – 1,200 rpm
Material housing	stainless-steel
Material sealing	PUR
Permitted operation conditions	-10 up to +50 °C (at 95% humidity)
Measurement (WxDxH)	260 x 260 x 68 mm
Weight (gross)	approx. 9.8 kg
Permitted storage conditions.	-40 °C up to +70 °C, 10-95 %, 500-1060 hPa
Protection category	IP64
Operating voltage (max.)	24 VDC

Control unit MAXcontrol

	MAXcontrol
Order no.	94400
Speed range	100 – 1,200 rpm
Stirring power (max.)	60 watts
Acceleration adjustment	variable, 20 – 99 s
Voltage output	24 VDC
Housing material	stainless-steel
Measurements (WxDxH)	200 x 175 x 51 mm
Weight (gross)	approx. 2.0 kg
Permitted operation conditions	0 up to +40 °C (at 80% humidity)
Permitted storage conditions.	-40 °C up to +70 °C, 10-95 %, 500-1060 hPa
Protection category	IP20
Electrical data	100-240 V / 50-60 Hz / 4.2 A

Magnetic stirrer FABdrive

	FABdrive
Order no.	50101
Stirring points	1
Stirring volume/point	1 – 1,000 liters
Stirring power (max.)	100 watts
Speed range	100 – 990 rpm
Material housing	stainless-steel
Material sealing	PUR
Permitted operation conditions	-10 up to +50 °C (at 95% humidity)
Measurement (WxDxH)	180 x 180 x 75 mm
Weight (gross)	approx. 4.8 kg
Permitted storage conditions.	-40 °C up to +70 °C, 10-95 %, 500-1060 hPa
Protection category	IP64
Operating voltage (max.)	24 VDC

Control unit FABcontrol

	FABcontrol
Order no.	94402
Speed range	100 – 990 rpm
Stirring power (max.)	100 watts
Acceleration adjustment	variable, 20 – 99 s
Buzzer tolerance	varaible, 5 – 50 rpm
Voltage output	24 VDC
Housing material	stainless-steel
Measurements (WxDxH)	200 x 175 x 48 mm
Weight (gross)	approx 2.0 kg
Permitted operation conditions	0 up to +40 °C (at 80% humidity)
Permitted storage conditions.	-40 °C up to +70 °C, 10–95 %, 500-1060 hPa
Protection category	IP20
Electrical data	100-240 V / 50-60 Hz / 4.2 A

Accessories – Stirring bar SATELLITE 140

	SATELLITE 140
Order no.	44900
Shape	round, tripod
(Cover) Material	ZEDEX
Dimensions D x L	Ø 32 x 140 mm
Diameter tripod construction	Ø 227 mm
Weight (gross)	approx. 0.46 kg

Image 5: Stirring bar SATELLITE 140

Accessory Magnetic Stirring Bar ASTEROID 70

	ASTEROID 70
Order no.	44070
Shape	triangle, convex
Material	PTFE
Measurement (HxL, D)	39 x 70 mm, Ø 45 mm
Weight (gross)	approx. 0.37 kg

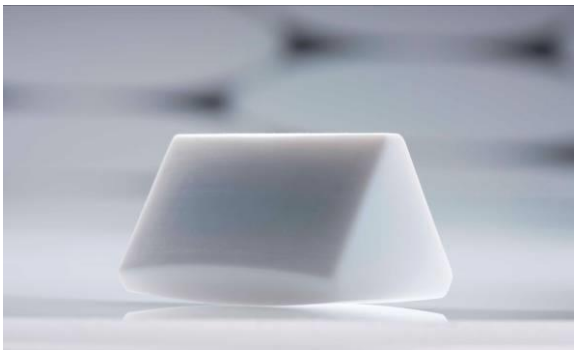

Image 6: Stirring bar ASTEROID 70

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EU-DECLARATION OF CONFORMITY FOR TECHNICAL DEVICES

(acc. to EU-guideline of the electromagnetic compatibility 2014/30/EU and the low voltage directive 2014/35/EU)

2mag AG
Schragenhofstraße 35 J
DE-80992 Muenchen
GERMANY

Hereby declares that the product

MAXdrive
FABdrive
incl.
MAXcontrol
FABcontrol

is conform to the appropriate regulations of the EU-guideline of the electromagnetic compatibility (EU-guideline 2014/30/EU) as well as the low voltage directive (2014/35/EU) incl. their changes and the laws for the realization of the guideline into national law.

The declaration is valid under the following conditions:
The ambient conditions being stated in the operation manuals have to be adhered to. This mainly applies to the supply with electric energy.

The following norms/standards were chosen to evaluate the finished products with regard to electromagnetic compatibility:

- DIN EN 61000-3-2
- DIN EN 61000-3-3
- DIN EN 61326-1
- DIN EN 60529

The following norms/standards were chosen to evaluate the finished products with regard to low voltage directive:

- DIN EN 61010-1
- DIN EN 61010-2-51

Muenchen, 20.04.2016 Signature: _____

Dr. Klaus Kaufmann (CTO)