

IKA

designed for scientists

RCT classic

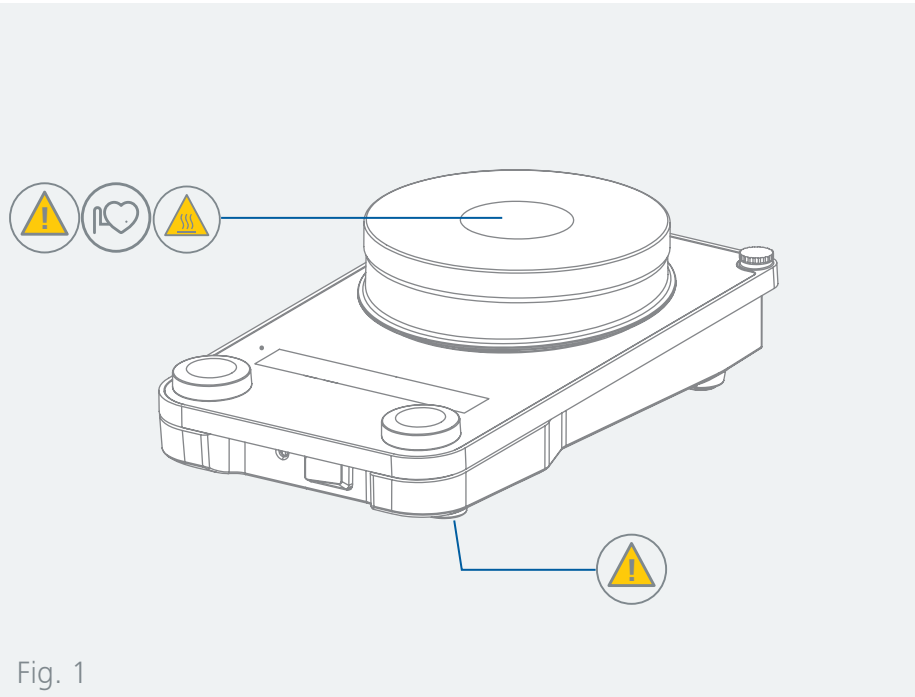










Fig. 1

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EU Declaration of conformity




We declare under our sole responsibility that this product corresponds to the directives 2014/35/EU, 2006/42/EC, 2014/30/EU and 2011/65/EU and conforms with the following standards or normative documents: EN 61010-1, EN 61010-2-010, EN 61010-2-051, EN 61326-1, EN 60529 and EN ISO 12100.

A copy of the complete Declaration of Conformity or further declarations of conformity can be requested.






Explication of warning symbols

/// Warning symbols

-  **Danger!** Indicates an (extremely) hazardous situation, which, if not avoided, will result in death, serious injury.
-  **Warning!** Indicates a hazardous situation, which, if not avoided, can result in death, serious injury.
-  **Caution!** Indicates a potentially hazardous situation, which, if not avoided, can result in injury.
-  **Notice!** Indicates practices which, if not avoided, can result in equipment damage.
-  **Attention!** Indicates the risks due to magnetism.
-  **Danger!** Indicates the exposure to a hot surface.

/// General Symbols

- A** — Position number
Indicates device components relevant to actions.
-  Correct / result
Indicates the correct execution or the result of an action step.
-  Wrong
Indicates the incorrect execution of an action step.
-  Note
Indicates steps of actions that require particular attention.

Safety instructions



/// General information

- > **Read the operating instructions completely before starting up and follow the safety instructions.**
- > Keep the operating instructions in a place where it can be accessed by everyone.
- > Ensure that only trained staff work with the device.
- > Follow the safety instructions, guidelines, occupational health and safety and accident prevention regulations.
- > Electrical outlet must be grounded (protective ground contact).

Attention – Magnetism!

- > Effects of the magnetic field have to be taken into account (e.g. data storage media, cardiac pacemakers ...).

Risk of burns!

- > Exercise caution when touching parts of the housing and the heating plate.
- > The heating plate can reach dangerous temperatures. Pay attention to the residual heat on the heating plate after switching off the stirrer.
- > The device may only be transported when the heating plate has cooled down.

Notice!

- > Pay attention to the marked sites in **Fig. 1**.

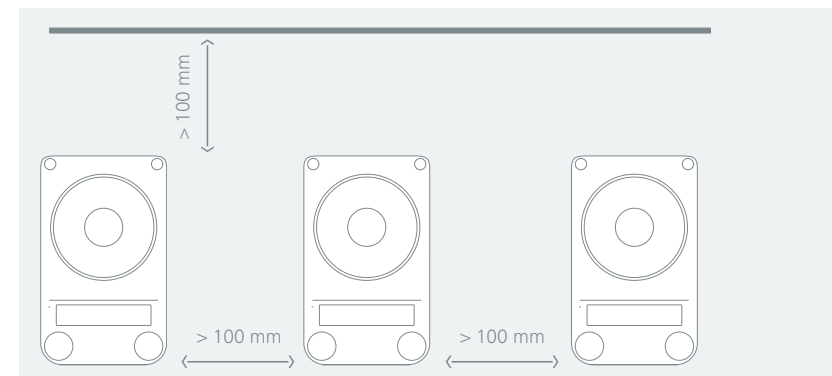
/// Device design

Caution!

- > Device surface is partially made of glass:
 - Glass surface can be damaged by impact.
 - If glass surface is damaged it could cause injury, don't use the device anymore.

Notice!

- > Set up the device in a spacious area on an even, stable, clean, non-slip, dry and fireproof surface.
- > Observe the minimum distances:
 - between devices min. 100 mm,
 - between device and wall min. 100 mm,
 - above the device min. 800 mm.



- › The feet of the device must be clean and undamaged.
- › Keep the base plate clean.
- › Protect the device and accessories from bumps and impacts.
- › Check the device and accessories for damage before each use. Do not use damaged components.
- › Ensure that the power cord set / temperature sensor cable does not touch the heating plate.
- › Do not cover the device, even partially e.g. with metallic plates or film. This may result in overheating.

/// Working with the device

Danger!

- › Do not use the device in explosive atmospheres, it is not EX-protected.
- › With substances capable of forming an explosive mixture, appropriate safety measures must be applied, e.g. working under a fume hood.
- › To avoid body injury and property damage, observe the relevant safety and accident prevention measures when processing hazardous materials.

Warning!

- › Only process media that will not react dangerously to the extra energy produced through processing. This also applies to any extra energy produced in other ways, e.g. through light irradiation.
 - › Beware of hazards due to:
 - flammable materials,
 - combustible media with a low boiling temperature,
 - glass breakage,
 - incorrect container size,
 - overfilling of media,
 - unsafe condition of container.
 - › Process pathogenic materials only in closed vessels under a suitable fume hood.
 - › The safety temperature must be set in accordance with EN 61010-2-010 Chapter "Requirements for devices containing or using flammable liquids".
 - The surface temperature of the flammable medium that is exposed to air may not exceed its flash point.
A danger usually arises if a medium is heated in open vessels.
 - The surface temperature of the heating device (e.g. the mounting plate) may not exceed the value of $(t - 25) \text{ °C}$ (= set value of the safety circuit) on the surface of the flammable medium and in contact with air, whereby t is the fire point of the liquid.
A danger usually arises if a medium is heated in glass vessels (glass breakage).
- If a setting made by the user (medium temperature or safety temperature) could bring a flammable medium into a state in which the conditions mentioned above could be exceeded, additional measures must be introduced that will protect the user from this danger.

Caution!

- › Wear your personal protective equipment in accordance with the hazard category of the media to be processed. There may be a risk from:
 - splashing and evaporation of liquids,
 - ejection of parts,
 - release of toxic or combustible gases.
- › Reduce speed if:
 - medium splashes out of vessel because the speed is too high,
 - device is not running smoothly,
 - container moves on the base plate,
 - an error message is displayed.

- › The heating plate can heat up due to the action of the magnets at high motor speeds, even if the heater is switched off.
- › Please consider any possible contaminations and unwanted chemical reactions.
- › It may be possible for wear debris from rotating accessory parts to reach the material being processed.
- › When using PTFE-coated magnetic bars, the following has to be noted: Chemical reactions of PTFE occur in contact with molten or solute alkali metals and alkaline earth metals, as well as with fine powders of metals in groups 2 and 3 of the periodic system at temperatures above 300 °C – 400 °C. Only elementary fluorine, chlorotrifluoride and alkali metals attack it; halogenated hydrocarbons have a reversible swelling effect.
(Source: Römpps Chemie-Lexikon and "Ulmann", Volume 19)

/// Accessories

- › Safe operation is guaranteed only with the use of original IKA accessories.
- › Ensure that the external temperature sensor is inserted into the medium to a depth of at least 20 mm when connected.
- › Always disconnect the plug before attaching accessories.
- › Accessories must be securely attached to the device and cannot come off by themselves. The centre of gravity of the assembly must lie within the surface on which it is set up.
- › Observe the operating instructions of the accessories.

/// Power supply / Switching off the device

Warning!

- › The device will automatically restart in operating mode B following any interruption to the power supply.
- › The voltage stated on the type plate must correspond to the mains voltage.
- › The outlet for the mains plug must be easily accessible.
- › The device can only be disconnected from the power supply by pulling out the power plug or the connector plug.

/// Maintenance

- › The device may only be opened by qualified and IKA approved experts. The device must be unplugged from the power supply before opening. Live parts inside the device may still be live for some time after unplugging from the power supply.

/// Disposal instructions

- › The device, accessories and packaging must be disposed of in accordance with local and national regulations.



Intended use

/// Use

- › The magnetic stirrer is suitable for mixing and / or heating substances.

/// Area of use

- › Indoor environments similar to that a laboratory of research, teaching, trade or industry area.
- › The safety of the user cannot be guaranteed:
 - if the device is operated with accessories that are not supplied or recommended by the manufacturer,
 - if the device is operated improperly or contrary to the manufacture's specifications,
 - if the device or the printed circuit board are modified by third parties.

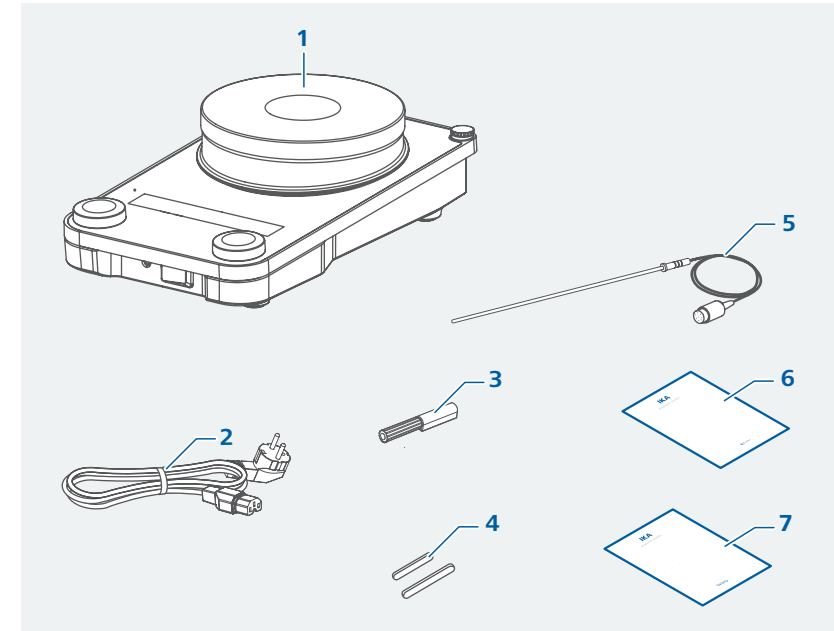
Unpacking



/// Unpacking

- › Unpack the device carefully. Any damage should immediately be reported to the carrier (mail, rail or freight forwarding company).

/// Scope of delivery



1	RCT classic
2	Power cord set
3	Screwdriver (safety circuit)
4	Magnetic stirring bar IKAFLO 30 round and IKAFLO 40 round
5	Temperature sensor PT 1000.60
6	User guide
7	Warranty card



Installation

/// Assembling support rod / extension etc.

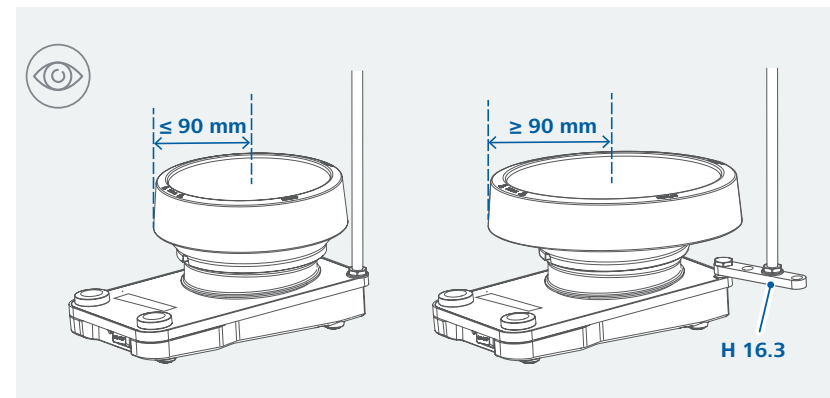
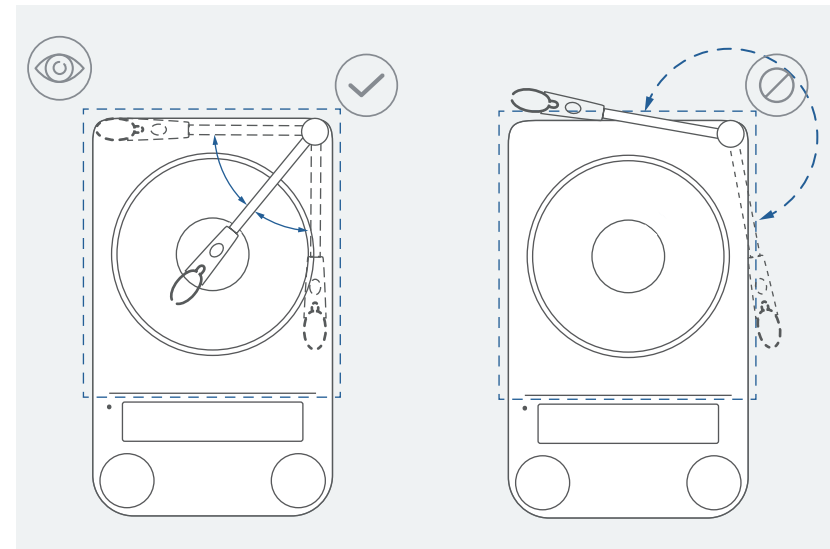
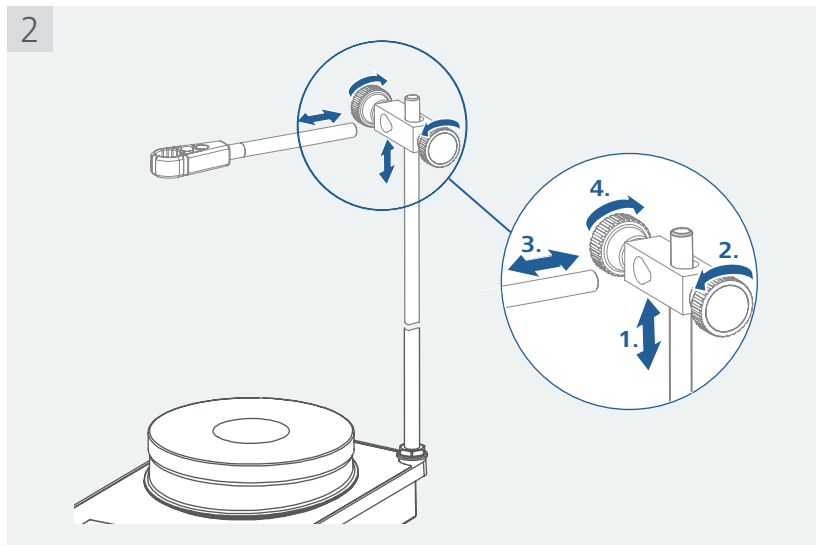
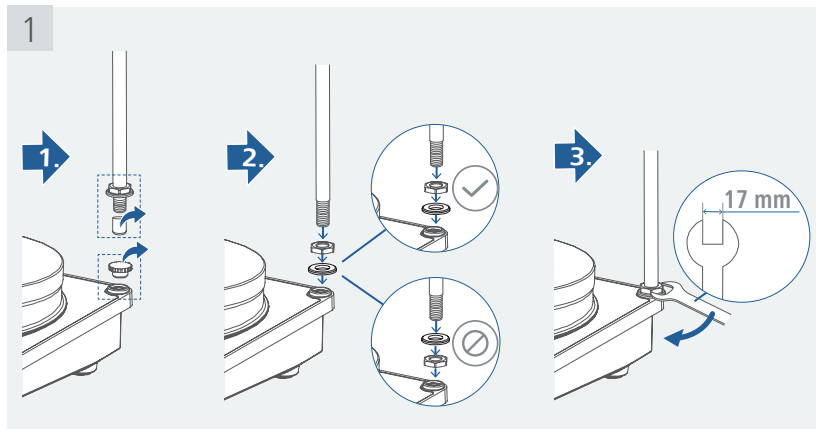
- › Review the mounting and safety instructions of the IKA boss head clamp prior to using it. (see "Accessories")
- › The device must not be suspended from the support rod!

⚠ Risk of tipping!

- › Make sure that the center of mass of the attached device does not protrude over the safe area indicated below with a dotted rectangle.

⚠ Notice!

- › When using bath attachments with a diameter over 180 mm, use support rod in conjunction with an extension (see "Accessories").



/// Connecting an external temperature sensor / thermometer

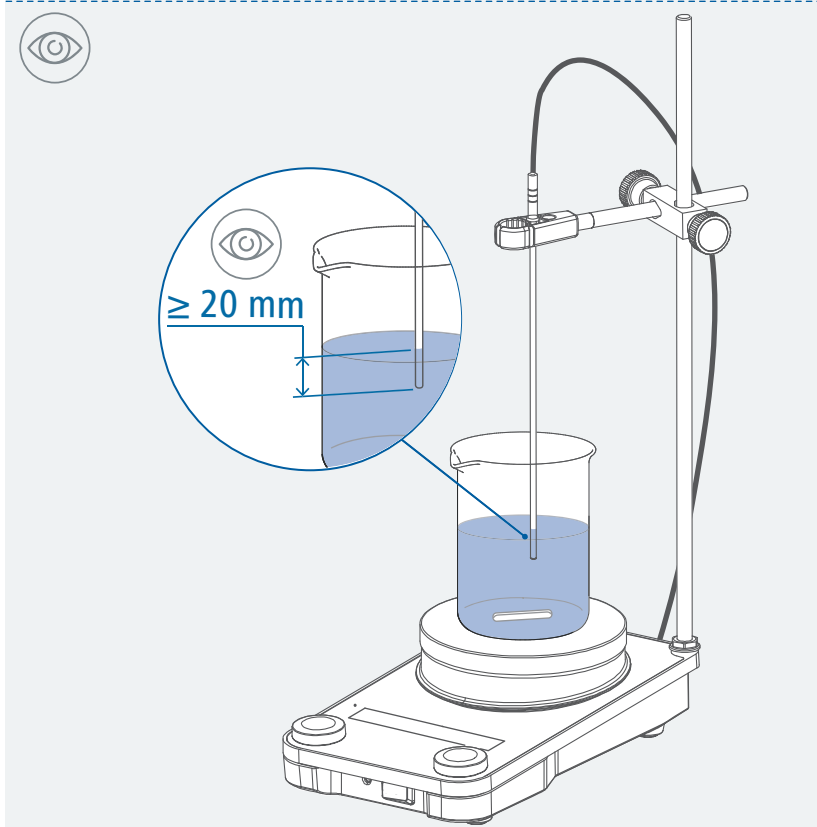
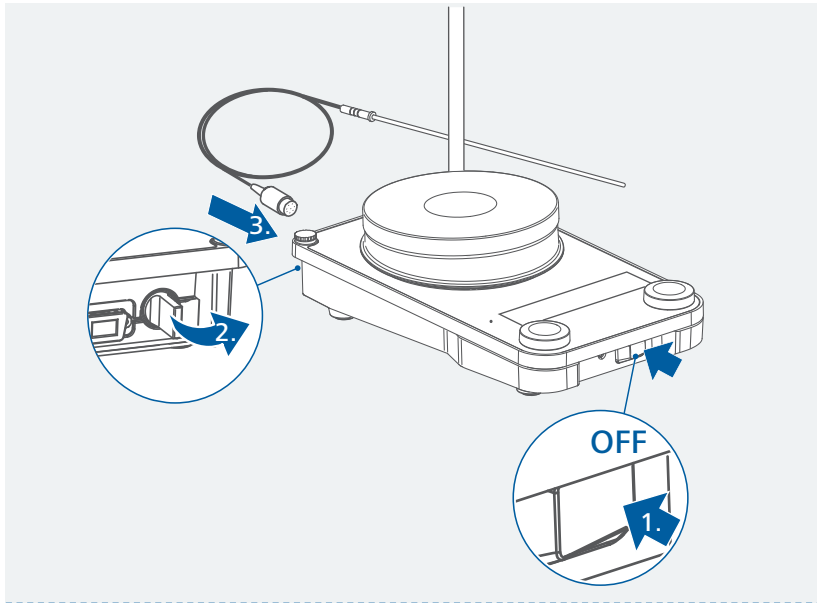
1. Switch off the device via the mains switch.
2. Connect the contact thermometers or Temperature sensor PT 1000 (single sensor) to the connection.
3. Switch on the device via the mains switch.

Temperature sensor PT 1000:

- › The actual temperature value shown on the display corresponds to the temperature of the medium. The temperature sensor LED (🔦) lights.

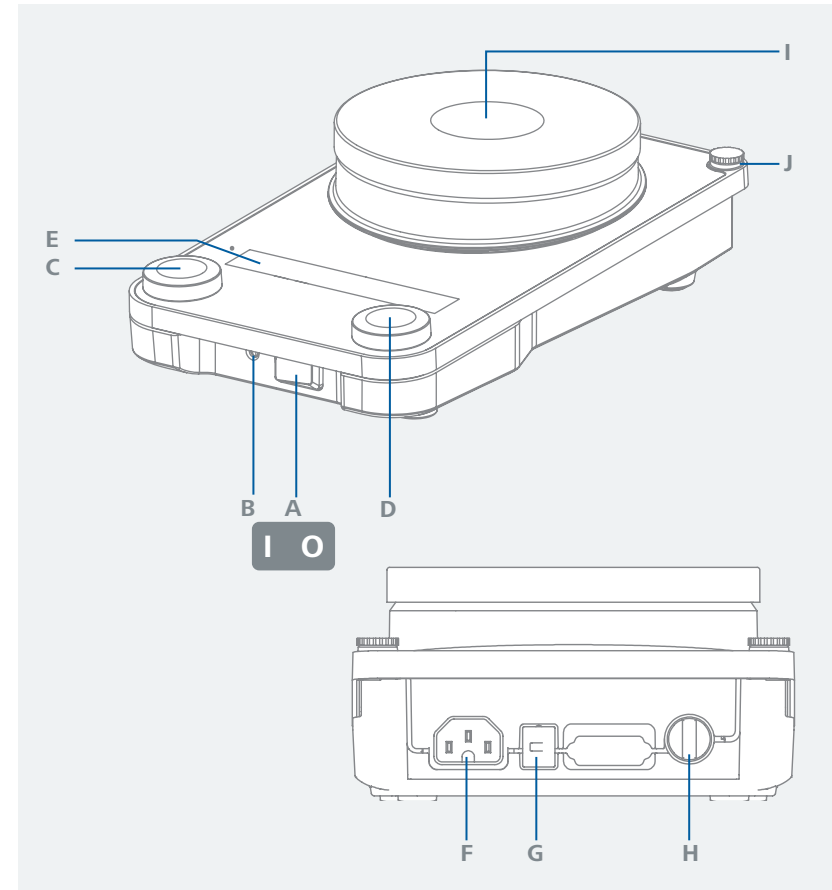
Contact thermometer ETS-D5 / ETS-D6:

- › Follow the operating instructions for the contact thermometer. The set temperature value of the heating plate is shown on the display. The LED display (3) lights.



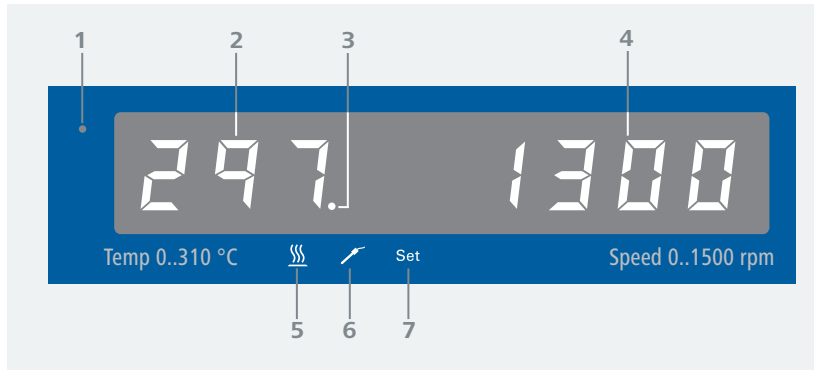
Operator panel and display

/// Operator panel



A	Mains switch (left "I" « on, right "O" « off)	G	USB Interface
B	Adjustable safety circuit	H	Connection for PT 1000 temperature sensor series, temperature probes or contact plugs
C	Rotating / pressing knob - Temperature setting	I	Heating plate
D	Rotating / pressing knob - Speed setting	J	Threaded hole for stand
E	Display		
F	Power socket		

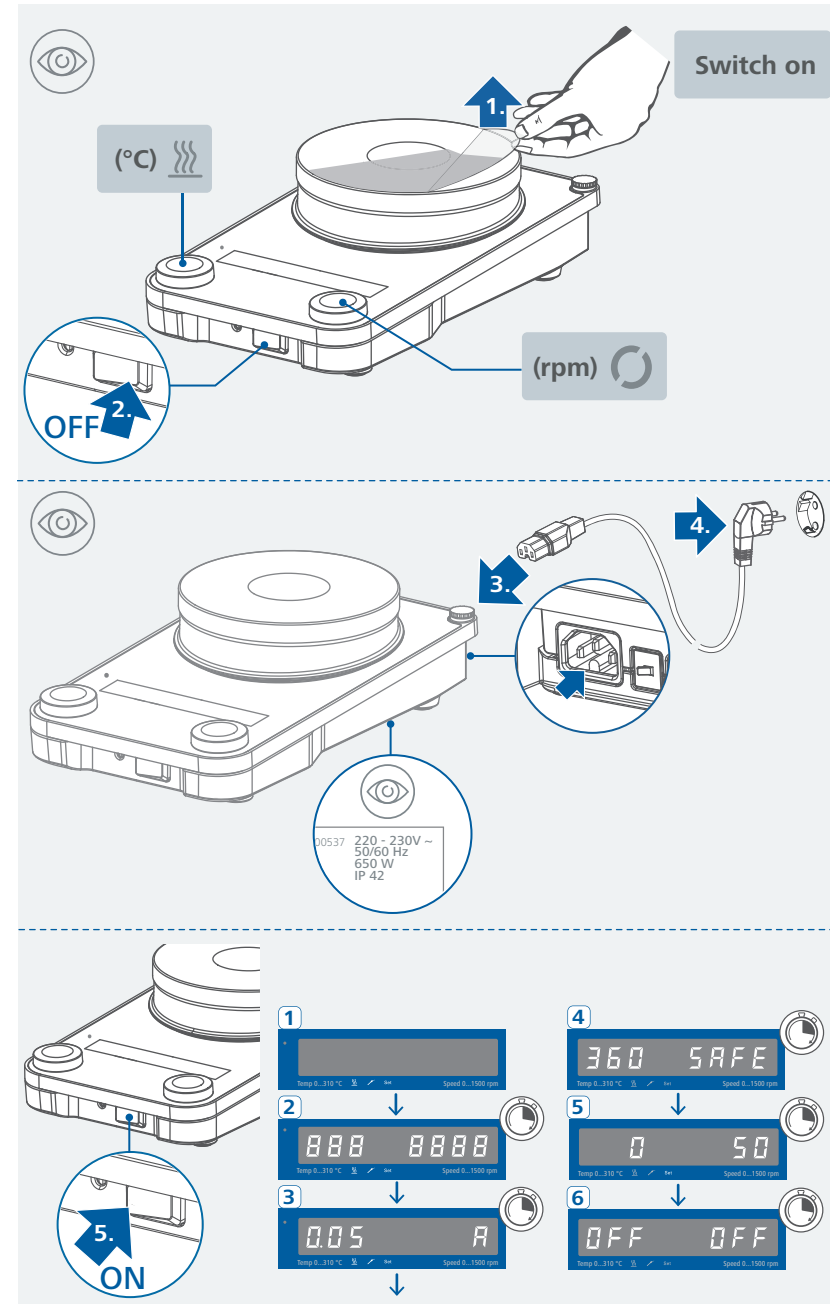
/// Display



1	Standby LED	5	LED display heating active
2	Temperature display	6	LED display temperature sensor plugged in
3	LED display external contact thermometer plugged in	7	LED display "Set temperature"
4	Speed display		

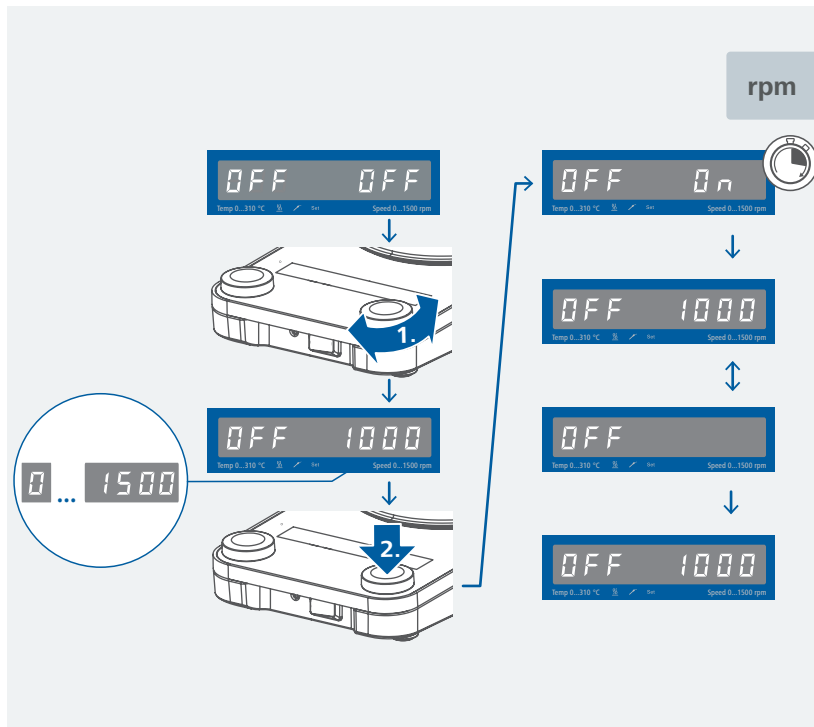
Operation

/// Switch on



/// Stirring

- › Set the speed using the rotating / pressing knob (D).
The set speed value is shown on the right of the display.
- › Press the rotating / pressing knob (D) to start the stirring function.
The speed value blinks until reaching the set value.



/// Heating

Setting the safety temperature limit:

The maximum achievable heating plate temperature is restricted by an adjustable safety temperature limit. Once this limit has been reached, the device stops heating.

⚠ Notice!

The denominated temperatures should always refer to the center of the heating plate.

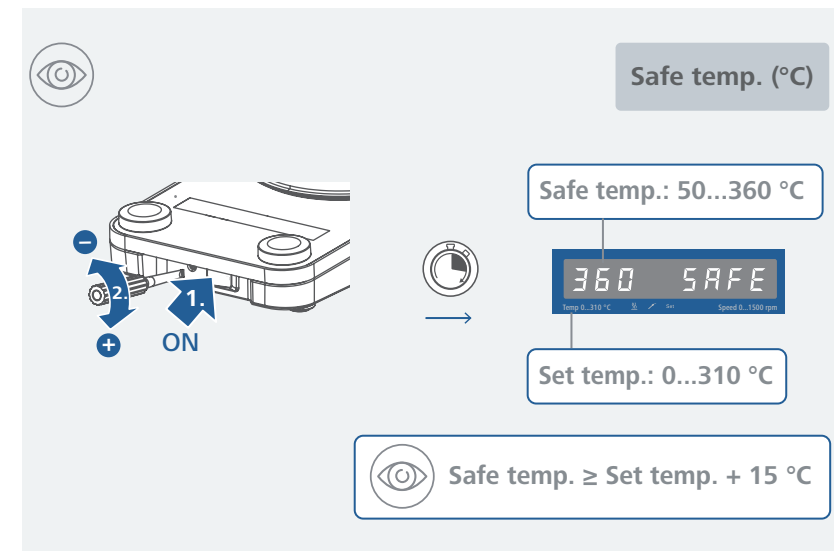
⚠ Warning!

The safety temperature limit must always be set at least 25 °C lower than the fire point of the media to be processed!

The adjustable maximum heating plate temperature must always be set at least 15 °C under the set safety temperature limit.

Setting range: see section "Technical data".

After switching on the device, the safety temperature limit can be adjusted using a screwdriver. Do not turn the setting screw beyond the clockwise or anticlockwise stop. This will cause irreparable damage to the potentiometer.

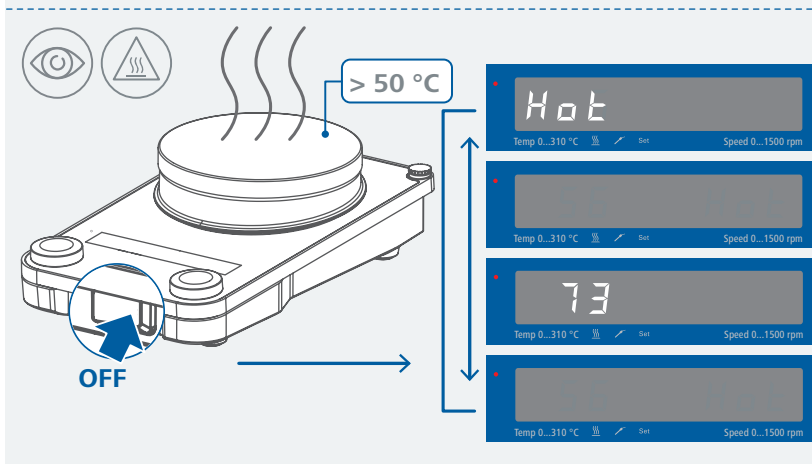
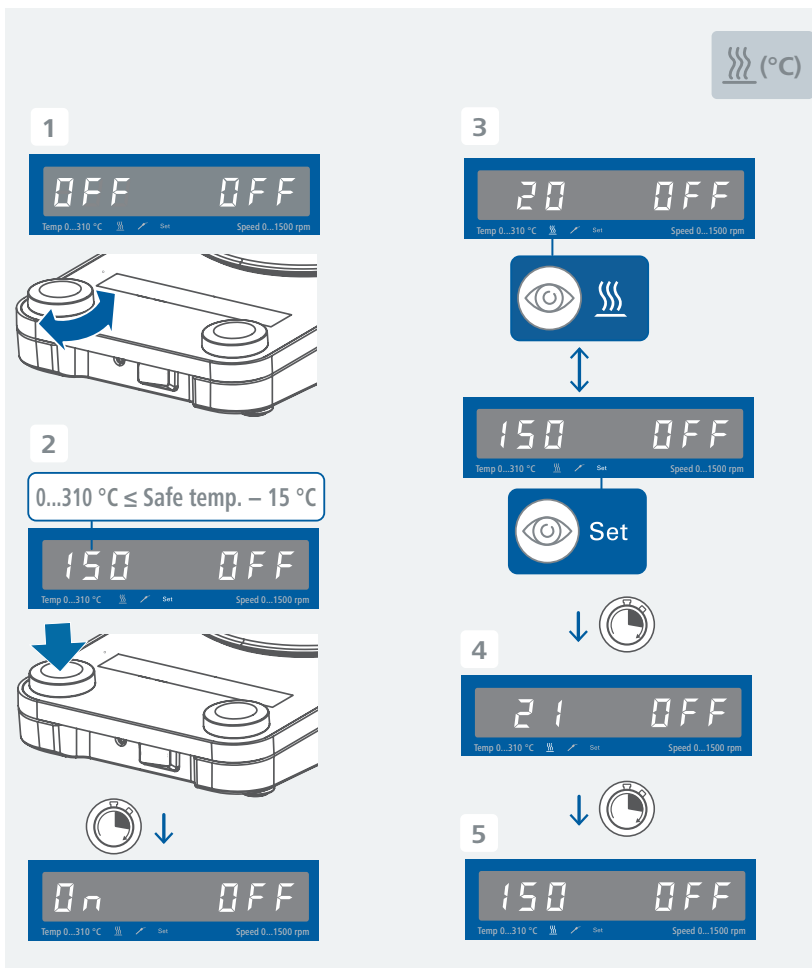


Start heating:

- › Set the safety temperature limit. (see "Setting the safety temperature limit")
- › Set the target temperature using the rotating / pressing knob (C).
The set temperature value is shown on the left of the display.
- › Set the temperature control mode. (see "Temperature control mode")
- › Press the rotating / pressing knob (C) to start the heating function.

General information for heating:

- › The set and actual temperature values are shown on the display alternately.
- › When the heating function is switched on, the heating LED indicator "☀" lights.
- › When the device is switched off while the heating plate temperature is higher than 50 °C, the display shows "Hot" and the actual temperature value, even if the device is switched off.



/// Additional operation

Operating mode:

Factory setting: Operating mode A

Operating mode A (**A**):

All settings will be stored if the device is switched off or disconnected from the power supply. The heating and stirring functions will be set to OFF when the device is powered on. The safety circuit can be set or modified. When the power supply switch is switched on, " **A** " is displayed.

Operating mode B (**b**):

All settings will be stored if the device is switched off or disconnected from the power supply. The heating and stirring functions will be set to ON or OFF when the device is powered on, depending on the previous status of the device. The safety circuit can be set or modified. When the power supply switch is switched on, " **b** " is displayed.

Operating mode C (**c**):

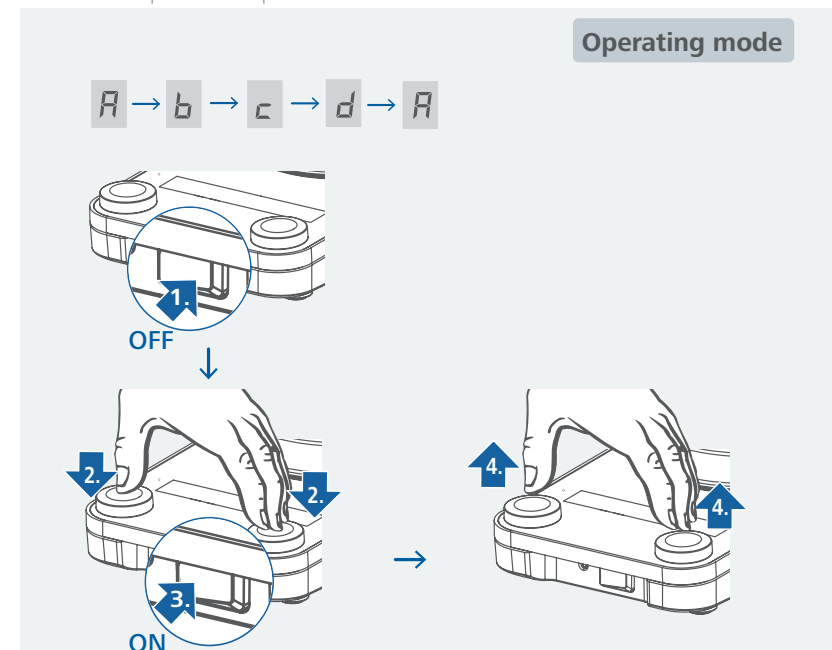
Set values (set in A or B) cannot be changed. All settings will be stored if the device is switched off or disconnected from the power supply. The heating and stirring functions will be set to ON or OFF when the device is powered on, depending on the previous status of the device. The safety circuit can be set or modified. When the power supply switch is switched on, " **c** " is displayed.

Operating mode D (**d**):

When switching the device on, the safety temperature has to be confirmed by pushing one of the rotating / pressing knobs.

During operation, in operating mode D the device behaves the same as in operating mode A with the exception that:

- > The temperature / speed setting must be confirmed by pressing the rotating / pressing knob. To change the temperature / speed setting, turn the rotating / pressing knob until the desired value appears.
- > The new value flashes for 5 seconds on the display. Confirm the new temperature / speed setting by pressing the rotating / pressing knob. Otherwise, the temperature / speed setting value will skip back to its previous value.



Temperature control mode:

When using an external PT 1000 temperature sensor, you can choose below control modes.

Precise control mode (Pr): **Pr**

Good control results, minimized overshooting, slow rise in temperature.

Fast control mode (FA): **FA**

Maximum heating rate, increased overshooting.

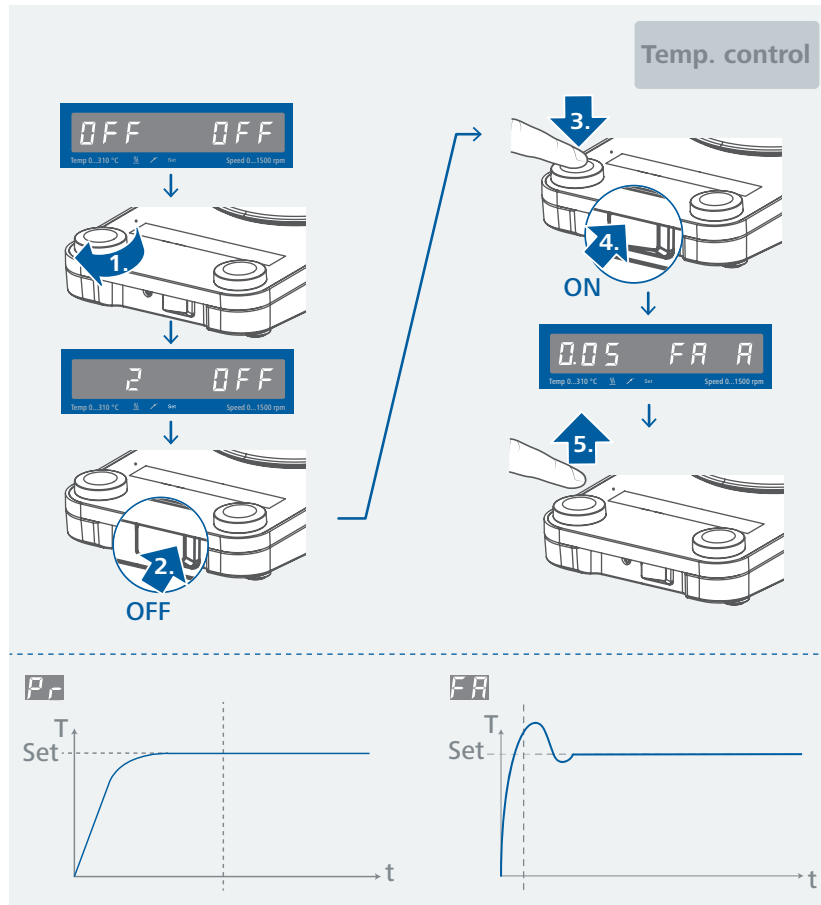
Factory setting: Pr mode

Switching the temperature control mode:

- › Set target temperature to 2 °C by turning the rotating / pressing knob (C).
- › Move the mains switch to the right (OFF) position.
- › Press and hold down the rotating / pressing knob (C)
- › Move the mains switch to the left (ON) position.

If the FA mode is activated and the device is switched on, "FA" is displayed next to the operating mode A/B/D.

When the heating function is active in FA mode, (with external PT 1000 temperature sensor) the actual temperature value displayed flashes!



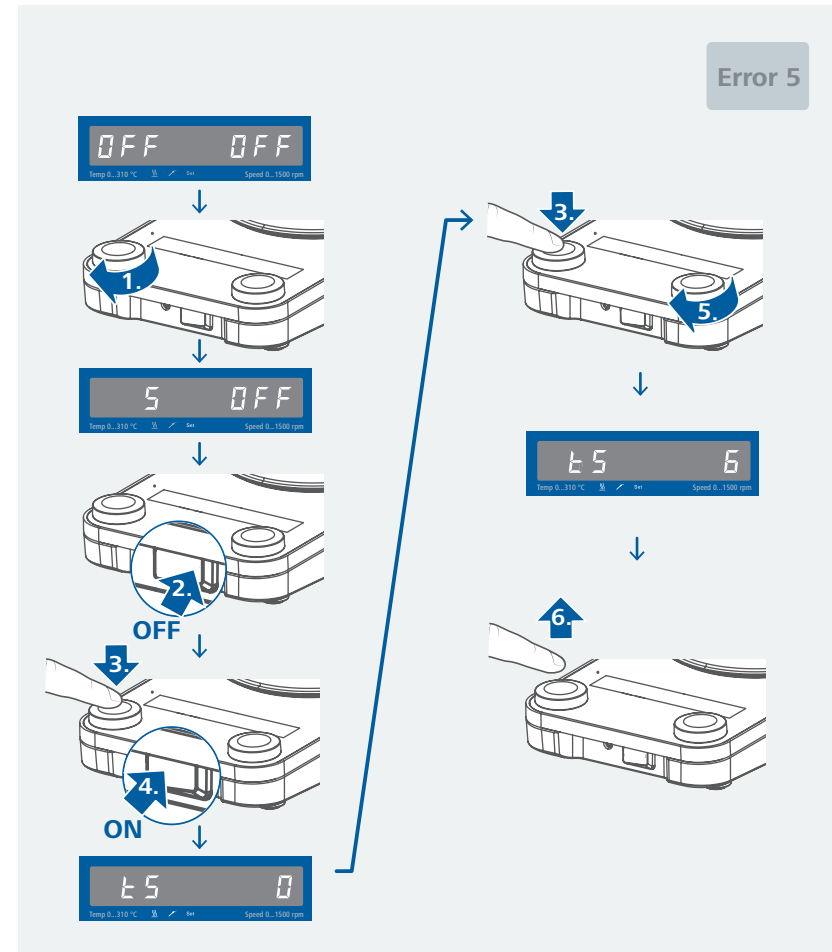
Error 5:

Providing safety protection, Error 5 is taken to recognize that the sensor has not been placed in the medium when the heating is switched on.

Factory setting: 5 min.

Changing the Error 5 settings:

- › Set target temperature to 5 °C by turning the rotating / pressing knob (C).
- › Move the mains switch to the right (OFF) position.
- › Press and hold on the rotating / pressing knob (C).
- › Move the mains switch to the left (ON) position.
- › Select time value from 0...30 min (in 1 min steps) by turning the rotating / pressing knob (D).
- › Release the rotating / pressing knob (C).



⚠ Notice!

You can set a value from 1 to 30 min for this time limit depending on the application. If time limit is set to 0 min, the Error 5 detection is disabled.

⚠ Caution!

This function will only be active if:

- › sensor temperature is $< 50\text{ }^{\circ}\text{C}$
- › difference between target temperature and sensor temperature $> 5\text{ K}$.

The time set will be shown on the display when the device is started up if the sensor is connected.

/// Controlling the medium temperature limit using a contact thermometer

The preferable method for controlling the average temperature is with contact thermometer. After the set point temperature has been adjusted, this results in a short heating-up time, practically no temperature drift and only minor fluctuation in temperature.

A 6-pin jack is located on the rear side of the device for connecting the PT 1000 series, contact thermometer or the contact plug. The electronics of the devices returns a test current that must flow via connector pins 3 and 5 for the heating plate to heat up.

Safety function:

If the test current is interrupted because of e.g. breakage of contact thermometer or falling out of the cable plug, the heating cuts off.

Settings:

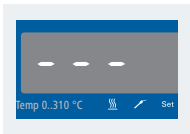
For detailed instructions for settings and limit values, please refer to the operating instructions of the device you are connecting.

The desired medium temperature can be adjusted on the contact thermometer. The required surface temperature of the heating plate can be selected with the rotating / pressing knob or button.

Adjusting the temperature of device to the maximum adjustable temperature will result in the fastest possible heating time. However, the medium temperature may fluctuate to values above the set-point temperature on the contact thermometer. By adjusting the rotating / pressing knob or button to approximately twice the set-point value of contact thermometer (with a set-point of $+ 60\text{ }^{\circ}\text{C}$, the temperature of device would be set to $+ 120\text{ }^{\circ}\text{C}$), you will reach a good compromise between a fast heating time and over-shooting the set point. If you adjust the temperature of the device to exactly the set-point temperature, the medium will not reach the set-point temperature because some loss of the heat will always occur between the heating plate and the medium.

The maximum heating plate temperature is limited to the adjusted safety temperature limit in the event of a control circuit malfunction. (See "Setting the safety temperature limit")

If the temperature sensor is connected and the temperature value is below $-20\text{ }^{\circ}\text{C}$, three dashes will be shown as the temperature value.



Interfaces and outputs

The device software can be updated with a PC via the USB port.

⚠ Notice!

Please comply with the system requirements together with the operating instructions and help section included with the software.

/// USB interface

The Universal Serial Bus (USB) is a serial bus for connecting the device to the PC. Equipped with USB devices can be connected to a PC during operation (hot plugging). Connected devices and their properties are automatically recognized.

/// USB device drivers

Connect the IKA device through the USB data cable to the PC. The data communication is via a virtual COM port.

From Windows 10 and onwards the standard Windows USB driver is automatically loaded and a COM port number is assigned (find details in Windows Device Manager: "USB Serial Port (COMxx)"). If you have problems with USB communication, first ask your IT system administrator whether access to the USB interface is restricted for data security reasons.

/// Connections between device and external devices

USB cable A – B:

This cable is required to connect USB port to a PC.



Maintenance and cleaning

- › The device is maintenance-free. It is only subject to the natural wear and tear of components and their statistical failure rate.

/// Cleaning

- › For cleaning disconnect the mains plug!
- › Use only cleaning agents which have been approved by IKA to clean the devices:
Water containing surfactant / isopropyl alcohol.
- › Wear protective gloves during cleaning the devices.
- › Electrical devices may not be placed in the cleansing agent for the purpose of cleaning.
- › Do not allow moisture to get into the device when cleaning.
- › Before using another than the recommended method for cleaning or decontamination, the user must ascertain with IKA that this method does not destroy the device.

/// Spare parts order

- › When ordering spare parts, please give:
 - device type.
 - serial number, see type plate.
 - position number and description of spare part.
 - software version.

/// Repair

- › Please only send devices in for repair that have been cleaned and are free of materials which might present health hazards.
- › For repair, please request the “**Safety Declaration (Decontamination Certificate)**” from IKA or use the downloaded printout of it from IKA website.
- › If your appliance requires repair, return it in its original packaging. Storage packaging is not sufficient when sending the device - also use appropriate transport packaging.

Accessories

- › For accessories see www.imlab.eu.

Error codes

- › The fault is shown by an error code on the display as following if the error occurs. Proceed as follows in such cases:
 - Turn off the device by using the mains switch (left « “ON”, right « “OFF”).
 - Carry out corrective measures.
 - Restart the device.

Error code | Causes | Effect | Solutions

E 3 - Temperature in the device is higher than 80 °C

Causes	› heat accumulation between heating plate and housing
	› permitted ambient temperature exceeded
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again
	› change experiment
	› observe maximum permissible ambient temperature

E 4 - Motor control is unavailable

Causes	› motor blocked or overloaded
Effect	› heating switched off
	› motor switched off
Solutions	› reduce load torque or use smaller magnetic rods
	› reduce target speed

E 5 - No temperature increase measured by temperature sensor (in the set time for t5)

Causes	› sensor not in medium
	› volume of medium to be measured too large
	› heat conductivity of medium to be measured too low
	› heat conductivity of the vessel is too low
	› in the case of indirect heating, the overall heat conductivity resistance is too large
Effect	› heating switched off
Solutions	› place the sensor in the medium
	› reduce the volume of the media
	› use a carrier fluid with better heat conductivity properties
	› replace the glass vessel with a metal pot
	› increase the “Time-out” period

E 6 - Interruption of the safety circuit

Causes	› break in safety circuit
Effect	› heating switched off
Solutions	› plug in contact plug
	› plug in PT 1000 temperature sensor
	› replace faulty connecting cable, plug, or contact thermometer

E 13 - Hotplate safety sensor, open-circuit

Causes	› target / current different of the adjustable safety circuit for minimum temperature monitoring
Effect	› heating switched off
Solutions	› after switching on, change the SAFE TEMP to a different value; if this solves the issue, the previous value can be reset by switching the device off and on again

E 14 - External temperature sensor, short-circuit

Causes	› short circuit in temperature sensor plug › short circuit in the cable or temperature sensor
Effect	› heating switched off
Solutions	› check the plug › replace the temperature sensor

E 21 - Fault during heating plate safety test

Causes	› safety relay does not open
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again

E 22 - Fault during heating plate safety test

Causes	› S_CHECK cannot generate H_S_TEMP
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again

E 24 - Heating plate temperature is higher than the set safety temperature

Causes	› safety temperature has been set to lower than the current temperature of the heating plate › disconnection of heating plate control temperature sensor
Effect	› heating switched off
Solutions	› leave the heating plate to cool › set the safety temperature higher

E 25 - Heating switching element monitoring fail

Causes	› heater control circuit switch (TRIAC) short-circuited › safety relay has interrupted the heating circuit › heater or the supply line is disconnected › disconnection of heating plate safety temperature sensor
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again

E 26 – Plate temperature > plate safety temperature (more than 40 K)

Causes	› irregular temperature distribution across heating plate due to sporadic heat dissipation › defective control or safety temperature sensor
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again › ensure regular heat dissipation when using metal blocks, etc. on the flat surface of the heating plate

E 31 – Fault in the heater switch element

Effect	› heating switched off
Solutions	› contact customer service

E 44 – Heating plate safety temperature is higher than the set safety temperature

Causes	› the set safety temperature has been set to lower than the safety temperature of the heating plate › disconnection of heating plate safety temperature sensor
Effect	› heating switched off
Solutions	› leave the heating plate to cool › set the safety temperature higher

E 46 – Plate safety temperature > plate temperature (more than 40 K)

Causes	› irregular temperature distribution across heating plate due to sporadic heat dissipation › defective control or safety temperature sensor
Effect	› heating switched off
Solutions	› switch device off, leave to cool and switch on again › ensure regular heat dissipation when using metal blocks, etc. on the flat surface of the heating plate

- › If the actions described fails to resolve the fault or another error code is displayed then take one of the following steps:
- contact the service department.
 - send the device for repair, including a short description of the fault.



Technical data

General data	
Voltage	220 ... 230 VAC ± 10 % 115 VAC ± 10 % 100 VAC ± 10 %
Frequency	50 / 60 Hz
Power input	650 W
Power input standby	1.6 W
Self-heating of the heating plate by max. stirring (RT: 22 °C / duration:1 h)	+ 17 K
Interface	USB-B (for "Firmware Update Tool" only)
Permissible ambient temperature	+ 5 ... + 40 °C
Permissible relative humidity	80 %
Protection class according to DIN EN 60529	IP 42
Protection class	I
Contamination level	2
Overvoltage category	II
Plate material	Aluminium
Plate dimensions	Ø 135 mm
Dimensions (W × D × H)	160 × 270 × 85 mm
Weight	2.4 kg
Operation at a terrestrial altitude	max. 2000 m
Stirring function	
Number of stirring positions	1
Motor rating output	9 W
Direction of rotation	right
Max. stirring quantity (H ₂ O)	20 l
Speed range	0 / 50 ... 1500 rpm
Speed display	LED
Speed setting	rotating / pressing knob
Speed setting accuracy	10 rpm
Speed variation (no load, nominal voltage, at 1500 rpm, ambient temperature +25 °C)	± 2 %
Stirring bar length	20 ... 80 mm

Heating function	
Heat output	600 W
Heating temperature range	RT + device self-heating ... 310 °C
Temperature setting range	0 ... 310 °C
Temperature display	LED
Temperature setting	rotating / pressing knob
Temperature setting resolution of heating plate	1 K
Temperature setting resolution of medium	1 K
Heating rate (1 l water in H 1500)	6.5 K / min
Temperature control accuracy of heating plate (without vessel, heating plate centre at 100 °C)	± 5 K
Adjustable safety circuit	(50 °C ... 360 °C) ± 10 °C
External temperature sensor / thermometer	
Connection for external temperature sensor / thermometer	PT 1000 series (excluding double PT 1000 sensors), ETS-D5, ETS-D6
Temperature control accuracy (500 ml water in 600 ml glass beaker, 40 mm bar, 600 rpm, 50 °C)	± 1.0 K (with temperature sensor PT 1000) ± 0.5 K (with thermometer ETS-D5) ± 0.2 K (with thermometer ETS-D6)
Temperature measuring range PT 1000	-20 °C ... + 350 °C
Temperature sensor PT 1000 deviation EN 60751 class A	≤ ± (0.15 + 0.002 × ITI)
Temperature measurement accuracy	± 0.5 + tolerance PT 1000 (DIN EN 60751 class A)
Sensor in medium detection (Error 5)	yes

Subject to technical changes!

Warranty

- › In accordance with IKA Terms and Conditions of Sale, the warranty period is 24 months. For claims under the warranty please contact your local dealer. You may also send the device direct to our factory, enclosing the delivery invoice and giving reasons for the claim. You will be liable for freight costs.
- › The warranty does not cover worn out parts, nor does it apply to faults resulting from improper use, insufficient care or maintenance not carried out in accordance with the instructions in this operating instructions.