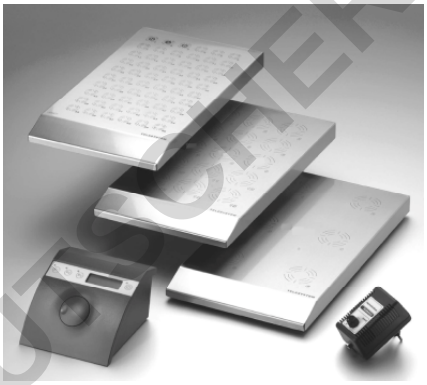
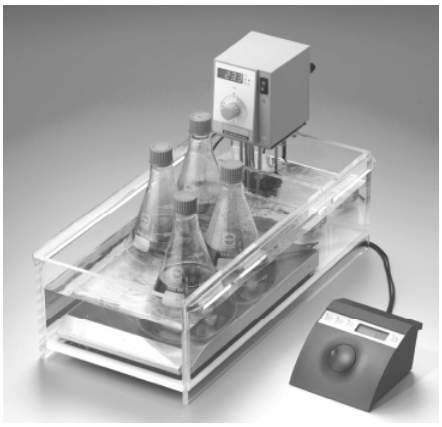
CIMAREC i™
Magnetic Stirrer

Operating Manual
50134782 Issue 03.2012



TELESYSTEM 06.07 • 06.20 • 06.40
TELESYSTEM 15.07 • 15.20 • 15.40
TELESYSTEM 60.07 • 60.20 • 60.40



RÜHR-BADTHERMOSTAT 06.20 • 06.40
RÜHR-BADTHERMOSTAT 15.20 • 15.40
RÜHR-BADTHERMOSTAT 60.20 • 60.40

Analyze • Detect • Measure • Control™

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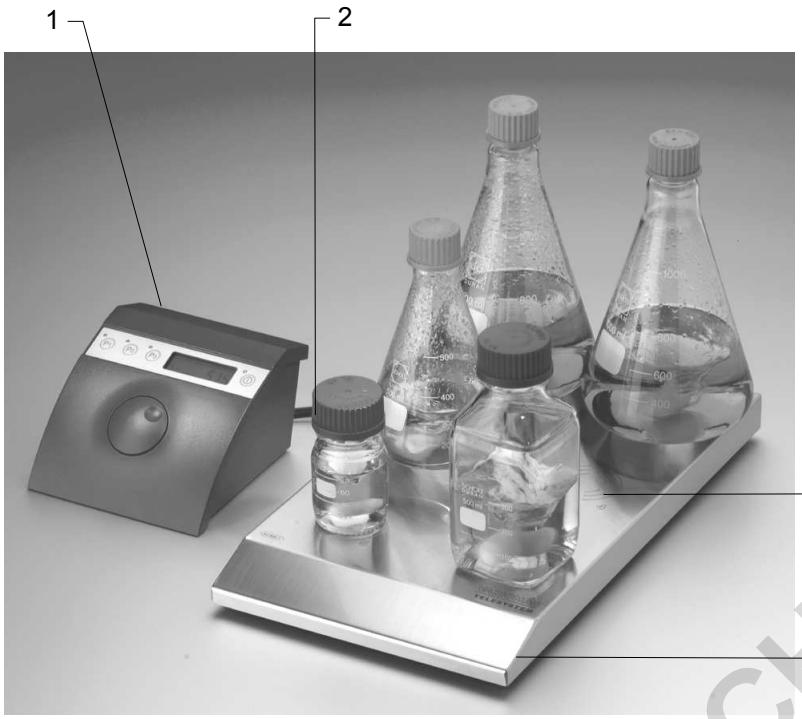
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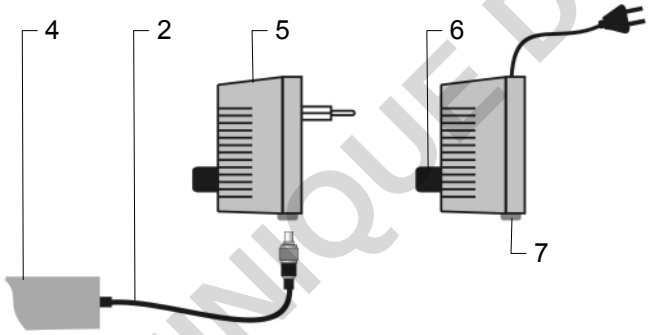
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1 *TELEMODUL 20 C / 40 C control unit*
2 *Control cable*
3 *Stirring point*
4 *Stirring drive*

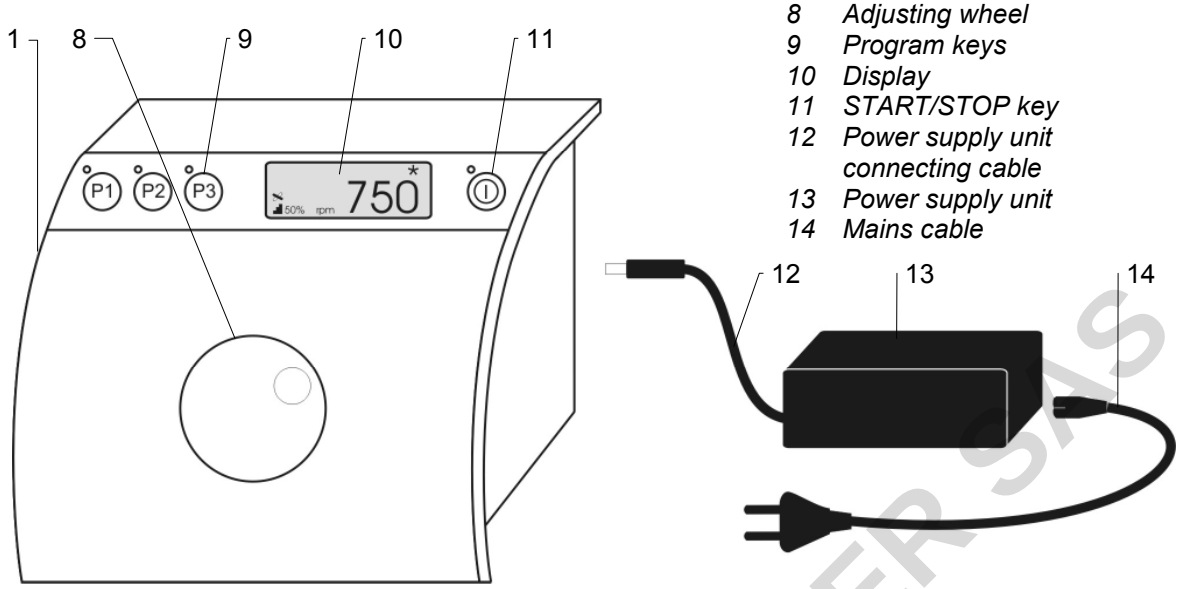
Figure 1: TELESYSTEM with TELEMODUL 20 C / 40 C control unit



2 *Control cable*
4 *Stirring drive*
5 *TELEMODUL control unit*
6 *Rotation speed control button*
7 *Magnetic stirrer outlet*

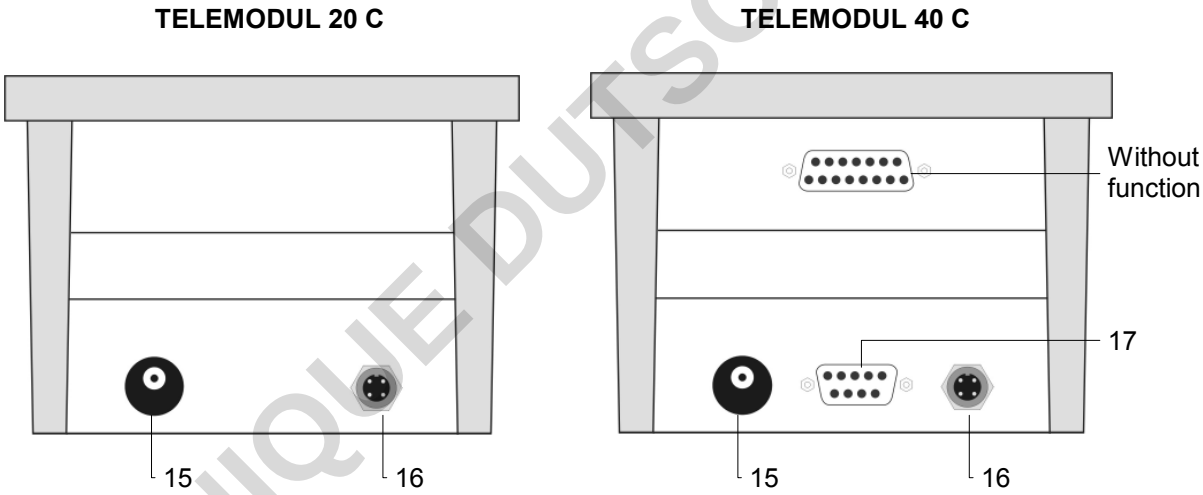
Figure 2: TELEMODUL control unit as plug-in control unit (left) or with mains cable (right)

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1 TELEMODUL 20 C / 40 C control unit
8 Adjusting wheel
9 Program keys
10 Display
11 START/STOP key
12 Power supply unit connecting cable
13 Power supply unit
14 Mains cable

Figure 3: Control unit TELEMODUL 20 C / 40 C with power supply unit



15 Power supply unit intake
16 Magnetic stirrer outlet
17 RS 232C port

Figure 4: Control unit TELEMODUL 20 C (left) and TELEMODUL 40 C (right), back view

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User Considerations

Correct use

The remote-controlled TELESYSTEM multiple magnetic stirrers are designed for simultaneous stirring or vertical mixing of liquids in several vessels. The stirrers are very well suited for submerged operation.

The stirrers can be employed for chemical, microbiological, biotechnical, pharmaceutical or medical purposes.

The stirrers are suited to unsupervised operation in the following areas:

- On the laboratory bench,
- In incubators and gas incubators with or without air humidification,
- In cold chambers,
- In water bath,
- In laminar flow equipment,
- In safety laboratories and sterile rooms.

STIRRING BATH THERMOSTATS must be used **only in the presence of an operator**.

Incorrect use

The magnetic stirring systems of the TELESYSTEM series must not be operated in hazardous locations.

Do not stir or shake flammable liquids with a low boiling point.

No flammable liquids with flash points below 100 °C must be used in the STIRRING BATH THERMOSTAT.

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.

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1 Safety considerations

Required safety features:

The device is compliant with the safety requirements of:

- EN 61010
- Low-voltage directive 2006/95/EC
- EMC directive 2004/108/EC

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 control unit (1, 5).
The control unit (1, 5) must only be connected to a grounded socket.



DANGER

Supply voltage and supply frequency must be within the range specified for the suspension thermostat (19).
The suspension thermostat (19) must only be connected to an earthed socket.



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 (4) and the magnetic stirring bars.



DANGER

GLASS SPLINTER.
At high speeds of the mixing stick can lead to the destruction of the sample vessels.
Wear safety goggles!
The vortex should not reach the stirring bar.
The stirring bar must rotate in the center of the sample vessel.
Watch the rotational behavior of the mixing stick for slow starts



CAUTION

The equipment must not be operated in hazardous locations.

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CAUTION

Permissible ambient conditions:
Cf. Technical specifications.
Avoid extreme temperature changes.
The control unit (1, 5) must not be run in humid rooms, or set up in water splash zones!



CAUTION

Connect only the appropriate power supply unit to the TELEMODUL 20 C (cf. Technical specifications, control units).
Connect only the appropriate power supply unit to the TELEMODUL 40 C (cf. Technical specifications, control units).
Connection to another power supply unit may cause damage to the control unit.



CAUTION

Do not place vessels on top of the stirring drive (4).
Maximum temperature: +56 °C



CAUTION

At high speeds of the magnetic stirring, too high power setting can lead to overheating of the stirred material.



CAUTION

High speed rotations of the stirring bar can cause a warming of the goods.



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.



CAUTION

The suspension thermostat (19) must be used only in the presence of an operator.



CAUTION

Make sure that no moisture can enter the suspension thermostat (19). Moisture might damage the suspension thermostat (19).



CAUTION

When replacing fuses (26), make sure to use only the original fuse type.

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INFORMATION
In the case of circular and triangular magnetic stirring bars, the length must not exceed 50 mm. The length of the magnetic stirring bars should not exceed 80 % of the vessel diameter.
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.

INFORMATION
Please observe the tables of the short operating manual (chapter 5) for operating the TELEMODUL 20 C / 40 C.

INFORMATION
Check the box, the parts delivered on completeness and visible damage.

INFORMATION
Use only appropriate sample containers! Review the sample containers prior to use for visible damage (cracks, tears, splinters, leakages, etc. ...)

INFORMATION
Use only suitable and undamaged magnetic stirrers! Check the stirring bar before use for signs of damage (cracks, chips ... etc.)

INFORMATION
Observe the relevant safety data sheets for chemical substances that you are working in the magnetic stirrer.

INFORMATION
Read the instructions carefully before using the magnetic stirrer. No application of the device by an untrained and inexperienced personnel.

INFORMATION
Use only in the instructions specified accessories, according to the illustrated configuration.

INFORMATION

CHECK THE BOX, THE PARTS DELIVERED ON COMPLETENESS AND VISIBLE DAMAGE.

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2 Equipment description

Figures 1 to 4 show the components together with their position numbers.

The TELESYSTEM magnetic stirrers feature 6, 15 or 60 stirring points (3). Drive and electronic control system are inside the stainless steel housing of the stirring drive (4), which is completely watertight. This prevents germs from penetrating into the inside of the stirring drive (4). The stirring drive (4) 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.

The stirring drives (4) get their power either from the TELEMODUL control unit (5; Figure 2) or the TELEMODUL 20 C / 40 C control unit (1; Figure 3).

On the budget-priced equipment incorporating the TELEMODUL control unit (Figure 2), the rotation speed can be preselected continuously. This is done using the rotation speed control button (6). The TELEMODUL control unit can be of the plug-in type, or be fitted with a mains cable.

The TELEMODUL 20 C / 40 C control unit (1) is available in two models, 20 C and 40 C. These two models differ with regard to maximum speed and to stirring power (for details see the technical specifications). The TELEMODUL 40 C control unit is additionally equipped with a RS 232C port (17). The RS 232C interface can be used to remote-control the control unit from a PC.

The TELEMODUL 20 C / 40 C (1) interface is menu-driven. The display (10) shows the selected speed (rpm) and gives an overview over the functions selected.
You may preset speed and stirring power as well as change the stirring mode. The adjusting wheel (8) is used for selecting the appropriate menu and for adjusting the desired value. The three program keys (9) can be individually defined.

After the startup time (soft start) all stirring bars turn or mix in the same direction at the preselected frequency.

The STIRRING BATH THERMOSTAT option lets you stir and heat/cool liquids concurrently.
This option includes:

- A TELESYSTEM 06.20, 06.40, 15.20, 15.40, 60.20 or 60.40 with TELEMODUL 20 C or 40 C control unit,
- A clear bath mount,
- A suspension thermostat.

The stirring drive (4) can be placed either below or inside the bath mount. The suspension thermostat heats the heating fluid in the bath mount while at the same time circulating it.

Stirring vessels and magnetic stirring bars do not fall within the scope of delivery.

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3 Function

The magnetic stirring systems of the TELESYSTEM type are used for chemical, microbiological, biotechnical, 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.

Remote-controlled multiple stirring drives are particularly suitable for bacterial cultures and for mixing liquids tending to form sedimentation.

The STIRRING BATH THERMOSTAT option lets you stir and heat/cool liquids concurrently. The suspension thermostat heats the heating fluid in the bath mount while at the same time circulating it. This causes the liquid in the stirring vessel to be heated evenly and carefully. STIRRING BATH THERMOSTATS are ideal for growing bacterial cultures.

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

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

When using the TELEMODUL 20 C / 40 C (Figure 3), you have a choice of stirring or vertically mixing the liquid. During stirring operation, the liquid will rotate in the vessel. During vertical mixing (shake mode), the current inside the vessel will be directed upwards and downwards. The liquid will not rotate. The rotation or shaking frequency can be adjusted continuously. The speed display shows the current rotating or oscillating speed of the magnetic stirring bars. All magnetic stirring bars will be moving at the same frequency.
In the case of TELESYSTEM 6, magnetic stirring bars on neighbouring stirring points (3) will rotate in the same direction. On all other TELESYSTEMS, they will rotate in opposite directions.

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4 Startup procedure

4.1 Connecting the device



DANGER

Supply voltage and supply frequency must be within the range specified for the control unit (1, 5). The control unit (1, 5) must only be connected to a grounded socket.



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 (4) and the magnetic stirring bars.



DANGER

GLASS SPLINTER.
At high speeds of the mixing stick can lead to the destruction of the sample vessels.
Wear safety goggles!
The vortex should not reach the stirring bar.
The stirring bar must rotate in the center of the sample vessel.
Watch the rotational behavior of the mixing stick for slow starts



CAUTION

The equipment must not be operated in hazardous locations.



CAUTION

Permissible ambient conditions:
Cf. Technical specifications.
Avoid extreme temperature changes.
The control unit (1, 5) must not be run in humid rooms, or set up in water splash zones!



INFORMATION

Read the instructions carefully before using the magnetic stirrer. No application of the device by an untrained and inexperienced personnel.

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⇨ **TELEMODUL control unit (5):**

- Turn the rotation speed control button (6) to position OFF.
- Connect the control cable (2) of the stirring drive (4) to the output socket (7) of the control unit (5). Tighten the knurled screw.
- Plug the mains plug into a properly installed mains outlet.
- If an absolutely germ-free environment is called for, the control unit (5) should be located outside the sterile zone.

⇨ **Control unit TELEMODUL 20 C / 40 C (1):**

CAUTION

Connect only the appropriate power supply unit to the TELEMODUL 20 C (cf. Technical specifications, control units).
Connect only the appropriate power supply unit to the TELEMODUL 40 C (cf. Technical specifications, control units).
Connection to another power supply unit may cause damage to the control unit.

- Connect the mains cable (14) with the power supply unit (13).
- Plug the power supply unit connecting cable (12) into the power supply unit intake (15) of the TELEMODUL 20 C / 40 C (1).
- Connect the control cable (2) of the stirring drive (4) to the output socket (16) of the control unit (1). Tighten the knurled screw.
- Connect the mains plug (14) into the mains socket.
- If an absolutely germ-free environment is called for, the control unit (1) should be located outside the sterile zone.

4.2 Stirring vessels

INFORMATION

Use only appropriate sample containers! Review the sample containers prior to use for visible damage (cracks, tears, splinters, leakages, etc. ...)

You should use stirring vessels which are circular in shape, and made of glass, nonmagnetic metal or plastic. Wall thicknesses 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 with a thin bottom.

Table 1 gives examples of suitable stirring vessels, and the available stirring points. In the case of larger vessels, not every stirring point (3) can be occupied by a vessel.

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TELESYSTEM	Type	HP 6	HP 15	HP 60
Stirring vessels	**Nominal capacity**	**Available stirring points**		
Erlenmeyer flasks and flat-bottomed flasks	25 ml 50/100 ml 250/500 ml 1000 ml 2000 ml	6 6 6 6 3	15 15 8/6 6 3	30 15 8/-[1)] -/- -/-
Beakers (tall in shape)	25 ml 50 ml 100/250 ml 600/1000 ml 2000 ml	6 6 6 6 6	15 15 15 8 6	60 30 15/- -/- -/-
Centrifuging tubes Test tubes Cultivating tubes		6[2)]	15[2)]	60[2)]
Distance between stirring points (mm)		130	65	32,5

1) Only in connection with a powerful TELEMODUL 40 C
2) Test tube rack required
Custom sizes on request.

Table 1: Suitable stirring vessels and available stirring points

Optional stainless steel test tube racks are available for the TELESYSTEM 60 stirring drive. They feature polished surfaces and handles on both sides.

Test tube rack for type	Test tubes Ø (mm)	Number of bores	Grid (mm)	Order No.
TELESYSTEM 60	25 16	60 60	33 33	50087960 50087955

Table 2: Test tube racks

Please inquire for additional test tube racks with other grids and bore diameters.

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4.3 Magnetic stirring bars

INFORMATION

Use only suitable and undamaged magnetic stirrers! Check the stirring bar before use for signs of damage (cracks, chips ... etc.)

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

Table 3: Suitable magnetic stirring bars

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.

INFORMATION

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

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Thermo has developed a new magnetic stirring bar **KOMET** (Figure 5). It contains a high-quality super-strong samarium-cobalt magnet. KOMET shows a strong magnetic force. The stronger attraction to the magnetic alternating field provides the stirring bar with very efficient stirring properties. 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 bars are specially fitted with a wear-resistant glide ring for use under excruciating circumstances (Figure 6).

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.

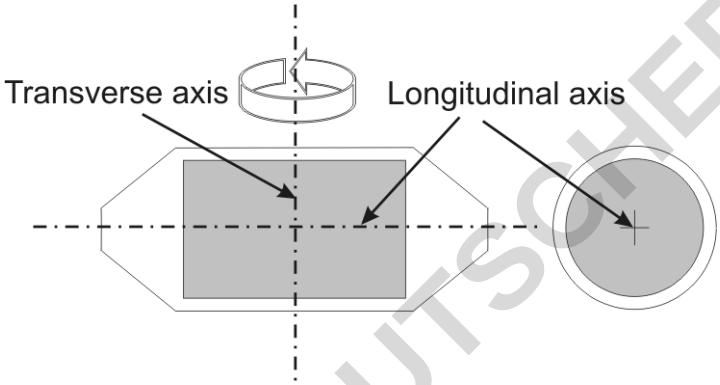


Figure 5: ***KOMET*** *stirring bar.*
Side view (left) and cross-section through central portion (right).

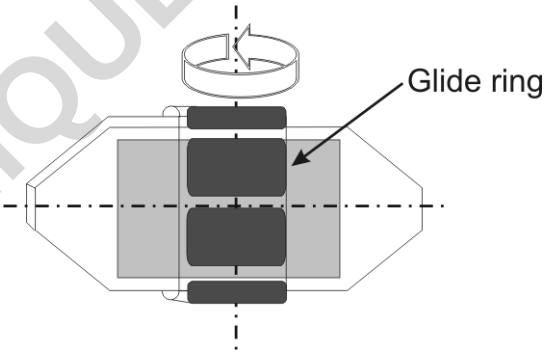


Figure 6: ***KOMET*** *stirring bar with glide ring*

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5 Short operating manual for TELEMODUL 20 C / 40 C

⇨ **Selecting a language, resetting the default settings, accessing device type / version:**

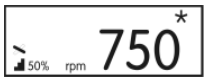
	Press the adjusting wheel (8) ☞: Selection is confirmed	
Press and release the P1 and P2 keys together:		
	◊ Back Language → Reset	
Turn the adjusting wheel (8) : Marker moves downward : Marker moves upward	Back ◊ Language → Reset	◊ Back ⊕ English Spanish German French
	Back Language → ◊ Reset	Factory setup *Factory defaults are restored:* *Language: English* *Startup time: 1x* *Power: 50 %* *Mode: Stirring* *Interval: OFF* *Stirring time: 00:10:00* *Pause time: 00:00:30* *P1: Speed 200 rpm* *P2: Speed 400 rpm* *P3: Speed 600 rpm*
Press and release the P1 and P3 keys together: Shows device type and version.		

Table 4: Selecting a language, resetting the default settings, accessing device type / version

◇ : The selection marker indicates the selected function.

⊕ : The circle-plus sign indicates the currently active function.

↓ : The down arrow indicates that the list is continued below.

↑ : The up arrow indicates that the list is continued above.

→ : The right arrow indicates that this selection will open another menu.

🕒 : Time: hours : minutes : seconds

Back in menu : Move marker to *Back* and press adjusting wheel, or press program key.

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⇨ Selecting a program:

750 rpm 50%	Press the adjusting wheel (8) ☞: Selection is confirmed								
Turn the adjusting wheel (8): Select speed	◇ back Stirrer →								
Turn the adjusting wheel (8) ↘: Marker moves downward ↗: Marker moves upward	back ◇ Stirrer →	◇ back Startup time Power Mode →							
		back ◇ Startup time Power Mode →	Startup time *1x / 2x / 4x* *Select by turning the adjusting wheel*						
		back Startup time ◇ Power Mode →	Power 20 C: *25 % / 50 % / 75 % / 100 %* 40 C: *10 % / 20 % / ... / 100 %* *Select by turning the adjust.wheel*						
		back Startup time Power ◇ Mode →	◇ back ⊕ Stirrer → Shake						
			back ◇ ⊕ Stirrer → Shake	◇ back Interval Stirring time Pause time					
				back ◇ Interval Stirring time Pause time	Interval ◇ ON OFF				
					back Interval ◇ Stirring time Pause time	Stirring time 00:00:30 ⏲ *Select time by turning the adjusting wheel*			
						back Interval Stirring time ◇ Pause time	Pause time 00:00:15 ⏲ *Select time by turning the adjusting wheel*		
			back ⊕ Stirrer → ◇ Shake					back Stirrer → ◇ ⊕ Shake	

Table 5: Selecting a program

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6 Stirring operation

DANGER

GLASS SPLINTER.
At high speeds of the mixing stick can lead to the destruction of the sample vessels.
Wear safety goggles!
The vortex should not reach the stirring bar.
The stirring bar must rotate in the center of the sample vessel.
Watch the rotational behavior of the mixing stick for slow starts

CAUTION

Do not place hot stirring vessels on top of the stirring drive (4).
Maximum temperature: +56 °C.

INFORMATION

Observe the relevant safety data sheets for chemical substances that you are working in the magnetic stirrer.

6.1 Recommended rotation speed ranges

We recommend the following rotation speed ranges for various applications:

Application	Rotation speed range
Microbiological and biotechnical applications:	(rpm)
Aeration of bacteria cultures Growth of bacteria cultures Dissolving nutrient media	200-350 300-450 350-500
Routine laboratory work:	
Prevent aeration of suspended matter Titration Dissolving solids	150-250 250-400 350-700

Table 6: Recommended rotation speed ranges

CAUTION

TELEMODUL 20 C / 40 C:
If you selected the shake mode (vertical mixing):
Select the minimum speed setting and then increase it slowly.
Depending on the magnetic stirring bar used, you may be able to perform vertical stirring only at lower speeds.

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6.2 Stirring using the TELEMODUL control unit

- Fill stirring vessels no more than half full (upper rotation speed range) or three-quarters full (lower rotation speed range).
- Place a magnetic stirring bar into every stirring vessel.
- Turn the rotation speed control button (6) to position OFF (see Figure 2).
- Center the stirring vessels onto the marked stirring points (3).
- Turn the rotation speed control button (6) clockwise until a slow speed is attained. The magnetic stirring bars will travel to turning center.
- Select the desired speed using the rotation speed control button (6).

6.3 Stirring using the TELEMODUL 20 C / 40 C

INFORMATION

Please observe the tables of the short operating manual (chapter 5) for operating the TELEMODUL 20 C / 40 C.

6.3.1 Selecting the language

The TELEMODUL 20 C / 40 C control unit can display messages in either of four different languages: German, English, French and Spanish. The factory default display language is *English*.

- Turn the control unit (1) off using the START/STOP key (11) (Figure 3).
- Press program keys P1 and P2 (9) concurrently.
- Release both program keys (9) simultaneously.

The display (10) shows the language selection menu (Table 4).

- Select Language by turning the adjusting wheel (8).
- Confirm your selection by pressing the adjusting wheel (8).

The display now shows the languages that can be selected (Table 4).

- Select a language by turning the adjusting wheel (8).
- Confirm your selection by pressing the adjusting wheel (8).

The display returns to the language selection menu. The selection marker is at the Back position.

- Exit the menu by pressing the adjusting wheel (8).

The display (10) returns to the stirring display (Figure 8).

6.3.2 Selecting a program

The three program keys labelled P1, P2 and P3 (9) can be programmed with individual settings. Programs can be selected only if the stirrer has been turned off. When the stirrer is turned on, the last program selected will be active. Speed, stirring

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power, and stirring mode settings are stored as a part of the currently active program.



Figure 7: Stirring display

: The stirring bar symbol turns when the stirrer is active. How the symbol turns indicates the selected stirring mode.
- Stirrer: Symbol continuously turns in the same direction
- Interval: Symbol alternates between turning clockwise and turning counterclockwise
- Shake: Symbol rocks back and forth

: The stair symbol indicates reduced stirring power. The power is adjustable:
For the TELEMODUL 20 C in 4 increments between 25 % and 100 %.
For the TELEMODUL 40 C in 10 increments between 10 % and 100 %.

***** : The asterisk symbol remains visible on the display until the set speed (rpm) has been reached (soft start).

Three program keys are available for storing repeated combinations of parameters. Changes to the parameters are stored as a part of the currently active program. The speed can always be adjusted by simply turning the adjusting wheel (8).

♦ Press one of the program keys P1, P2 or P3 (9).

Programs can be selected only if the control unit has been turned off with the START/STOP key (11). All other settings can be adjusted while the unit is turned on.

The adjusting wheel (8) serves two purposes: selecting a menu and adjusting values.

♦ Press the adjusting wheel (8).

The display (10) shows the main menu (Table 5).

♦ Select a function by turning the adjusting wheel (8).

The selection marker ◇ indicates the selected function.

♦ Confirm your selection by pressing the adjusting wheel (8).

The display will show the appropriate selection menu (Table 5). Repeat the process until you have reached the desired settings menu.

♦ Use the adjusting wheel (8) to make the desired adjustment (e.g. to the stirring power).

♦ Confirm your setting by pressing the adjusting wheel (8).

The display will return to the previous menu. The marker will point to ***back***.

♦ Select another menu.

or

♦ Confirm all settings by again pressing the adjusting wheel (8). Repeat until the stirring display (Figure 8) reappears.

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alternatively:

- Press the program key (9) for which you made the settings. The settings are stored, and the stirring display (Figure 8) reappears.

6.3.3 Stirring

- Fill stirring vessels no more than half full (upper rotation speed range) or three-quarters full (lower rotation speed range).
- Place a magnetic stirring bar into every stirring vessel.
- Place the stirring vessel on the stirring point (3) of the magnetic stirrer.
- Select a program key (9).
- Start the stirrer using the START/STOP key (11).
- Set the desired speed using the adjusting wheel (8).

The magnetic stirrer has a soft start feature that first centers the magnetic stirring bars within the vessels and then slowly accelerates them to the desired speed. As long as the asterisk symbol is still shown in the display (10), the selected speed has not been reached yet.

6.3.4 Power adaptation

Cf. Table 5, *Power* menu.

Select

- **Higher** power for larger quantities, higher speeds, and viscous media.
- **Lower** power for smaller quantities, lower speeds, media of watery consistency, or if heating the area where the stirrer is placed or heat emanation (e.g. in incubators) are undesirable.

- Select the required stirring power in the Power menu.

While doing so, observe the stirring movement: The power setting is correct when the stirring bar turns evenly and without jerking.

6.3.5 Mixing vertically (Shake)

CAUTION

If you selected the shake mode (vertical mixing):
Select the minimum speed setting and then increase it slowly.
Depending on the magnetic stirring bar used, you may be able to perform vertical stirring only at lower speeds.

Cf. Table 5, *Shake* menu.

To avoid vigorous stirring movements, change the stirring mode to Shake. This will keep the magnetic stirring bar from spinning, rocking it gently back and forth only. This helps avoid excessive shear forces.

- Select vertical mixing on the *Shake* menu.
- Select the minimum speed setting and then increase it only slowly.

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6.3.6 Interval operation

Cf. Table 5, *Interval* menu.

Even during continuous operation (e.g. overnight) it may be a good idea to interrupt the stirring at regular intervals. After each pause, the stirring bars are being recentered. This ensures that no stirring point is rendered inoperative for a longer period of time if a stirring bar migrates away from the turning center.

- ♦ Select the *Interval* submenu
- ♦ Select Interval ON.
- ♦ Select the desired stirring time (e.g. 30 s).
- ♦ Select the desired pause time (e.g. 10 s).

The rotation speed is reduced at the end of every stirring period, and the stirring is stopped. After every pause the stirrer is restarted. The direction of rotation is reversed, the magnetic stirring bars are recentered and the rotation speed is slowly increased again.

6.3.7 Selecting the startup time

Cf. Table 5, *Startup time* menu.

If you intend to stir large quantities of liquid or highly viscous media, it may be necessary to slowly accelerate the stirring bar to the selected speed. To do so, you may adjust the soft start feature to double or quadruple the startup time.

- ♦ Select the *Startup time* menu.
- ♦ Select the desired startup time (1x, 2x, 4x).

6.3.8 Terminating the stirring process

- ♦ Turn off the stirrer using the START/STOP key (11).

The control unit (1) switches now to standby.
In order to switch it off completely, you have to pull the mains plug.

6.4 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 (4).
  You can do this by placing a glass plate or a nonmagnetic metal plate between vessel and stirring drive (4), or
- ♦ Reduce the stirring power of the TELEMODUL 20 C / 40 C.

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⇨ **If the magnetic stirring bar cannot be centered, or constantly wanders off center:**

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, or
- ♦ Increase the stirring power of the TELEMODUL 20 C / 40 C.

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

- ♦ Use the magnetic stirring bar KOMET.
- ♦ Use a longer magnetic stirring bar, or a stirring vessel of smaller diameter.

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7 Remote operation

The TELEMODUL 40 C control unit is additionally equipped with a RS 232C port (17). The RS 232C interface can be used to remote-control the control unit from a PC.

- ♦ Connect a PC to the RS 232C port (17) at the rear of the TELEMODUL 40 C control unit (1).

In order to send commands and data to the TELEMODUL 40 C control unit (1) using the RS 232C port (17), you need to start a terminal emulation program. Serial port settings and commands are listed in Table 7.

RS 232C port settings	
Bits per second (bps)	9600
Data bits	8
Parity	None
Stop bits	1
Protocol	None
Commands[1]	
VER↵	(same as VERSION)
VERSION↵	Shows the date the current software was compiled.
GETTYPE↵	Shows device type information.
STIRRER␣[n]↵	Stirrer OFF: [n]=0 ON: [n]=1 Corresponds to the START/STOP key of the control unit.
SETRPM␣[speed]↵	Entering the desired speed in rpm. Speeds below 100 rpm are not supported.
GETRPM↵	Shows the set stirrer speed in rpm.
RESTARTRPM↵	Stirrer is started at the lowest speed, which is then increased to the set speed using the automatic start-up characteristics.
SETPOWER␣[power]↵	Sets stirring power in % (Partition: 20 C – 4 increments, 40 C – 10 increments)
GETPOWER↵	Shows the set stirring power in %.

Table 7: RS 232C remote control commands for the TELEMODUL 40 C

[1] ␣ = Space,
↵ = Enter or Carriage Return (CR) + Line Feed (LF)

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Examples:

To turn on the stirrer:

Table 7 shows: STIRRER␣[n] ↵,
ON: [n]=1

Enter: STIRRER ␣1↵

To reduce the stirring power to 50 %:

Table 7 shows: SETPOWER␣[power]↵
stirring power in %

Enter: SETPOWER ␣50↵

As soon as the control unit (1) senses a signal on the RS 232 interface (17), it will automatically go into remote operation mode.

⇨ **Terminate remote operation mode:**

- ♦ Disconnect the power supply unit (13) of the TELEMODUL 40 C from mains.

On reconnecting the power supply unit (13) you can once again operate the TELEMODUL 40 C manually.

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8 Maintenance and cleaning

The stirring drive (4) is maintenance-free.

The magnetic drive inside the housing is embedded in synthetic resin and watertight. This prevents germs from being carried over to the inside or the outside. The stainless steel surface is largely resistant to acids and alkalis.

The standing surface is coated with a protective film. You may leave this on the stirring drive (4), or strip it off.

Clean the surfaces of the magnetic stirrer (4) at regular intervals. You can wash it down with water or a disinfectant solution. For this purpose the magnetic stirrer (4) may be totally immersed in water.

Wipe the surface of the control unit (1, 5) using a damp cloth. Do not use caustic liquids.

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.

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9 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 magnetic properties of the stirring bar.

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 4.3). They are made from high-performance Samarium-Cobalt magnets. Any risk of demagnetization by external magnetic fields is completely eliminated.

TELEMODUL only: The rotation speed control button (6) slips:

- Tighten screw on rotation speed control button (6).

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10 Expansion options/accessories

INFORMATION

Use only in the instructions specified accessories, according to the illustrated configuration.

10.1 STIRRING BATH THERMOSTAT

The STIRRING BATH THERMOSTAT 06.20, 06.40, 15.20, 15.40, 60.20 and 60.40 option lets you stir and heat/cool liquids concurrently.
This option includes:

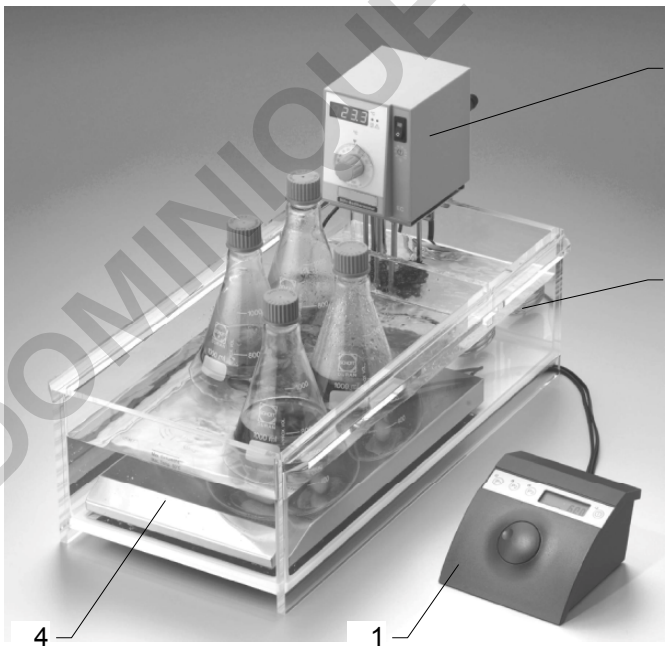
- A TELESYSTEM 6, 15 or 60 with TELEMODUL 20 C or 40 C control unit,
- A clear bath mount (19),
- An suspension thermostat (18) with digital temperature display.

The suspension thermostat (18) heats the heating fluid in the bath mount (19) while at the same time circulating it.

Startup and stirring operations are the same as for TELESYSTEM magnetic stirring systems.

Note the following additional instruction:

♦ Select 100 % stirring power on the *Power* menu (see Table 4).



1 TELEMODUL 20 C / 40 C control unit
4 Stirring drive (in bath mount)
18 Suspension thermostat
19 Bath mount

Figure 8: STIRRING BATH THERMOSTAT

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10.1.1 Clear bath mount

Order No.	**50087880**
Material:	Acrylics
External dimensions (W x D x H):	330 x 610 x 185 mm
Internal dimensions (W x D x H):	270 x 590 x 140 mm
Weight:	7 kg
Volume:	15 l
Operating temperature:	0 ° to +60 °C
Heating fluid:	deionized water or specific heating liquids with flash points above 100 °C compatible with acrylics.

- ♦ Fill the bath mount (19) with heating liquid.
  The maximum filling volume is marked on the bath mount (19).

The stirring drive (4) can be placed either below or inside the bath mount (19). The control cable will point backward in either case.

⇨ **To heat the heating liquid to 50 °C to 60 °C, or to stir inside large vessels:**

- ♦ Place the stirring drive (4) below the bath mount (19).
  The concave part in the bottom of the bath mount (19) exactly fits the top surface of the stirring drive (4). The markings of the stirring points (3) remain visible.

⇨ **To heat the stirring liquid to below 50 °C, or to stir using a test tube rack:**

- ♦ Place the stirring drive (4) inside the bath mount (19).
  The coupling to the magnetic field is thus more pronounced.

Use standard lead rings to prevent stirring vessel buoyancy.

10.1.2 Suspension thermostat

Order No.	**50087884**
Working temperature range:	25 ° to 60 °C
Temperature setting:	Analog control
Resolution:	2 K
Resolution on display:	0.1 °C
Temperature constancy:	± 0.1 K
Temperature control:	Proportional
Control sensor:	PTC
Safety sensor:	PTC
Heating power:	2,000 W
Circulation pump	
Maximum pressure:	350 mbar at 0 l
Volume:	max. 15 l/min at 0 mbar
Immersion depth:	80 to 150 mm
Dimensions (W x D x H):	120 x 150 x 320 mm
Weight:	3.0 kg
Ambient temperature:	5 to 40 °C
Mains connection:	230 V / 50 Hz (± 10 %)
Total power draw:	2,100 W
Overheating protection:	20 to 110 °C, safety class 1 W

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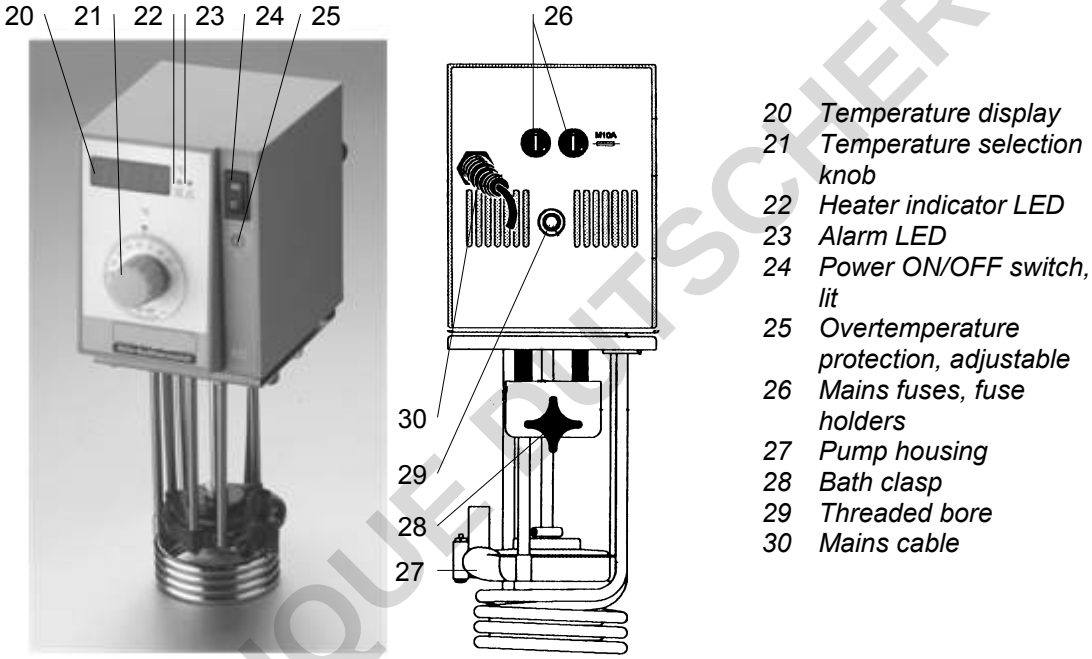
DANGER

Supply voltage and supply frequency must be within the range specified for the suspension thermostat (18).
The suspension thermostat (18) must only be connected to an earthed socket.

CAUTION

The suspension thermostat (18) must be used only in the presence of an operator.

You may use the suspension thermostat (18) to heat baths of any size with up to 25 litres in volume. The thermostat complies with the DIN 12 879 safety requirements including DIN 58 966 subsidiary requirements, the EN 61010 low-voltage standard and the NAMUR recommendations.



20 Temperature display
21 Temperature selection knob
22 Heater indicator LED
23 Alarm LED
24 Power ON/OFF switch, lit
25 Overtemperature protection, adjustable
26 Mains fuses, fuse holders
27 Pump housing
28 Bath clasp
29 Threaded bore
30 Mains cable

Figure 9: Suspension thermostat, front (left) and back (right)

- Use the bath clasp (28) to attach the suspension thermostat (18) to the back wall of the bath mount (19; Figure 9).
- Turn the pump housing (27) so that the direction of the stream optimally circulates the bath liquid.

The factory default overtemperature monitor turn-off temperature (25) has been set to 60 °C. This will prevent overheating the bath mount. Do not heat the heating liquid to more than 60 °C.

- Select the desired bath temperature using the temperature selection knob (21).
- Turn on the suspension thermostat (18) using the power ON/OFF switch (24).

The check lamp in the power ON/OFF switch (24) will come on. During the heating phase, the yellow heater indicator LED (22) will be on continuously. Once the

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selected temperature is reached, the yellow heater indicator LED (22) will start flashing. The temperature display (20) will show the current bath temperature.

The suspension thermostat (18) is maintenance-free. Replace the heating liquid when dirty. Regularly clean the bath mount (19) and the suspension thermostat (18) with water and a mild detergent.

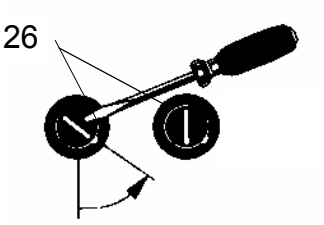
CAUTION
Make sure that no moisture can enter the suspension thermostat (18). Moisture might damage the suspension thermostat (18).

If the overtemperature monitor is actuated, the alarm LED (23) will be lit and the heater will be shut down permanently. This may happen in one of the following situations:

- The bath temperature exceeds the selected safety temperature level, or
- The suspension thermostat (18) is operated without or with too little heating fluid, or
- the temperature control sensor or switch are defective, or
- The heating liquid is heated abruptly, e.g. by introducing pre-heated stirring vessels.

♦ Turn off the suspension thermostat (18) using the power ON/OFF switch (24).
♦ Investigate the cause of the problem, and resolve the problem before turning the device back on again.

If the suspension thermostat (18) is inoperative due to a blown fuse, replace the fuse (26):



26 Mains fuses, fine 10.0 A slow, Ø 5 x 20 mm

Figure 10: Replacing a fuse

♦ Disconnect the device from mains.
♦ Replace the defective fuse (26; Figure 12).

CAUTION
When replacing fuses (26), make sure to use only the original fuse type.

10.1.3 Extended applications

The following additional options related to the STIRRING BATH THERMOSTAT are available on request:

- Stainless steel bath mount (Order No. 96052) for higher temperatures;
- TELESYSTEM stirring drives with silicone encapsulation for use **within** the water bath up to +95 °C;
- Special heat-proof TELESYSTEM stirring drives for temperatures of up to +200 °C (not for use in water baths).

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11 Technical specifications

TELESYSTEM with control unit TELEMODUL

TELESYSTEM type		06.07	15.07	60.07
Order No. 230 VAC, 50-60 Hz (DE) 115 VAC, 50-60 Hz (US) 230 VAC, 50-60 Hz (GB) 100 VAC, 50-60 Hz (JP)		 50088091 50088075 50088074 50101997	 50088030 50088033 50088031 50101978	 50088025 50088017 50088027 50101981
Stirring points		6	15	60
Distance between stirring points	mm	130	65	32.5
Stirring volume	ml	1-800	1-500	0.1-10
Stirring power	W	7		
Rotation speed range	rpm	130 – 1,000		
Duty cycle	%	100		
Speed regulation for alternating loads		None		
Dimensions (W x D x H)	mm	240 x 420 x 35		
Weight	kg	7.5	7.5	8
Housing		Stainless steel		
Permissible operation conditions: Air, 100 % humidity In water bath	 °C °C	 -10 to +56 0 to +50		
Permissible storage conditions: Temperature Humidity Barometric pressure	 °C % hPa	 -40 to +120 10 - 100 500 - 1,060		
Operating voltage	VDC	12		
Protective system		IP 68 (acc. to DIN 40050)		
Expansion levels, accessories		Test tube rack, clear bath mount, stainless-steel bath mount, suspension thermostat, KOMET stirring bars, stirring drive extension cable (reliable installation!)		

Subject to technical alterations

Table 8: TELESYSTEM with control unit TELEMODUL

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TELESYSTEM with control unit TELEMODUL 20 C

TELESYSTEM type		**06.20**	**15.20**	**60.20**
Order No.: 100-240V		50088077	50088034	50088009
Stirring points		6	15	60
Distance between stirring points	mm	130	65	32.5
Stirring volume	ml	1-1,500	1-1,000	0.1-50
Nominal power	W	5 / 10 / 15 / 20 (adjustable in four levels)		
Rotation speed range	rpm	130 – 1,400		
Duty cycle	%	100		
Speed regulation for alternating loads		None		
Dimensions (W x D x H)	mm	240 x 420 x 35		
Weight	kg	7.5	7.5	8
Housing		Stainless steel		
Permissible operation conditions: Air, 100 % humidity In water bath	 °C °C	 -10 to +56 0 to +50		
Permissible storage conditions: Temperature Humidity Barometric pressure	 °C % hPa	 -40 to +120 10 - 100 500 – 1,060		
Operating voltage	VDC	20		
Protective system		IP 68 (acc. to DIN 40050)		
Expansion levels, accessories		Test tube rack, clear bath mount, stainless-steel bath mount, suspension thermostat, KOMET stirring bars, stirring drive extension cable (reliable installation!)		

Subject to technical alterations

Table 9: TELESYSTEM with benchtop control unit TELEMODUL 20 C

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TELESYSTEM with control unit TELEMODUL 40 C

TELESYSTEM type		06.40	15.40	60.40
Order No.: 100-240V		50088078	50088036	50088011
Stirring points		6	15	60
Distance between stirring points	mm	130	65	32.5
Stirring points	ml	1-2,000	1-1,200	0.1-100
Nominal power	W	4 - 40 (in10 increments)		
Rotation speed range	rpm	100 – 2,000		
Duty cycle	%	100		
Speed regulation for alternating loads		None		
Dimensions (W x D x H)	mm	240 x 420 x 35		
Weight	kg	7.5	7.5	8
Housing		Stainless steel		
Permissible operation conditions: Air, 100 % humidity In water bath	 °C °C	 -10 to +56 0 to +50		
Permissible storage conditions: Temperature Humidity Barometric pressure	 °C % hPa	 -40 to +120 10 - 100 500 - 1,060		
Operating voltage	VDC	36		
Protective system		IP 68 (acc. to DIN 40050)		
Expansion levels, accessories		Test tube rack, clear bath mount, stainless-steel bath mount, suspension thermostat, KOMET stirring bars, stirring drive extension cable (reliable installation!)		

Subject to technical alterations

Table 10: TELESYSTEM with benchtop control unit TELEMODUL 40 C

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Control units

Type		TELEMODUL	TELEMODUL 20 C	TELEMODUL 40 C
Order No. Control unit		50134969 (EU) 50134968 (AU) 50134972 (UK) 50134971 (JP) 50134967 (US)	50094707	50094705
Order No. Control unit with power supply unit		- - -	50090773	50090774
Order No. Power supply unit		- - -	50093506	50094706
Dimensions (W x D x H)	mm	63 x 96 x 50	155 x 165 x 95	
Weight	g	400	600	700
Nominal power	VA	7	20	40
Setting range as a percentage of the nominal power	%	100	25 / 50 / 75 / 100 (in 4 increments)	10 - 100 (in 10 increments)
Rotation speed range	rpm	130 to 1,000	130 to 1,400	100 to 2,000
Speed constancy	%	± 3	± 1	± 1
Stirring times			5 sec to 60 min	5 sec to 60 min
Pause times			5 sec to 60 min	5 sec to 60 min
Output voltage	VDC	12	2x 20	2x 36
Operating voltage	VDC		24	48
Permissible operating conditions		+10 °C to +40 °C at 30 % to 75 % relative humidity 700 to 1060 hPa barometric pressure		
Permissible storage conditions		-40 °C to +70 °C, at max.80 % relative humidity, 500 to 1060 hPa barometric pressure		
Input voltage / Frequency	VAC/Hz	EU: 230/50-60 AU: 240/50-60 UK: 230/50-60 JP: 100/50-60 US: 115/50-60		
Input voltage / Frequency of the power supply unit included			100-240 V / 50-60 Hz	
Mark of conformity Protective system (acc. to DIN 40050)		Protection class 2 IP 20 VDE tested	IP 30 -	
Unit design			compliant with IEC 1010	

Subject to technical alterations

Table 11: Technical specifications for control units

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12 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.

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