

Goldleaf  Scientific

Instruction Manual

Magnetic Hotplate Stirrer

M 26G2



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1. User Instructions

1.1 Important Instructions for your safety



- Every user must read and understand this manual completely before use. Failure to do so can result in serious injury or death.
- Comply with all safety and accident-prevention regulations applicable to laboratory work.
- Follow general instructions for hazard prevention and general safety instructions, e.g. wear protection clothing, eye protection and gloves.
- This operating manual is part of the product. Thus, it must always be easily accessible.
- This instruction sheet does not purport to address all of the safety problems which might result from the use of this device, chemicals, reagents, apparatus or equipment employed in any specific test or protocols. It is the responsibility of the user to consult their authorized safety advisors and establish appropriate health and safety practices and then determine the application of regulatory limitations prior to use.
- Enclose this operating manual when transferring the device to another place.
- If this manual is lost, please request another one. Please contact your dealer or

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1.2 Danger symbols in this operating manual

The safety instructions in this manual appear with the following danger symbols and danger levels:

1.2.1 Danger symbols:

	Hazard point		Electrical shock
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	Risk of fire		Explosion
	Crushing		Hot surface
	Bio hazard		Magnetic field
	Chemical hazard		Material damage

1.2.2 Danger levels

	Will lead to severe injuries or death
	May lead to severe injuries or death
	May lead to light to moderate injuries
	May lead to material damage

1.2.3 Warning signs on the device

	<p> WARNING</p> <p>This symbol indicates that it is imperative to read and understand the instruction manual prior to operating the instrument. Please highlight points which require special attention in your field of application so they are not overlooked. Disregard of warnings may result in impairment of serviceability as well as in physical harm to the user.</p>
	<p> WARNING</p> <p>Beware of the effect of the magnetic field on cardiac pacemakers and data storage media.</p>
	<p> WARNING</p> <p>This symbol indicates that there are hot surfaces on the device. It refers to the hotplate of the device which can reach up to 500°C during operation causing a hazard resulting in serious burns.</p> <ul style="list-style-type: none"> • Avoid contact with the hotplate, vessel and heating medium. • Avoid storage of flammable substances near the instrument.

2. General safety warnings and instructions

	<p>⚠ DANGER Risk of explosion.</p> <ul style="list-style-type: none"> • Do not operate the device in the vicinity of highly flammable or explosive substances. The instrument is not explosion-proof. • Do not use this device for processing any substances which could generate an explosive atmosphere. • Do not use this device to process any explosive or highly reactive substances. • Do not use flammable or explosive substances near the instrument.
	<p>⚠ DANGER Electric shock as a result of penetration of liquid.</p> <ul style="list-style-type: none"> • Do not allow any liquids to penetrate the inside of the housing • Switch off the device and disconnect the power plug before starting cleaning or disinfection work. The On/Off Switch on the device does not disconnect the device from the power source. • Use only closed tubes. • Only plug the device back in if it is completely dry, both inside and outside.
	<p>⚠ WARNING Risk from incorrect supply voltage</p> <ul style="list-style-type: none"> • Only connect the device to a AC power source with a protective earth (PE). • Only connect the device to voltage sources which correspondent to the electrical requirements on the type label.
	<p>⚠ WARNING Electric shock due to damage to device or mains cable</p> <ul style="list-style-type: none"> • Only connect the device to the mains supply if the device and the mains cable are undamaged • Only use devices that have been properly installed or repaired. • In case of danger, disconnect the device from the mains supply by pulling the power plug from the mains socket or by using the isolating device intended for this purpose (e.g. emergency stop switch)
	<p>⚠ WARNING Lethal voltage inside the device</p> <ul style="list-style-type: none"> • Do not open the device. • Ensure that the housing is always closed and undamaged so that no parts inside the housing can be contacted by accident. • The On/Off Switch on the device does not disconnect the device from the power source. Remove the plug from the AC power outlet to disconnect the instrument from the mains supply entirely. • Do not allow any liquids to penetrate the inside of the housing. • Repairs are only to be carried out by trained service technicians.
	<p>⚠ WARNING Damage to health due to corrosive or aggressive chemicals</p> <ul style="list-style-type: none"> • Observe all markings on the reagent bottles.

	<ul style="list-style-type: none"> ● Always check the instrument for leaks and air bubbles. Special attention should be directed to determine that all push-ons, threaded connections and suction tubes are firmly in place before beginning operation. Leaking solutions may endanger persons and materials ● Use proper connecting vessels, protective clothing and gloves. ● Avoid splashes ● When dispensing, maintain a physical distance between the instrument and the body. ● Dangerous and fuming chemicals must be dispensed in a fume hood. ● Only employ the instrument for the purpose intended by the manufacturer, and particularly within the resistance limits of the instrument. If in doubt, contact your supplier, or the manufacturer's factory representative at the phone number shown at the front page of this operating instruction. ● Always use the instrument in such a manner that neither the operator, nor any other person is endangered.
	<p>▲WARNING Damages to health due to infectious liquids and pathogenic germs.</p> <ul style="list-style-type: none"> ● When handling infectious liquids and pathogenic germs, observe the national regulations, the biological security level of your laboratory, the material safety data sheets and the manufacturer's application notes. ● Wear personal protective equipment ● For comprehensive regulations about handling germs or biological material of the risk group II or higher, please refer to the "Laboratory Biosafety Manual" in its respectively current valid version from the World Health Organisation
	<p>▲WARNING Damage to health due to contaminated device and accessories</p> <p>In the following cases, sample material can be released:</p> <ul style="list-style-type: none"> - improperly sealed tubes - unstable tubes - high vapour pressure of the content so that the seal of the tubes can spring open - damaged sealings - smashed glass tubes <ul style="list-style-type: none"> ● Only mix in closed tubes ● Observe the nationally prescribed safety environment when working with hazardous, toxic and pathogenic samples. Pay particular attention to personal protective equipment (gloves, clothing, goggles, etc.), extraction, and the safety class of the lab. ● Decontaminate the device and the accessories before storage and shipping.
	<p>▲WARNING Risk of fire</p> <ul style="list-style-type: none"> ● Do not use this device to process any highly flammable liquids
	<p>▲CAUTION Poor safety due to inadequate fixing of the unit</p> <ul style="list-style-type: none"> ● Ensure that the unit is firmly attached to a solid stand.

	<p>▲CAUTION Poor safety due to incorrect accessories and spare parts.</p> <p>The use of accessories and spare parts other than recommended by Ingenieurbüro Goldleaf Scientific may impair the safety, function and precision of the device. Goldleaf Scientific cannot be held liable or accept any liability for damage resulting from the use of incorrect or non-recommended accessories and spare parts, or from the improper use of such equipment.</p> <ul style="list-style-type: none"> ● Only use accessories and spare parts recommended by Goldleaf Scientific
	<p>▲CAUTION Crush hazard due to moving parts</p> <ul style="list-style-type: none"> ● Do not replace any consumables as long as the device is running. ● Do not open the coverage as long as the device is running

3. Scope of Delivery

Unpack the delivered contents carefully and check to see that nothing appears physically damaged or is missing. Your delivery should contain the following:

- 1 Magnetic Hotplate Stirrer M 26G2 PN: 60279-0000 (230V) or PN: 60279-0001 (115V)
or PN: 60279-0030 (230V)
- 1 Dummy DIN Plug
- 1 Instruction Manual

Optional:

- Pt100 Temperature Probe PN: 60278-0000
- Pt100 Duplex Temperature Probe PN: 60673-0000
- Stand holder PN: 60669-0010
- Stand PN: 60618-0000
- Probe Clamp PN: 8B00562400
- Clamp PN: 60668-0000
- RS485-RS232 Adapter for RS485 Communication PN: 61703-0000
- RS 232 to USB Adapter PN: 30244-0001
- 9 pol. Sub-D extension cord PN: 30275-0051

4. General Information

Our Magnetic Hotplate Stirrers are designed according to protection class 1. They were manufactured and tested according to DIN EN 61010. According to these regulations, the devices are designed to meet the requirements for safe and correct operations. To ensure the proper safety and operational functions of the instrument, the user should follow the instructions and safety guidelines in this manual.

5. Intended Use

These Magnetic Hotplate Stirrers are mainly to be used to heat and stir hydrous solutions and oil not containing inflammable parts in glass vessels. They are designed for use in chemical and biological laboratories of industrial enterprises, universities and pharmacies.

To ensure maximum service life, observe the specified ambient conditions (temperature and humidity) and ensure that the instrument is not exposed to a corrosive atmosphere.

The onus is on the user to find out whether the device is suitable for his application. If in doubt clarify this with your dealer or with the manufacturer directly.

6. Setting up and Starting up the Instrument

6.1 Unpacking the Instrument

Unpack the instrument carefully and check to see that it is not damaged. It is important that any damage incurred during transport be recognized at the time of unpacking. Notify your carrier or forwarding agent immediately in case of such damage.

If the instrument is not damaged and all parts are complete you may start to operate the device after reading the instruction manual.

6.2 Setting up the Instrument

Please place the device on a fire-proof horizontal and even surface. A minimum distance of 50cm to inflammable materials should always be observed.

	⚠ DANGER The device may not be operated in explosion-prone areas.
	⚠ WARNING The power cable may not come in contact with the hotplate.
	⚠ WARNING The device is not to be used without supervision.
	⚠ WARNING When connecting the instrument to an AC power outlet ensure that your local supply voltage matches the indication on the instrument.
	⚠ WARNING Beware of the effect of the magnetic field on cardiac pacemakers and data storage media.

6.3 Electrical Connection

⚠ WARNING



- A earthing-pin plug (DIN 49441 CEE 7/VII10/ 16 A 250 V, a standard plug in Germany, Austria, the Netherlands, Belgium, France, Norway, Sweden, Finland, Denmark, Portugal and Spain) is standard on all instruments. For North America instruments feature standard US plugs (NEMA Pub.No.WDI1961 ASA C 73.1. 1961 page 8 15A 125V),, for the UK with a standard UK plug BS 1363.
- When operating the instruments in countries with different AC plug systems use an approved adapter or have a qualified electrician replace the AC plug with an approved model suitable for the country of operation.
- The instrument is earthed as supplied. When replacing the original AC plug, ensure that the earth conductor is connected to the new plug!
- When connecting the instrument to an AC power outlet, ensure that your local supply voltage matches that indicated on the instrument's rating plate.

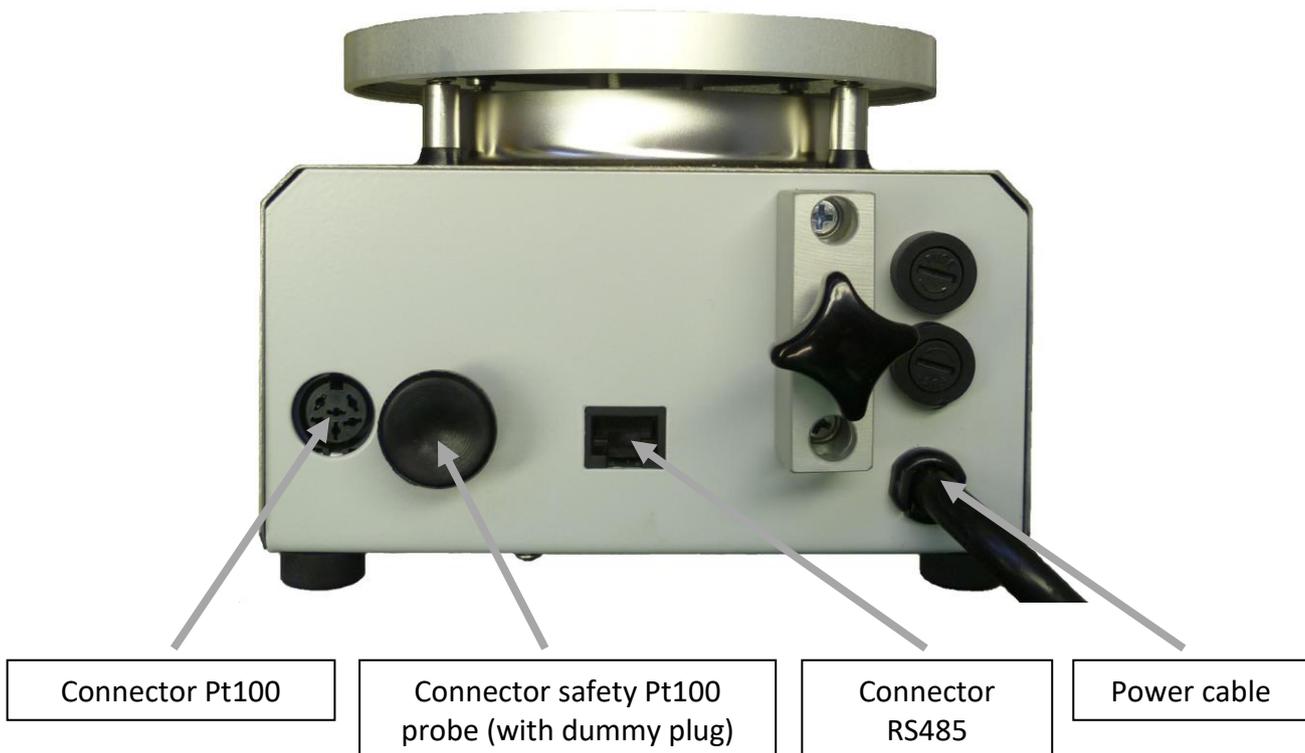


⚠ WARNING

Before connection the instrument to the mains ensure that the rocker switch (1) is set to the „OFF“- position.

6.4 Rear Connections

Following connections are located on the rear panel of the device:



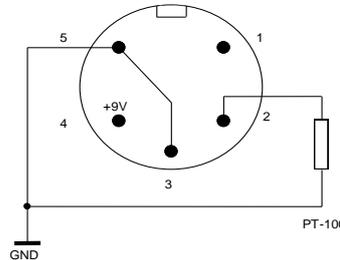
6.4.1 Mains Connection

Connect the mains power cable to the mains power connector. Ensure that your local supply voltage matches the indication on the instrument.

6.4.2 Connection of the Pt100 Probe

The left 5-pin DIN Connector on the rear of the instrument is intended for the connection of a Pt100 temperature probe (PN: 60278-0000). Pt1000 probes are not suitable.

Pin assignment of the connector for the Pt100 probe:

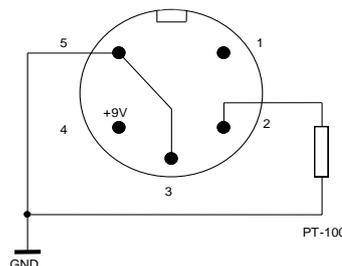


	CAUTION Ensure that the cable of the Pt100 probe does not come in contact with the hotplate.
	NOTICE Use Pt100 probes with electrically isolated tips only. Probes that allow for an electrical connection to the metal chassis of the device may distort temperature measurement.
	NOTICE Ensure that the Pt100 probe tip is submersed to a depth of at least 50mm in the heating medium to allow accurate measurement.

6.4.3 Connection of the 2nd Pt100 Probe

The right 5-pin DIN Connector on the rear of the instrument is intended for the connection of a safety Pt100 temperature probe (Pt100 probe: PN: 60278-0000 or Duplex Pt100 probe: PN60673-0000). Pt1000 probes are not suitable.

Pin assignment of the connector for the safety Pt100 probe:



	CAUTION Ensure that the cable of the Pt100 probe does not come in contact with the hotplate.
	NOTICE Pay attention to the sequence of connection: First insert the sensor on the left side and then the sensor on the right side, otherwise the sensors will not be detected correctly by the electronics.

	<p>NOTICE If no safety Pt100 probe is used, connect the supplied dummy plug to the connector for the safety Pt100 probe.</p> <p>The device will not switch on if there is no safety Pt100 probe or no dummy plug is inserted in the socket.</p>
	<p>NOTICE Use Pt100 probes with electrically isolated tips only. Probes that allow for an electrical connection to the metal chassis of the device may distort temperature measurement.</p>
	<p>NOTICE Ensure that the Pt100 probe tip is submersed to a depth of at least 50mm in the heating medium to allow accurate measurement.</p>

6.4.4 Connection of the RS485 Interface

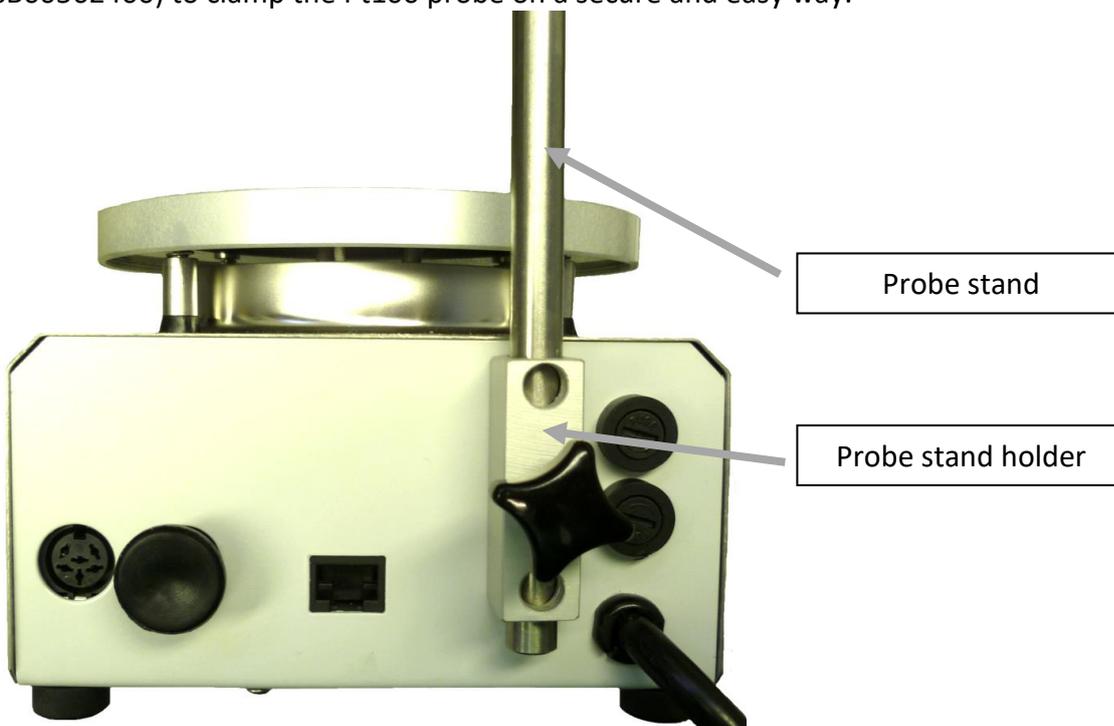
On the rear of the device is a connector for a RS485 Interface. For an easy use with a PC, you can use an optional RS485 to RS232 adapter (PN: 61703-0000). With this adapter, the device can communicate with a PC.

For more information on this interface please refer to chapter 13-RS485 Interface.

	<p>NOTICE Never connect the RJ45 jack with a network jack of a PC, router, switch or something like that. Only connect original accessories to the "RS485 In" jack! Any other use may result in damage of the device or damage to third party devices!</p>
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6.5 Probe Stand

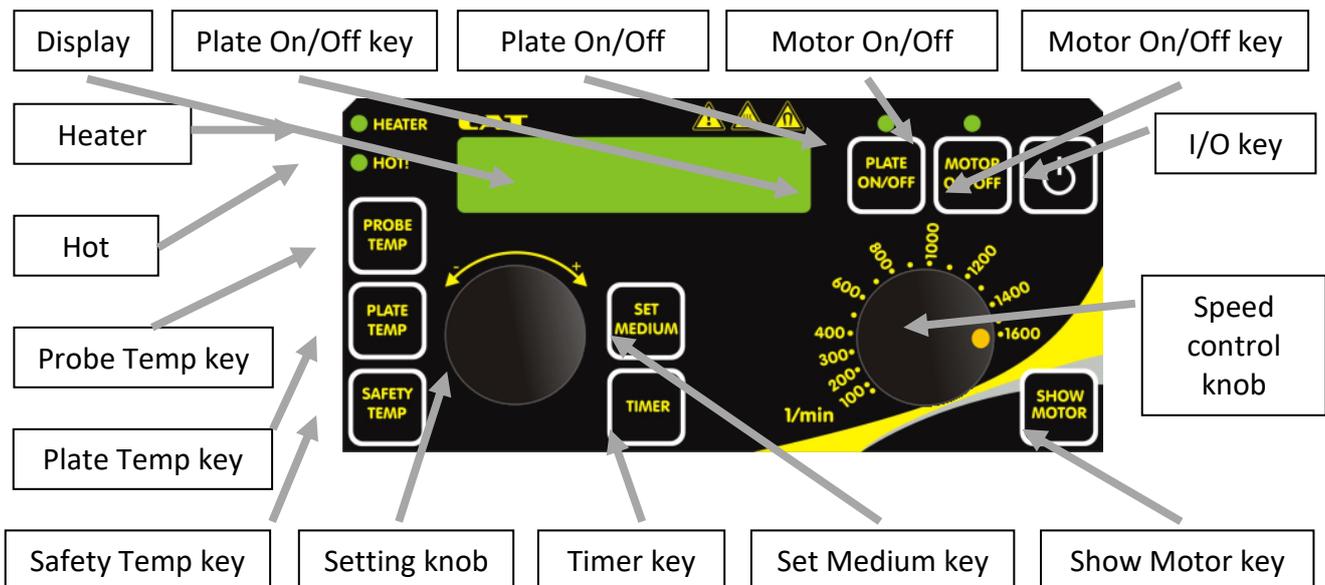
Use the optional probe stand holder (PN: 60669-0010) on the rear of the device to mount an optional probe stand (PN: 60618-0000). Then it is possible with an additional probe clamp (PN: 8B00562400) to clamp the Pt100 probe on a secure and easy way.



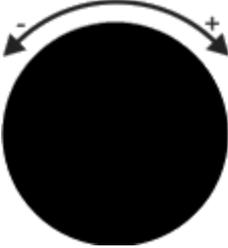
7. Operation of the device

7.1 Description of the Controls

Adjusting the different temperature values is done on the left side of the control panel via various buttons and the setting knob. The speed adjustment is done on the right side via the speed control knob. With the two buttons “Plate On/Off” and “Motor On/Off”, the hotplate as well as the motor can be switched on or off on a quick and easy way. The various values as well as the different device states are shown on the display together with several LEDs.



Control	Function
Display	This display is used for showing the various temperature and speed values as well as different messages and setup menus.
Heater LED	This LED indicates that the hotplate is currently being exposed to an energy pulse.
Hot LED	While the hotplate is hotter than 60°C this LED lights up.
Plate On/Off LED	This LED is illuminated when the hotplate is switched on. It indicates that the device is trying to reach or keep the entered set temperature for the hotplate or probe.
Motor On/Off LED	This LED is illuminated when the motor is switched on.
	If the device is in standby mode, the device can be switched on by pressing the I/O key. In switched on mode you can press the I/O key again to switch the device back into standby mode.
	By pressing the Plate On/Off key, you can switch the hotplate on or off.
	For Switching the motor on or off, this key needs to be pressed.

	<p>Press the Probe Temp key to access the Probe menu. In this view you can see the actual as well as the set probe temperature. While the Probe menu is displayed, you can press the Probe Temp key again to access the setting menu. The Probe Temp key is only available with a connected external Pt100 probe.</p>
	<p>Press the Plate Temp key to access the plate menu. In this view you can see the actual as well as the set hotplate temperature. While the plate menu is displayed, you can press the Plate Temp key again to access the setting menu.</p>
	<p>Press the Safety Temp key to access the safety menu. In this view you can see the actual safety temperature. While the safety menu is displayed, you can press the Safety Temp key again to access the setting menu.</p>
	<p>Press the Medium key to access the medium menu. In this view you can see the actual volume of the liquid. While the medium menu is displayed, you can press the Medium key again to access the setting menu.</p>
	<p>Press the Timer key to access the timer menu. In this view you can see the actual timer value. While the timer menu is displayed, you can press the Timer key again to access the setting menu.</p>
	<p>Press this button to see the actual speed together with the set speed on the display.</p>
	<p>Press the setting knob to access the setting menu of the actual shown value in the display. If you press the setting knob in the setting menu the adjusted value is accepted and the display changes back to the display menu. While the setting menu is shown, you can turn the setting knob to change the selected value. Turning clockwise will increment values, while turning anti-clockwise will decrement.</p>
	<p>The speed control knob is used to set the speed of the stirring motor. The actual set speed is shown on the display while this wheel is turned.</p>

7.2 Switching the Device On and Off

	<p>▲WARNING The On/Off Switch on the device does not disconnect the device from the power source. Remove the plug from the AC power outlet to disconnect the instrument from the mains supply entirely.</p>
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Make sure that you have read the instruction manual carefully before operating the device. It is also necessary to check whether the device is in accordance with the setup instructions above.



If the device is in standby mode, the device can be switched on by pressing the I/O key. In switched on mode you can press the I/O key again to switch the device back in standby mode.

During switching on and off the device, various messages can appear in the display. These messages give information to the user about different device states. For more information refer to chapter 12 Display messages.

Note:

When you switch off the device in standby mode, all values are stored (e.g. the set hotplate temperature). Next time you switch on the device these values are restored.

7.3 Device Settings

Besides the two basic functions of heating and stirring, the device offers several additional settings that can be changed via the setting menu.

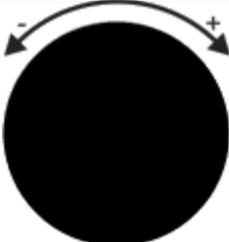
7.3.1 Select Menu

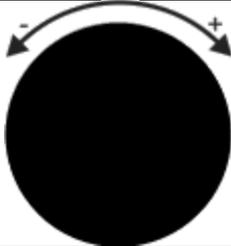
The device offers the opportunity to make several basic settings. In the Select Menu you can select the different submenus, which contains the various setting parameters. The menu can be left via the menu item „BACK“.

- Setup Menu (Section: 7.3.2. Setup Menu)
- PID Menu (Section: 7.3.3 PID Menu)
- Calibrate Menu (Section: 7.3.4 Calibrate Menu)
- BACK

In each submenu different parameters can be selected and changed. The various parameters are described in the corresponding chapters.

To enter the Select Menu the following steps are required:

	Press the I/O key to switch on the device.
	Directly after pressing and releasing the I/O key, press and hold the Timer key until "Select Menu" is displayed
	By turning the setting knob, you can navigate between the different submenus.

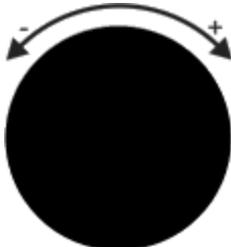
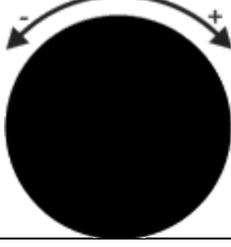
	<p>Press the setting knob to select the shown submenu. The submenu can be left via the menu item „BACK“.</p>
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7.3.2 Setup Menu

In the Setup Menu you can change various basic settings of the device. This submenu can be reached over the Select Menu as described in Section 7.3.1-Select Menu and contains the following setting parameters:

- DiffAlrm Sensity (Section: 7.3.2.1-DiffAlrm Sensity)
- Out of Liq.Check (Section: 7.3.2.2-Out of Liq.Check)
- Liquid Ramp (Section: 7.3.2.3-Liquid Ramp)
- PlateTemp. Limit (Section: 7.3.2.4-PlateTemp. Limit)
- PlateTempAutoSet (Section: 7.3.2.5-PlateTempAutoSet)
- Second Safety (Section: 7.3.2.6- Second Safety)
- Safety Auto Set (Section: 7.3.2.7-Safety Auto Set)
- Ask Volume (Section: 7.3.2.8-Ask Volume)
- Motor Auto On (Section: 7.3.2.9-Motor Auto On)
- Safety Stir Time (Section: 7.3.2.10-Safety Stir Time)
- RS485 Address (Section: 7.3.2.11-RS485 Address)
- RS485 Baud Rate (Section: 7.3.2.12-RS485 Baud Rate)
- Temperature Unit (Section: 7.3.2.13-Temperature Unit)
- Restart After Power Fail (Section: 7.3.2.14- Restart After Power Fail)
- Default Settings (Section: 7.3.2.15- Default Settings)
- BACK

Navigation through the submenus and changing the setting parameters can be done using the setting knob:

	<p>Turn the setting knob to navigate between the different submenus with its setting parameters. By pressing the setting knob, the displayed parameter can be selected. The display switches into the setting menu (flashing arrow is shown). Now you can adjust the selected parameter by turning the setting knob. Turning the setting knob clockwise will increase and turning it anti-clockwise will decrease the selected value.</p>
	<p>When the selected parameter is set to the desired value, confirm the setting by pressing the setting knob again. The menu can be left via the menu item „BACK“.</p>

7.3.2.1 DiffAlrm Sensity

This safety function registers an extreme drop in temperature of the measured medium temperature (external Pt100 probe). For more information, see section 11.4-Differential Alarm.

To adjust the sensitivity of the Differential Alarm, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "DiffAlrm Sensity".

Adjustment range: 1% ... 100% (low: 1 ... 39%, normal: 40 ... 69%, high: 70 ... 100%)

Default value: 90%

7.3.2.2 Out of Liq.Check

The Out of Liquid function monitors, whether the Pt100 probe is immersed in the liquid in the vessel on the hotplate. For more information, see section 11.5-Out of Liquid Check.

To adjust the sensitivity of the Out of Liquid function, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Out of Liq.Check".

Adjustment range: 0 ... 100% (off: 0%, low: 1% ... 39%, normal: 40 ... 69%, high: 70 ... 100%)

Default value: 40%

7.3.2.3 Liquid Ramp

This setting allows you to define a temperature ramping for the Pt100 probe (Probe Temp). For more information see section 8.1.3-Liquid Ramp Function.

To adjust the Liquid Ramp function, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Liquid Ramp".

Adjustment range: 1 ... 450°C/h (off: 450°C/h)

Default value: 450°C/h (off)

7.3.2.4 PlateTemp. Limit

By changing this value, the maximum adjustable hotplate temperature can be limited. For more information, see section 11.7. Hotplate Temperature Limit

To adjust the maximum allowed hotplate temperature, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "PlateTemp. Limit".

Adjustment range: 50 ... 360°C (off: 360°C)

Default value: 360°C (off)

7.3.2.5 PlateTempAutoSet

If a Pt100 probe is connected to the device and the temperature of the heating medium (Probe Temp) is changed, the maximum hotplate temperature (Plate Temp Limit) automatically will be set to its maximum allowed value, to guarantee a short heat-up time. In some cases this is not desirable, but the set limitation of the hotplate temperature (Plate Limit, see section 8.1.2) should not be overwritten after changing the temperature of the medium (Probe Temp). This automatic function can be switched off here.

To switch the automatic setting of the hotplate temperature on or off, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "PlateTempAutoSet".

Adjustment range: On, Off

Default value: On

7.3.2.6 Second Safety Temp

The device offers the possibility to connect a Safety Pt100 probe to increase the security of the device. The circuit of this mechanism is completely independent of the microcontroller. For more information, see section 11.3-Independent 2nd Safety Pt100 Temperature.

To adjust the Second Safety Temperature, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Second Safety".

Adjustment range: 50 ... 280°C (off: 280°C)

Default value: 280°C (off)

7.3.2.7 Safety Auto Set

When this option is enabled, the device will automatically set the safety temperature 15°C above the programmed set temperature every time the setpoint is changed. If a Pt100 probe is connected, the set temperature is the set value of the heating medium (Probe Temp), otherwise it is the hotplate temperature (Plate Temp). Every time the Safety Temperature was set by the device automatically, a short message will be displayed to inform the user. After that, the user can readjust the Safety Temperature manually by using the setting knob.

To switch the automatic setting of the Safety temperature on or off, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Safety Auto Set".

Adjustment range: On, Off

Default value: On

7.3.2.8 Ask Volume

To optimize the heat-up time, whenever the device is switched on or a Pt100 probe is connected to the device, the user will be asked automatically for the volume of the heating medium. This automatic query can be switched off in this menu item. If this function is turned off, the volume of liquid can only be changed manually. For more information, see section 8.1.1-Setting up the Heating Volume.

To switch the automatic Ask Volume function on or off, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "PlateTempAutoSet".

Adjustment range: On, Off

Default value: On

7.3.2.9 Motor Auto On

When this option is enabled, the motor will be automatically switched on every time the hotplate is switched on. However the motor will not be switched off if the hotplate is switched from On to Off. If this function is disabled, the motor must be switched on separately.

To switch the automatic Motor Auto On function on or off, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "PlateTempAutoSet".

Adjustment range: On, Off

Default value: Off

7.3.2.10 Safety Stir Time

After device malfunction (e.g. hotplate overheating) the hotplate switches automatically off. But the device continues stirring the liquid for a certain time, to prevent heat accumulation and helping cooling down the liquid. The user can define the time for continue stirring (Safety Stir Time) in this setting. For more information, see section 11.1-Safety Stir Function.

To adjust the Safety Stir Time, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Safety Stir Time".

Adjustment range: 00:00:00 ... 01:00:00 h:m:s (off: 00:00:00 h:m:s)

Default value: 00:05:00

7.3.2.11 RS485 Address

If you want to operate several devices on one RS485 bus, each device needs its unique slave address, so that the devices can differentiate between their commands. For more information, see chapter 13.4-Addressing the Instrument.

To adjust the RS485 Address, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "RS485 Address".

Adjustment range: 1 ... 255

Default value: 1

7.3.2.12 RS485 Baud Rate

With this setting the baud rate of the RS485 port can be changed. It is recommended not to change this setting.

To adjust the RS485 baud rate, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "RS485 Baud Rate".

Adjustment range: 1200, 2400, 4800, 9600baud

Default value: 9600baud

7.3.2.13 Temperature Unit

The temperature unit can be switched between Celsius and Fahrenheit. It affects both the temperature values on the display, as well as the values read via the RS485 interface.

To adjust the Temperature Unit, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Temperature Unit".

Adjustment range: Celsius, Fahrenheit

Default value: Celsius

7.3.2.14 Restart After Power Fail

With this function the behavior of the device after a mains voltage error, e.g. Power failure can be changed. If the function is switched on and the mains voltage is interrupted during operation, the device restores the last device state as soon as the mains voltage is switched on again and continues to run automatically.

To enable or disable this function enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "RestartPowerFail".

Adjustment range: On, Off

Default value: On

7.3.2.15 Default Settings

By selecting this function, the device can be reset to its factory settings. It will erase all user settings.

To reset the device to its default settings, enter the Setup Menu (Section: 7.3.2) and choose the setting parameter "Default Settings".

Adjustment range: No, Yes

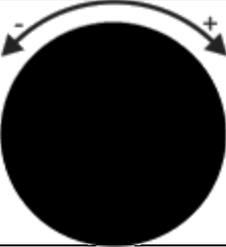
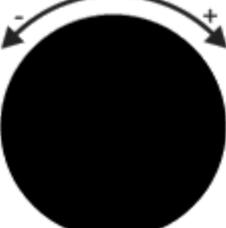
Default value: No

7.3.3 PID Menu

In the PID Menu you can change various setting parameters which affect the heating control. It is recommended that these setting parameters should only be changed by experienced users. This submenu can be reached over the Select Menu as described in Section 7.3.1-Select Menu and contains the following setting parameters:

- Thermal Resist. (Section: 7.3.3.1-Thermal Resistance)
- Container Type (Section: 7.3.3.2-Container Type)
- BACK

Navigation through the submenus and changing the setting parameters can be done using the setting knob:

	<p>By turning the setting knob, you can navigate between the different submenus with its setting parameters.</p> <p>If a setting parameter is selected and the menu is in setting mode (flashing arrow), the parameter can be adjusted by turning the setting knob. Turning the setting knob clockwise will increase and turning it anti-clockwise will decrease the selected value.</p>
	<p>After selecting a setting parameter, press the setting knob to access the setting menu and change its value. You can recognize the setting menu at the flashing arrow.</p> <p>When the selected parameter is set to the desired value, confirm the setting by pressing the setting knob again.</p> <p>The menu can be left via the menu item „BACK“.</p>

7.3.3.1 Thermal Resistance

This value reflects the energy drop from the liquid to ambient temperature.

This means that if there is a lot of energy needed (which comes from the hotplate) to hold the desired liquid temperature (Probe Temp), there is a low thermal resistance present. If for example water should be heated to 99°C at normal ambient conditions, this would need much more than only the double the energy to heat water to 50°C. If, however, a temperature close to the boiling temperature should be controlled, this value should be decreased to lower values to achieve a faster heat up time.

To adjust the Thermal Resistance of the heating medium enter the PID Menu (Section: 7.3.3) and choose the setting parameter “Thermal Resist.”.

Adjustment range: 50 ... 400

Default value: 380

	<p>WARNING The value of the thermal resistance should only be readjusted from default when operating close to the boiling point of the liquid. Otherwise an extreme temperature overshoot can occur!</p>
---	---

7.3.3.2 Container Type

This option allows to adapt/optimize the temperature regulation circuitry to the type of container (=vessel) being used.

To adjust the Container Type of the vessel, enter the PID Menu (Section: 7.3.3) and choose the setting parameter “Container Type”.

Adjustment range: Glass, Aluminium, Stainless steel

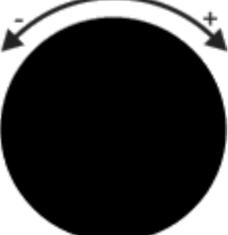
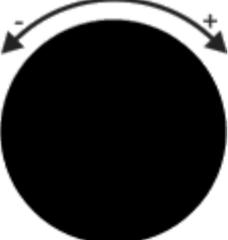
Default value: Glass

7.3.4 Calibrate Menu

This device allows a recalibrating of the Pt100 probe and the Safety Pt100 probe. This can be done by an easy to use 2-point calibration. The calibration submenu can be reached over the Select Menu as described in Section 7.3.1-Select Menu and contains the following setting parameters:

- Pt100-A low Cal. (Section: 7.3.4.1-Calibration for Pt100 A)
- Pt100-A high Cal (Section: 7.3.4.1-Calibration for Pt100 A)
- Pt100-B low Cal. (Section: 7.3.4.2-Calibration for Pt100 B)
- Pt100-B high Cal (Section: 7.3.4.2-Calibration for Pt100 B)
- Reset Calibration (Section: 7.3.4.3-Reset Calibration)
- BACK

Navigation through the submenus and changing the setting parameters can be done using the setting knob:

	<p>By turning the setting knob, you can navigate between the different submenus with its setting parameters.</p> <p>If a setting parameter is selected and the menu is in setting mode (flashing arrow), the parameter can be adjusted by turning the setting knob. Turning the setting knob clockwise will increase and turning it anti-clockwise will decrease the selected value.</p>
	<p>After selecting a setting parameter, press the setting knob to access the setting menu and change its value. You can recognize the setting menu at the flashing arrow.</p> <p>When the selected parameter is set to the desired value, confirm the setting by pressing the setting knob again.</p> <p>The menu can be left via the menu item „BACK“.</p>

7.3.4.1 Calibration for Pt100 A

The device allows you to recalibrate the Pt100 probe. To achieve a good calibration result, please operate carefully.

Please follow strictly to the prescribed calibration instructions. Prerequisite for a good result is a highly accurate thermometer:

- Enter the Calibrate Menu as described in section 0.
- If already a calibration for the Pt100 probe exists, please reset it as described in chapter 7.3.4.3.
- Put the Pt100 probe together with the sensor of a high-precision temperature measuring device in ice water (both at least 5cm immersed) and wait at least 5 minutes until the temperature sensors has reached the temperature of the water.
- Select the menu item “Pt100-A low Cal.” from the Calibrate Menu.
- Now read the ice water temperature from the high-precision temperature measuring device. Set this temperature value in the bottom line on the left side of the display from the magnetic stirrer by turning the setting knob. On the right side of the display you will see the temperature value measured by the magnetic stirrer of the ice water (before calibration).
- Confirm the setting by pressing the setting knob.
- Put the Pt100 probe together with the sensor of a high-precision temperature measuring device in boiling water (both at least 5cm immersed) and wait at least 5 minutes until the temperature sensors has reached the temperature of the water.
- Select the menu item “Pt100-A high Cal.” from the Calibrate Menu.

- Now read the temperature of the boiling water from the high-precision temperature measuring device. Set this temperature value in the bottom line on the left side of the display from the magnetic stirrer by turning the setting knob. On the right side of the display you will see the temperature value measured by the magnetic stirrer of the boiling water (before calibration).
- Confirm the setting by pressing the setting knob.

To be sure that the new calibration is working properly, you have to control the result. The best way to do this is by heating a suitable medium at different temperatures (see section 8.1-Temperature Control with External Pt100 Probe) with the magnetic stirrer. Wait until the several temperatures are stable, before comparing the measured temperature of the magnetic stirrer with the temperature of a high-precision temperature measuring device.

7.3.4.2 Calibration for Pt100 B

The device allows you to recalibrate the Safety Pt100 probe (see also chapter 11.3-Independent 2nd Safety Pt100 Temperature). To achieve a good calibration result, please operate carefully.

Please follow strictly to the prescribed calibration instructions. Prerequisite for a good result is a highly accurate thermometer:

- Enter the Calibrate Menu as described in section 0.
- If already a calibration for the Safety Pt100 probe exists, please reset it as described in chapter 7.3.4.3.
- Put the Safety Pt100 probe together with the sensor of a high-precision temperature measuring device in ice water (both at least 5cm immersed) and wait at least 5 minutes until the temperature sensors has reached the temperature of the water.
- Select the menu item "Pt100-B low Cal." From the Calibrate Menu.
- Now read the ice water temperature from the high-precision temperature measuring device. Set this temperature value in the bottom line on the left side of the display from the magnetic stirrer by turning the setting knob. On the right side of the display you will see the temperature value measured by the magnetic stirrer of the ice water (before calibration).
- Confirm the setting by pressing the setting knob.
- Put the Pt100 probe together with the sensor of a high-precision temperature measuring device in boiling water (both at least 5cm immersed) and wait at least 5 minutes until the temperature sensors has reached the temperature of the water.
- Select the menu item "Pt100-B high Cal." From the Calibrate Menu.
- Now read the temperature of the boiling water from the high-precision temperature measuring device. Set this temperature value in the bottom line on the left side of the display from the magnetic stirrer by turning the setting knob. On the right side of the display you will see the temperature value measured by the magnetic stirrer of the boiling water (before calibration).
- Confirm the setting by pressing the setting knob.

To be sure that the new calibration is working properly, you have to control the result. The best way to do this is by setting different Second Safety Temperatures (see section 11.3). Now you can heat up a suitable medium over the Second Safety Temperature and check with a high-precision temperature measuring device, whether the device switches off when exceeding the second safety temperature.

7.3.4.3 Reset Calibration

To reset the user calibration and returning to the factory calibration of the Pt100 probe or the Safety Pt100 probe, enter the Calibrate Menu (Section: 0) and choose the setting parameter “Reset Calibration”.

Adjustment range: No, Pt100-A (reset Pt100 probe), Pt100-B (reset Safety Pt100 probe), Both Pt100 (reset Pt100 probe and Safety Pt100 probe)

Default value: No

8. Heating

The Magnetic Hotplate Stirrer allows 2 different modes of operation:

- **Temperature control with external Pt100 probe (recommended mode)**
- **Temperature control of the hotplate (no Pt100 probe connected)**

For exact temperature control of a liquid, the use of an external Pt100 probe is recommended to regulate the liquid temperature as accurately as possible.

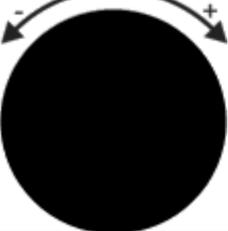
	▲WARNING Always switch off the device after use!
	▲CAUTION As long as the Heater LED is flashing or lights, the hotplate is supplied with energy. The Hot LED lights when the hotplate is hotter than 60°C. You may get burned!
	▲CAUTION After switching off the device the hotplate stays hot! Therefore, after switching off the device, a warning message appears on the display if the hotplate exceeds 60°C and the power cord is still plugged in.

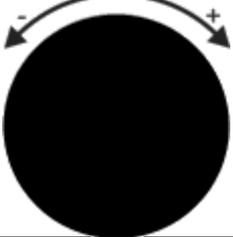
8.1 Temperature Control with External Pt100 Probe

	▲WARNING Please ensure that the cable of the Pt100 probe does not come in contact with the hotplate.
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We recommend the use of an external Pt100 probe (Pt100 Temperature Probe, PN: 60278-0000) to allow for accurate temperature control of the heating medium. To heat up a medium, following steps are required:

- Connect the Pt100 probe with the DIN connector on the rear of the Magnetic Hotplate Stirrer
- Place the Pt100 probe in the vessel with the heating medium (min. 5 cm immersed)

	Press the I/O key to switch on the device. Any messages displayed at start can be reset by pressing the setting knob.
	While the flashing “Volume” indicator appears on the display, you can turn the setting knob to select the desired volume of the heating medium. Confirm the setting by pressing the setting knob.

	<p>Press the Probe Temp key to access the Probe menu. In this view you can see the actual as well as the set probe temperature. While the Probe menu is displayed, you can press the Probe Temp key again to access the setting menu.</p>
	<p>While the flashing “ProbeSET” indicator appears on the display, you can turn the setting knob to select the desired set value. Confirm the setting by pressing the setting knob.</p>
	<p>After making sure that all parameters are set correctly (also Safety Temp, etc.), the heating process can be started. To do this, press the Plate On/Off key to switch on the hotplate (Plate On/Off LED lights). To switch off the hotplate press the Plate On/Off key again (Plate On/Off LED goes out).</p>

Note:

When a Pt100 probe is connected, the “Plate Temp” value does not refer to the set temperature of the hotplate, but to the plate limit temperature of the hotplate (see chapter 8.1.2-Hotplate temperature Limit).

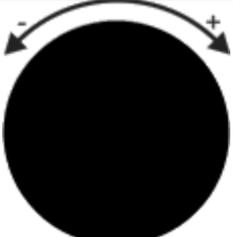
Note:

When a Pt100 probe is connected to the device, the set temperature of the “Probe Temp” will be set automatically to 0°C and the hotplate will be switched off if it is turned on.

8.1.1 Setting up the Heating Volume

For the temperature control of the device, it makes a big difference whether it heats-up a small or a big amount of liquid. So it is necessary to give the device the information about the amount of the heating medium, to achieve the best compromise between temperature accuracy and the time duration of the heating process. The device asks you automatically about the amount of the heating medium (Volume) when it is switched on or a Pt100 probe is connected to the device during operation. You will get a flashing “Volume” on the display. While the flashing “Volume” indicator appears on the display, you can turn the setting knob to select the desired volume of the heating medium and confirm the setting by pressing the setting knob.

You also can change the amount of the heating medium (Volume) during operation mode manually:

	<p>Press the Medium key to access the medium menu. In this view you can see the actual volume of the liquid. While the medium menu is displayed, you can press the Medium key again to access the setting menu.</p>
	<p>While the flashing “Volume” indicator appears on the display, you can turn the setting knob to select the desired volume of the heating medium. Confirm the setting by pressing the setting knob.</p>

	<p>This value reflects the heat capacity of the liquid on the hotplate. An increase of this value will result in a faster heat up time. If a too high value is entered (much higher than the real existing amount of liquid) this</p>
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	can result in an overshoot and oscillation of the liquid temperature. A too low setting of this value will result in a very slow reaction of the system and a longer than necessary heat up time.
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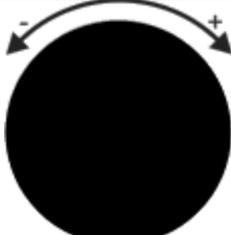
8.1.2 Hotplate temperature Limit

If a Pt100 sensor is connected, the set value “Plate Temp” doesn’t refer to the set value of the hotplate, but to the temperature limit of the hotplate. This is shown in the display by no longer displaying “PlateSET”, but “PlateLIM”. This means that during the heating process the hotplate doesn’t rise above the set “PlateLIM” value.

It should be noted that if the hotplate temperature limit (PlateLIM) has been limited to a too low value, the liquid may not reach the set temperature (ProbeSET) or an extremely long heating time is required.

To avoid this and if no security risk exists, the hotplate temperature limit (PlateLIM) should be set to its max. possible value. So the Magnetic Stirrer has the opportunity to choose the most effective hotplate temperature for a fast heating-up.

Change this value only if there is a security risk (i.e. liquid with a low flash point).

	<p>Press the Plate Temp key to access the plate limit menu. In this view you can see the actual hotplate temperature limit. While the plate limit menu is displayed, you can press the Plate Temp key again to access the setting menu.</p>
	<p>While the flashing “PlateLIM” indicator appears on the display, you can turn the setting knob to select the desired limit value. Confirm the setting by pressing the setting knob.</p>

Note:

With every change of the “Probe Temp” the hotplate limit “PlateLIM” is automatically set to its maximum! If necessary, the value must be set back lower.

Shall the hotplate temperature be permanently limited, it must be limited as described in chapter 11.7. Hotplate Temperature Limit

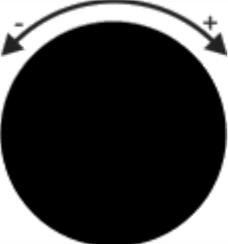
8.1.3 Liquid Ramp Function

The device offers the possibility to heat up a liquid with a defined heating rate (Temperature Ramp). By default this feature is turned off. So the device is trying to reach the set value of the temperature of the liquid as fast as possible. For example, if the Liquid Ramp is set to a value of 10°C/h, the device is trying to reach the set value of the temperature of the liquid by heating up the liquid with a defined heating rate of 10°C/h.

This function is called “LiquidRamp” and can be adjusted as described in chapter 7.3.2.3-Liquid Ramp.

8.2 Temperature Control without External Pt100 Probe (Hotplate Temperature Control)

If you want set the temperature of the hotplate directly and not the temperature of the medium, this is only possible when no Pt100 sensor is connected.

	<p>Press the I/O key to switch on the device. Any messages displayed at start can be reset by pressing the setting knob.</p>
	<p>Press the Plate Temp key to access the Plate menu. In this view you can see the actual as well as the set hotplate temperature. While the Plate menu is displayed, you can press the Plate Temp key again to access the setting menu.</p>
	<p>While the flashing "PlateSET" indicator appears on the display, you can turn the setting knob to select the desired set value. Confirm the setting by pressing the setting knob.</p>
	<p>After making sure that all parameters are set correctly (also Safety Temp, etc.), the heating process can be started. To do this, press the Plate On/Off key to switch on the hotplate (Plate On/Off LED lights). To switch off the hotplate, press the Plate On/Off key again (Plate On/Off LED turns off).</p>

	<p>CAUTION If a Pt100 sensor is connected, the set value "Plate Temp" doesn't refer to the set value of the hotplate, but to the temperature limit of the hotplate (see chapter 8.1.2-Hotplate temperature Limit).</p> <p>If the Pt100 sensor is being unplugged, then the set temperature of the hotplate is automatically set to 0°C.</p>
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9. Stirring

With this magnetic stirrer, fluids can be stirred in a vessel with a magnetic rod. Make sure that the used vessel is permeable to magnetic field lines (e.g. glass, ceramics or stainless steel).

To adjust the stirring speed and switch on the motor following steps are required:

	<p>Turn the speed control knob to set the desired speed value. While turning the speed control knob the display shows the actual set value.</p>
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	Press the Motor On/Off key to switch on the motor (Motor On/Off LED lights). To switch off the motor press the Motor On/Off key again (Motor On/Off LED goes out).
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To switch off the motor, either the Motor On/Off key can be pressed (Motor On/Off LED goes out) or the speed control knob is fully turned anticlockwise.

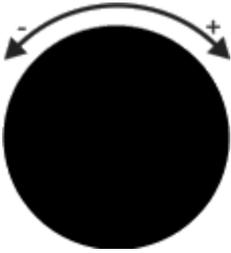
Note:
Optimal magnetic coupling is acquired with stirring bars with lengths of 30 – 70 mm and diameters of 5 – 10 mm. The appropriate stirring bar for an application must be determined by the user experimentally.

	<p>CAUTION Use a suitable vessel (e.g. Erlenmeyer flask) and beware of high stirring speeds and high liquid levels to avoid splashing. Make sure that suitable protective clothing and eyewear is used.</p>
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10. Timer Function

This device has an integrated timer function. The timer function switches off the device after the adjusted time. If the timer expires, the hotplate turns off. The device continues stirring until the adjusted Safety Stir Time expires (see also chapter 11.1-Safety Stir Function) and then turns off into standby mode by itself.

The timer function can be switched on by the following way:

	Press the Timer key to access the timer menu. In this view you can see the actual timer value. While the timer menu is displayed, you can press the Timer key again to access the setting menu.
	While the flashing “Timer” indicator appears on the display, you can turn the setting knob to select the desired set value. The timer value is displayed in the format “hh:mm:ss”. For example the timer value “11:22:33” means 11 hours, 22 minutes and 33 seconds. If the timer value is set to “00:00:00”, then it shows “Off” and the timer function is disabled. Confirm the setting by pressing the setting knob.

If the timer function is switched on, you can view the remaining time in the timer menu. If you want to cancel the current timer, you have to set the timer value to “Off” and confirm by pressing the setting knob as described above. A running timer is disabled so.

11. Safety Functions

The following section describes the different security mechanisms of the device.

11.1 Safety Stir Function

The device has different functions (Timer function, ...) and security mechanisms (Safety Temp, ...) that can switch off the device automatically. After such an automatic switch-off, it is often useful to continue stirring the liquid for a certain time to prevent heat accumulation and helping cooling down the liquid. Therefore the device has an integrated Safety Stir Function. This function allows the user to set a desired time period (Safety Stir Time). After an automatic switch-off, the device shuts down the hotplate and continues stirring for the set Safety Stir Time. The Safety Stir Function is only active when the motor is switched on while the heating process. If the Safety Stir Function is active, the display shows an appropriate message with the remaining Safety Stir Time. Once the time has elapsed the device switches off. The user can also switch off the device manually by pressing the I/O key.

To adjust the Safety Stir Time or to switch off this function, please refer to chapter 7.3.2.10-Safety Stir Time.

	NOTICE	For serious shutdowns as, for example, a hardware defect in the device, the device is switched off immediately.
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Note: If the status of the device allows stirring, the Safety Stir Function continues stirring after every automatic shutdown

11.2 Safety Temperature

In the case of unexpected heating of the liquid or malfunction of the device, the user can set a Safety Temperature (Safety Temp). If the Safety Temperature is exceeded, the device switches off automatically. If a Pt100 probe is connected to the device, the Safety Temp refers to the temperature of the heating medium, otherwise to the hotplate temperature.

	WARNING	If there is no security risk, the user should set the Safety Temperature to a value as high as possible to avoid an unintentional switch off of the device in normal operation. In safety critical applications the proper use of the safety temperature is advised.
	NOTICE	If a Pt100 probe is connected to the device, the Safety Temp refers to the temperature of the heating medium, otherwise to the hotplate temperature.

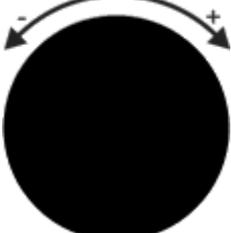
11.2.1 Safety Temperature with External Pt100 Probe

The device checks if the measured temperature values of the Pt100 probe are lower than the set Safety Temp. When the temperature of the Pt100 probe exceeds the adjusted Safety Temp, the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described

in chapter 11.1-Safety Stir Function. Afterwards it switches off automatically. If however the sensor temperature still increases to more than 15% above the Safety Temperature, the device will immediately switch off and does not wait until the Safety Stir Time has expired.

If the Probe Temperature is changed by the user, the Safety Temperature is adjusted automatically 15°C above the new set Probe Temperature. You can switch off this automatic function as described in chapter 7.3.2.7-Safety Auto Set. When the device changes the Safety Temperature automatically, the new value is displayed a short time to inform the user.

To adjust the Safety Temp manually, please follow the steps below:

	<p>Press the Safety Temp key to access the safety menu. In this view you can see the actual Safety Temp value. While the safety menu is displayed, you can press the Safety Temp key again to access the setting menu.</p>
	<p>While the flashing "SafetySET" indicator appears on the display, you can turn the setting knob to select the desired safety value. Confirm the setting by pressing the setting knob.</p>

	<p>WARNING If the user changes the set temperature of the external Pt100 probe (Probe Temp) above the set safety temperature (Safety Temp), the device automatically adjusts the safety temperature 15°C above the new Probe Temp. When the device changes the Safety Temperature automatically, the new value is displayed for a while.</p>
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Note:
To set the safety temperature (Safety Temp) as close to the actual set value (Probe Temp) as possible, set the probe temperature first, before changing the safety temperature to the desired value manually.

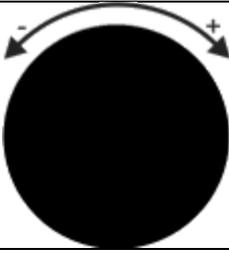
11.2.2 Safety Temperature without External Pt100 Probe

The device checks if the measured temperature values of the hotplate are lower than the set Safety Temp. When the temperature of the hotplate exceeds the adjusted Safety Temp, the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described in chapter 11.1-Safety Stir Function. Afterwards it switches off the device automatically. If however the sensor temperature still increases to more than 15% above the Safety Temperature the device will immediately switch off and does not wait until the Safety Stir Time has expired.

If the Plate Temperature is changed by the user, the Safety Temperature is adjusted automatically 15°C above the new set Plate Temperature. You can switch off this automatic function as described in chapter 7.3.2.7-Safety Auto Set. When the device changes the Safety Temperature automatically, the new value is displayed a short time to inform the user.

To adjust the Safety Temp manually, please follow the steps below:

	<p>Press the Safety Temp key to access the safety menu. In this view you can see the actual Safety Temp value. While the safety menu is displayed, you can press the Safety Temp key again to access the setting menu.</p>
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While the flashing “SafetySET” indicator appears on the display, you can turn the setting knob to select the desired safety value. Confirm the setting by pressing the setting knob.



▲WARNING

If the user changes the set temperature of the external Pt100 probe (Probe Temp) above the set safety temperature (Safety Temp), the device automatically adjusts the safety temperature 15°C above the new Probe Temp. When the device changes the Safety Temperature automatically, the new value is displayed for a while.

Note:

To set the safety temperature (Safety Temp) as close to the actual set value (Probe Temp) as possible, set the probe temperature first, before changing the safety temperature to the desired value manually.

11.3 Independent 2nd Safety Pt100 Temperature

The device offers a second Pt100 connector for connecting a Safety Pt100 probe (Second Safety Temp). This Safety Pt100 probe is monitored by a redundant safety circuit. This means that this important safety feature is now fully independent of the microprocessor. Therefore even it works in case of malfunction of the microprocessor. If the temperature detected by the Safety Pt100 probe exceeds the Second Safety Temp, the independent safety circuit switches off the hotplate immediately. This Safety Pt100 probe is used to increase the overall safety of the device.

You can use a second, optionally available Pt100 probe (Simple model PN: 60278-0000 or Duplex model PN: 60673-0000) as a Safety Pt100 probe.

To adjust Second Safety Temp, please refer to chapter 7.3.2.6.

Note:

If you do not wish to use the Safety Pt100 probe, the supplied dummy plug must be connected to the Safety Pt100 probe connector on the rear panel. The dummy plug simulates a temperature of approx. 0°C to the M 26G2. Otherwise you can't switch on the device.

11.4 Differential Alarm

This safety function detects an extreme temperature drop of the temperature measured in the medium to be heated (external Pt100 probe). Such a fast temperature drop may occur, for example, if the glass breaks or the Pt100 probe falls out of the liquid. In this case the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described in chapter 11.1-Safety Stir Function. Afterwards it switches the device off automatically.

To adjust the sensitivity of the Differential Alarm or switching this function off, please refer to chapter 7.3.2.1-DiffAlrm Sensity.

Note:

If the device switches off incorrectly, although the Pt100 probe is immersed in the liquid correctly, in certain circumstances it may be necessary to reduce the sensitivity of the Differential Alarm. For example, this could be necessary when the user wants to add a cold liquid into the heated medium.

11.5 Out of Liquid Check

The Out of Liquid function monitors, whether the Pt100 probe is immersed in the liquid in the vessel on the hotplate. The device checks, whether the Pt100 probe temperature changes in relation to temperature changes of the hotplate. If the Out of Liquid function detects no increase in the liquid temperature over a certain time, although the hotplate temperature is rising, the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described in chapter 11.1-Safety Stir Function. Afterwards it switches the device off automatically.

To adjust the sensitivity of the Out of Liquid function or switching this function off, please refer to chapter 7.3.2.2-Out of Liq.Check.

Note:

If the device is switching off incorrectly, although the Pt100 probe is immersed in the liquid correctly, in certain circumstances it may be necessary to reduce the sensitivity of the Out of Liquid function. For example, this could be necessary when operating with larger volumes of liquid or with liquids that have a very high heat capacity.

Note:

This Safety feature is only available, if the set Pt100 probe temperature is a minimum of 10°C higher than the actual liquid temperature.

11.6 Failure of External Pt100 Probe

If a Pt100 probe or a Safety Pt100 probe is connected to the device, it monitors if the measured temperatures are in a valid value range. If this is not true or a Pt100 probe is disconnected in operating mode, the device recognizes this. In this case the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described in chapter 11.1-Safety Stir Function. Afterwards it switches off automatically.

11.7 Hotplate Temperature Limit

The maximum adjustable hotplate temperature can be limited in two different ways:

Permanent limitation of the hotplate temperature in Setup Menu:

If you want to limit the maximum hotplate temperature permanently, e.g. when the hotplate in a laboratory or a classroom should never rise above 300°C, you have to set this in the Setup Menu as described in section 7.3.2.4-PlateTemp. Limit. If the value in this submenu is limited to 300°C, the user can not set hotplate temperatures over 300°C. The device behaves as if the maximum hotplate temperature is only 300°C. This setting is stored even after switching off and back on the device.

One-time limitation of the hotplate temperature for a single heating process:

The other possibility is limiting the hotplate temperature only for a single heating process. This can be done as described in section 8.1.2-Hotplate temperature Limit. This setting will be reset to its maximum value every time you change the temperature for the heating medium (Probe Temp) and must be re-adjusted if necessary.

**WARNING**

The use of the hotplate temperature limitation results in a longer heat-up time of the heating medium. Therefore in normal operation, the hotplate temperature limit should be set to the maximum value to achieve optimal heat-up times. Setting the hotplate temperature limit to the maximum value allows the microprocessor to freely select the optimum hotplate temperature to reach the set probe temperature as fast as possible. However, when operating with flammable liquids it may be required to limit the maximum allowed hotplate temperature to a safe value.

11.8 Self-Monitoring of the Instrument

The device has additional, internal security functions to monitor and switch off itself automatically, in case of malfunction. For example the device monitors the internal temperature and the internal data communication. When the internal microcontroller hangs up, it will be restarted by the internal watchdog timer. Additionally there are further security mechanisms integrated, to monitor some malfunctions of the heating stage, the temperature probe of the hotplate, as well as wrong calibration values. If a malfunction occurs, the device is switching off the hotplate and continues stirring the adjusted Safety Stir Time as described in chapter 11.1-Safety Stir Function. Afterwards it switches off automatically. For serious shutdowns as, for example, a hardware defect in the device, the device is switched off immediately.

12. Display Messages

12.1 Messages at Starting

At switching on the device displays different system information to inform the user about different settings:

Display	Description
Last Off Cond.: XXX	If the device is switched off automatically, the Off Condition "XXX" is displayed at the next switching on, to inform the user. See chapter 12.4-Off Conditions.
Temp. is shown in Fahrenheit	The temperature unit is changed. The temperatures are shown in Fahrenheit instead of Celsius.
Device uses a Pt100 User Cal.	The user has stored a user calibration for at least one of the two Pt100 probe connectors.
Liquid Ramp is Set to XXX°C/h	For the temperature control with an external Pt100 probe, a temperature ramp was set.
Thermal Resist. Is set to: XXX	The Thermal Resistance has been changed in the PID menu.
Container Type: XXX	The Vessel Type has been changed in the PID menu.
Max. Platetemp. Limited to: XXX°C	The max. adjustable hotplate temperature has been limited in the Setup menu to the value "XXX".
No Pt100 Dummy- Plug found!	The device can't be switched on, because no Safety Pt100 probe or no Dummy Plug is connected to the Safety Pt100 connector.

No Pt100 Hotplate Control	At switching on, no Pt100 probe was found. The device is in the hotplate control mode.
Pt100 2ndSafety Temp set: XXX°C	The Second Safety Temperature of the Safety Pt100 probe is set to the value "XXX".

12.2 Messages at Shutdown

At switching off the device displays different system information to inform the user about different settings:

Display	Description
Remaining Stir Time: XX:XX:XX	The device is in the Safety Stir Mode (see chapter 11.1-Safety Stir Function). This means the hotplate is disabled and the device stirs the duration of the adjusted Safety Stir Time before it turns off automatically.
Off Condition: XXX	If the device is switched off automatically, the Off Condition "XXX" is displayed to inform the user. See chapter 12.4-Off Conditions.
WARNING: Hotplate is hot!	The device was switched off, but the hotplate is still hotter than 60°C. You may get burned. This warning message is displayed until the hotplate is cooled below 60°C.

12.3 Information and Warnings

During Operation, the device displays different information to the user to simplify the handling of the device. Additionally, in the most cases a warning message is displayed to facilitate troubleshooting. A description of each message on the screen is described below:

Display	Description
INFO: Timer Expired	The Timer function was expired.
WARNING: Probe Different. Alarm	The Differential Alarm was triggered. The temperature drop at the Pt100 probe was too quick. Maybe the Pt100 probe fell out of the vessel or the liquid has leaked.
WARNING: Probe Out Of Liquid	The OutOfLiquid Function was triggered. Maybe the external Pt100 probe is not immersed into the medium.
WARNING: Probe Reached Safety	The measured temperature of the Pt100 probe was higher than the set Safety Temperature.
WARNING: Probe Reached2ndSafety	The measured temperature of the Safety Pt100 probe was higher than the set Second Safety Temperature.
INFO: Set Probe Safety to: XXX°C	The safety temperature of the Pt100 probe was automatically set to the value "XXX"°C.
WARNING: Probe A CalibrationError	The calibration of the Pt100 probe is damaged.
WARNING: Probe B CalibrationError	The calibration of the Safety Pt100 probe is damaged.
INFO: Probe A Connected	The Pt100 probe was connected.

WARNING: Probe A Broken	The Pt100 probe is damaged or was disconnected during operation.
INFO: Probe B Connected	The Safety Pt100 probe was connected.
WARNING: Probe B Broken	The Safety Pt100 probe is damaged or was disconnected during operation.
INFO: ContThermo Connected	The Contact Thermometer was connected.
WARNING:ContTher Disconnected	The Contact Thermometer is damaged or was disconnected during operation.
WARNING: Plate Reached OverTemp	The measured hotplate temperature was higher than the max. permissible temperature range.
WARNING: Plate Reached Safety	The measured hotplate temperature was higher than the set Safety Temperature.
INFO: Set Plate Safety to: XXX°C	The safety temperature of the hotplate was automatically set to the value "XXX"°C.
WARNING: Plate A CalibrationError	The calibration of the hotplate temperature sensor is damaged.
WARNING: Plate A Broken	The hotplate temperature sensor is damaged.
WARNING: Plate AmplifierShorted	The hotplate output stage is damaged.
INFO: Set Plate to Max: XXX°C	The hotplate temperature limit was automatically set to the max. possible value "XXX"°C.
INFO: Set Plate to Min: XXX°C	The hotplate temperature limit was automatically set to the min. possible value "XXX"°C.
INFO: Plate Temp Might Be To Low	Maybe the hotplate temperature limit is set too low to heat up the heating medium to the set temperature (ProbeSET).
WARNING: IntComErrorFront	There was an error in the communication between the printed circuit boards inside the device.
WARNING: InComErrorMotor	There was an error in the communication between the printed circuit boards inside the device.
WARNING:Internal Over Temp.	The temperature inside the device has reached its maximum allowed temperature.
WARNING:Internal Temp. Error	The internal temperature sensor is damaged.
No external Pt100 connected	There is no connected external Pt100 probe. The selected menu item is only available when a Pt100 sensor is connected to the device.
Device is Remote Locked	The control of the device via the control panel was disabled via RS485. Only the I/O key still works.

12.4 Off Conditions

Because of the many features and security mechanisms of the device, there are several possibilities why the device switches off itself automatically. To inform the user about the Off Condition and simplify locating and correcting problems, an according message appears in the display when the device switches off. The next time it is switched on, the last Off Condition is displayed again. If the device is controlled via the RS485 interface, the last Off Condition Code can be read with the RAC Command. A description of each Off Conditions on the screen and RS485 Off Condition Codes can be found below:

Display	RS485 Off Condition Code	Description
OffCondition: Switch Off	101	The device was switched off by the I/O key on the control panel.
OffCondition: Switch Off	102	The device was switched off by RS485 command.
OffCondition: Timer Expired	103	The Timer function was expired.
OffCondition: Probe Diff.Alarm	106	The Differential Alarm was triggered. The temperature drop at the Pt100 probe was too quick. Maybe the Pt100 probe fell out of the vessel or the liquid has leaked.
OffCondition: Probe OutOfLiq.	107	The OutOfLiquid Function was triggered. Maybe the external Pt100 probe is not immersed into the medium.
OffCondition: Probe Safety	108	The measured temperature of the Pt100 probe was higher than the set Safety Temperature.
OffCondition: Probe 2ndSafety	109	The measured temperature of the Safety Pt100 probe was higher than the set Second Safety Temperature.
OffCondition: Probe A Broken	113	The Pt100 probe is damaged or was disconnected during operation.
OffCondition: Probe B Broken	115	The Safety Pt100 probe is damaged or was disconnected during operation.
OffCondition: ContactTherBroke	117	The Contact Thermometer is damaged or was disconnected during operation.
OffCondition: Plate OverTemp.	118	The measured hotplate temperature was higher than the max. permissible temperature range.
OffCondition: Plate Safety	120	The measured hotplate temperature was higher than the set Safety Temperature.
OffCondition: Plate A Broken	125	The hotplate temperature sensor is damaged.
OffCondition: PlateAmp.Shorted	130	The hotplate output stage is damaged.
OffCondition: IntComErrorFront	134	There was an error in the communication between the printed circuit boards inside the device.

OffCondition: IntComErrorMotor	135	There was an error in the communication between the printed circuit boards inside the device.
OffCondition: Internal TempErr	139	The temperature inside the device has reached its maximum allowed temperature or the internal temperature sensor is damaged.
OffCondition: MainsVoltageErr.	140	The device was not turned off properly. Maybe the power cable was disconnected during operation or there was a mains power failure.
OffCondition: Watch Dog Timer	141	The internal Watch Dog Timer of the microcontroller was triggered.

13. RS485 Interface

The RS485 interface allows remote access of all functions as well as readout and change of all system parameters (e.g. hotplate temperature, motor speed etc.).

Multiple devices may be connected parallel on a RS 232 port of a PC with an RS485 to RS232 adapter (PN: 61703-0000) and connection cords for connection of different devices via RS485.

Therefore it is necessary to address the device. Every device has a so-called slave address between 1 and 255 (default address: 1). For parallel operation, each device needs its own and unique address, to avoid data clashes.

13.1 Settings of the RS485 Interface

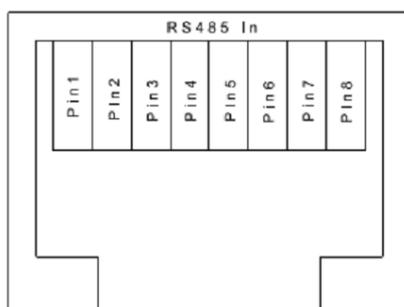
The parameters of the interface (default settings: 9600, 8, N, 1):

Baudrate:	<ul style="list-style-type: none"> • 1200 Baud • 2400 Baud • 4800 Baud • 9600 Baud (default setting)
Databits:	<ul style="list-style-type: none"> • 8 Bit
Parity:	<ul style="list-style-type: none"> • none
Stopbits:	<ul style="list-style-type: none"> • 1
Slave Address:	<ul style="list-style-type: none"> • 1 ... 255 (1 = default setting)

13.2 Pin assignment of the RS485 Connector

	<p>NOTICE Never connect the RJ45 jack with a network jack of a PC, router, switch or something like that. Only connect original accessories to the „RS485 In“ jack! Any other use may result in damage of the device or damage to third party devices!</p>
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The serial port is a RS485 4-wire system with 2 differential inputs (A and B) and 2 differential outputs (Y and Z). The RS485 connector on the back of the device has the following pin assignment:

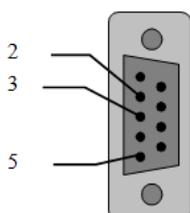


Pin 1: RS485 B
 Pin 2: RS485 A
 Pin 3: GND
 Pin 4: reserviert
 Pin 5: reserviert
 Pin 6: +5V (maximal 100mA)
 Pin 7: RS485 Z
 Pin 8: RS485 Y

13.3 Connection between PC and Instrument

	NOTICE	Connect the plug of the RS485 to RS232 adapter only to the “RS485 In” jack of the device. Never connect the adapter with a network jack of a PC, router switch or similar.
--	---------------	--

For connecting the device with a PC a separate RS485 to RS232 adapter (PN: 61703-0000) is necessary. You have to connect the RS485 plug of this adapter with the “RS485 In” jack on the rear of the device. The 9-pin Sub-D connector of the adapter is for the connection to the PC and has the following pin assignment.



Pin number	Description
2	transmit data TxD
3	receive data RxD
5	ground, GND

9-pin Sub-D connector (female) of the RS485 to RS232 adapter (view on socket)

For the extension of the cable you can use a standard 9-pin cable (pins not crossed, PN: 30275-0051). When your PC has no RS232 port, you can use additionally an USB to RS232 converter (PN: 30244-0001).

13.4 Addressing the Instrument

To use several devices on a bus-system, every device needs its own and unique address number. This address number is used to send the commands to the device. No address number must occur twice in the bus system to avoid data collision. The address numbers are possible between 1 and 255. The default setting is 1 for all devices. To change the address number, follow the instructions described in chapter 7.3.2.11-RS485 Address.

13.5 RS485 Data Transfer

Every data transfer is started from the master (normally the PC). The master sends a command to the device (slave). After that the slave sends an answer back to the master, consisting of the repeated command and a handshake.

Note:

The master must not send the next command until the complete answer from the slave is received (repeated command and the handshake)!

13.5.1 Format of an RS485 Command

Every command corresponds to the following format:

ADR,CMDCODE,PARAMETERLIST<CR>

Description:

- **ADR:** Slave Address of the desired device
- **CMDCODE:** Command-code
- **PARAMETERLIST:** 1 to 6 parameters separated by commas (see command table)
- **CR:** The command string must be terminated by Carriage/Return (ASCII code 13)

13.5.2 Format of an RS485 Handshake

When a slave device receives a command with its address it will answer to the master in this way:

- The complete command is send back
- The slave device sends a handshake corresponding to the following format:

ADR,"HS",RETURNCODE,PARAMETERLIST<CR>

Description:

- **ADR:** Slave Address of the Controller sending the handshake
- **RETURNCODE:** Error-code (see table below)
- **PARAMETERLIST:** 0 to 6 parameters (see command table), each parameter is separated by a comma ","
- **CR:** the handshake as any command, is terminated by ASCII-code 13 (CR)

Return Code	Explanation	Parameterlist
OK	command executed, no error	see command table
UC	unknown command	None
PA	wrong parameter number (too few or too many parameters specified)	None
NA	command is not allowed in actual operation mode	actual operation mode
PR	at least one parameter is out of range	None
PL	at least one parameter is too long	None
DF	unknown data format	None

13.6 RS485 Commands

Overview of all available RS485 Commands:

Command	Function	Parameter Description	Parameter Range	Example	Comment
RTY	Read Type and Version of device	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. name/type of device 2. Version number of software 3. On Off counts 4. Total Minutes Operation time	1 text number number number	1,RTY,1	
PON	Switch on Device	1. Security parameter 1234	1234	1,PON,1234	
OFF	Switch off Device	1. Security parameter 1234	1234	1,OFF,1234	
WON	Set Status (ON/OFF control) of - Motor - Plate	1. Motor On/Off (0-> Off, 1-> On) 2. Plate On/Off (0-> Off, 1-> On)	0/1 0/1	1,WON,1,0	
RON	Read status of: - Motor - Plate	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Motor On/Off (0-> Off, 1-> On) 2. Plate On/Off (0-> Off, 1-> On)	1 0/1 0/1	1,RON,1	
RAC	Read actual	1. Dummy parameter to initiate transfer -> Controller sends in handshake 1. actual motor speed in rpm 2. actual plate temperature in °C or °F 3. actual probe temperature in °C or °F (if connected, if not 'x' as return value) 4. actual 2 nd probe temperature in °C or °C (if connected, if not 'x' as return value) 5. last Off Condition Code	1 0...MaxSpeed* 0...MaxPlateTemp* 0...MaxProbeTemp*, x 0...MaxProbeTemp*, x 101...140** see: table Chapter 12.4-Off Conditions.	1,RAC,1	Motor disabled in H30/30D. Device will send 'x' as parameter.
WSE	Write actual set values of: - Motor - Hotplate (plate) - external Pt100 sensor (probe)	1. Setpoint of motorspeed in rpm 2. Setpoint of hotplate temperature in °C or °F 3. Setpoint of probe temperature in °C or °F	0, 60...MaxSpeed* Without Pt100: 0...MaxPlateTemp* With Pt100: SetProbeTemp+10°C... MaxPlateTemp* 0...MaxProbeTemp*	1,WSE,800,34 0,60	Motor disabled in H30/30D. Device will ignore the value.
RSE	Read actual set values of: - Motor - Hotplate (plate) - external Pt100 sensor (probe)	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Setpoint of motorspeed in Rpm 2. Setpoint of hotplate temperature in °C or °F 3. Setpoint of probe temperature in °C or °F	1 0...MaxSpeed* 0...MaxPlateTemp* 0...MaxProbeTemp*	1,RSE, 1	Motor disabled in H30/30D. Device will send 'x' as parameter.
WTR	Set / Write: - Timer - Ramp - Safety temperature	1. Timer value in seconds. Set this value to 0 to disable the timer. 2. setting of the ramp in °C/h or °F/h (a value of 450°C/h disables the ramp) 3. Safety temperature in °C	0...MaxTimer* 1...450 Without Pt100: -PlateTemp+1... MaxPlateTemp*+25°C With Pt100: -ProbeTemp + 1... MaxProbeTemp*+25°C	1,WTR,600,45 0,160	Ramp disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will ignore the value.

RTR	Read settings of: - Timer - Ramp - Safety temperature	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. actual setting of the timer in seconds. If the timer value is 0, the timer is disabled. 2. setting of the ramp in °C/h (a value of 450 signals that the ramp is disabled) 3. Safety temperature in °C	1 0...MaxTimer* 1...450, x Without Pt100: -0...MaxPlateTemp*+ 25°C With Pt100: -0...MaxProbeTemp*+ 25°C	1,RTR,1	Ramp disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will send 'x' as parameter.
WVO	Write/Set volume	1. Volume in ml	100...9900	1,WVO,1000	
RVO	Read volume	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. programmed volume in ml	1 100...9900	1,RVO,1	
WSM	Activate serial mode (→ enable/disable setpoint control via frontpanel)	1. Set this value to 0 to allow control via the frontpanel or set this value to 1 to disable control via the frontpanel. (only used for devices with motor)	0 / 1		
WTU	Set / Write Temperature Units	1. Type of Units (0->Celsius / 1->Fahrenheit)	0 / 1	1,WTU,0	
RTU	Read Temperature Units	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Type of Units	1 0=Celsius / 1=Fahrenheit	1,RTU,1	
WSU	Set / Write Safety Auto Set function	1. Set this value to 0 to disable Safety Auto Set or set this value to 1 to enable Safety Auto Set. (0->Off / 1->On)	0 / 1	1,WSU,0	Safety Auto Set disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will ignore the value.
RSU	Read Safety Auto Set function	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Safety Auto Set On/Off (0-> Off, 1-> On)	1 0 / 1		Safety Auto Set disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will send 'x' as parameter.
WSD	Write setup data: - Plate Temp Limit - Safety Stir Time - Ask for Volume at power up - Differential Alarm Sensitivity - Out of Liquid Sensitivity - Thermal Resistance	1. Plate Temp Limit in °C 2. Safety Stir Time in seconds 3. Ask for Volume at power up (0-> Off, 1-> On) 4. Differential Alarm Sensitivity in % 5. Out of Liquid Sensitivity in % 6. Thermal Resistance	50...MaxPlateTemp* 0...3600 0 / 1 1...100 0...100 (0=Off) 50...400	1,WSD,360,600,1,90,20,380	Command completely disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will ignore the values.
RSD	Read setup data: - Plate Temp Limit - Safety Stir Time - Ask for Volume at power up - Differential Alarm Sensitivity - Out of Liquid Sensitivity - Thermal Resistance	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Plate Temp Limit in °C 2. Safety Stir Time in seconds 3. Ask for Volume at power up (0-> Off, 1-> On) 4. Differential Alarm Sensitivity in % 5. Out of Liquid Sensitivity in % 6. Thermal Resistance	1 50...MaxPlateTemp* 0...3600 0 / 1 1...100 0...100 (0=Off) 50...400	1,RSD,1	Command completely disabled in M21, M22, M23 KM16.4, KM16.7 and H30/30D. Device will send 'x' as parameters.

RCO	Read connector status	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Connector Pt100 status 0 - Nothing connected 1 - PT100 probe connected 2 - PT100 dummy connected 3 - Contactthermometer mode 2. Connector Safety Pt100 status 0 - Nothing connected 1 - PT100 probe connected 2 - PT100 dummy connected 3 - Contactthermometer mode	1 0...3 0...3	1,RCO,1	Connector Safety Pt100 is disabled in M21, M22, M23 KM16.4, KM16.7, M36 and H30/30D. Device will send 'x' as parameter.
RSS	Read system status	1. Dummy parameter to initiate transfer -> Controller sends in handshake: 1. Device On/Standby/Safety Stir 2. Remaining Safety Stir Time in seconds	0=Standby / 1=On / 2=Safety Stir Mode 0...3600	1,RSS,1	
WSA	Set RS485 slave address	1. New slave address of controller	0...255	1,WSA,3	
WBD	Set RS485 Baudrate	1. Baudrate	0=1200baud / 1=2400baud / 2=4800baud / 3=9600baud	1,WBD,2	
RST	Reset the device to default settings	1. Security parameter 1234	1234	1,RST,1234	

Note:
In the Fahrenheit mode all values are shown in Fahrenheit and not in Celsius!

*The RS485 commands are applicable to different device types with different parameter ranges. In the following table you can find all device specific parameters of all device types:

Device Type	MaxPlateTemp	MaxProbeTemp	MaxSpeed	MaxTimer
M21	350°C	250°C	1600rpm	59940
M22	380°C	250°C	1600rpm	59940
M23	500°C	250°C	1600rpm	59940
KM16.4	450°C	300°C	1100rpm	59940
KM16.7	450°C	300°C	1100rpm	59940
H30/30D	380°C	250°C	Not available	59940
M 26G2	360°C	250°C	1600rpm	86400
M36	500°C	250°C	1100rpm	86400

**The appropriate assignment of the "RS485 Off Condition Codes" to the corresponding Off Conditions can be found in the table in chapter 12.4-Off Conditions.

13.7 RS485 Examples

13.7.1 Example 1 – Setting up a Value

Programming of a M 26G2 device with the following parameters:

- Hotplate temperature: 300°C (corresponds to the plate limit)
- Probe temperature: 50°C
- Motor speed: 500rpm

The device has the standard slave address 1 and a Pt100 probe is connected:

Following commands must be send to the device. The answers of the M 26G2 are marked *italic*, they must not be send to the device:

1,PON,1234<CR>	;Switch on the device.
1,PON,1234<CR>	;Command is sent back repeatedly from the device.
1,HS,OK<CR>	;Handshake sent from the device, command accepted.
1,WSM,1<CR>	;Deactivating the front panel only controlling via RS485 (optional).
1,WSM,1<CR>	;Command is sent back repeatedly from the device.
1,HS,OK<CR>	;Handshake sent from the device, command accepted.
1,WSE,500,300,50<CR>	;Set values (motor speed, hotplate and probe temperature).
1,WSE,500,300,50<CR>	;Command is sent back repeatedly from the device.
1, HS,OK<CR>	;Handshake sent from the device, command accepted.
1,WON,1,1<CR>	;Switch on motor and hotplate.
1,WON,1,1<CR>	;Command is sent back repeatedly from the device.
1, HS,OK<CR>	;Handshake sent from the device, command accepted.

13.7.2 Example 2 – Reading a Value

Reading of the actual values of a M 26G2 device:

- Temperature units
- Hotplate temperature
- Probe temperature
- Motor speed

The device has the standard Slave Address 1 and a Pt100 probe is connected:

Following commands must be send to the device. The answers of the M 26G2 are marked *italic*, they must not be send to the device:

1,PON,1234<CR>	;Switch on the device.
1,PON,1234<CR>	;Command is sent back repeatedly from the device.
1,HS,OK<CR>	;Handshake sent from the device, command accepted.
1,RTU,1<CR>	;Reading temperature unit.
1,RTU,1<CR>	;Command is sent back repeatedly from the device.
1,HS,OK,0<CR>	;Handshake sent from the unit, command accepted. (temperature unit = Celsius)
1,RAC,1<CR>	;Reading actual values.

1,RAC,1<CR>

;Command is sent back repeatedly from the device.

1,HS,OK,480,180,50,x,101<CR>

;Handshake sent from the unit, command accepted.
(motor speed = 480rpm, hotplate temperature = 180°C, probe temperature = 50°C)

The actual settings can be read out of the different handshakes from the slave device:

- The temperatures are shown in Celsius (command RTU, parameter 1 = 0)
- The actual motor speed is 480rpm (command RAC, parameter 1 = 480)
- The actual hotplate temperature is 180°C (command RAC, parameter 2 = 180)
- The actual probe temperature is 50°C (command RAC, Parameter 3 = 50)

14. Maintenance and Cleaning

	▲WARNING	In case of malfunction do not attempt to repair the device. There are no user-serviceable parts in this instrument.
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The outer casting is mostly 304 grade stainless steel, the hotplate consist of anodized aluminum. Together with a chemically resistant splash-proof membrane key-pad and therefore easily cleaned with warm water and any proprietary liquid laboratory detergent. Do not use steel wool or any similar plastic wool sponge or any aggressive cleaning agents to clean the device.

Crust, limestone and water stains may be cleaned with the usual household detergents. Please remove remaining detergent thoroughly with a damp cloth or sponge, since some of the detergents react caustic with higher temperatures. If soils are already encrusted use a razorblade scratcher. Plastics, kitchen foil as well as stuff containing sugar must be removed immediately.

Mechanical supports are: Razorblade scratchers, non-scratching sponges and non-scratching steel wool.

The device should only be opened and repaired by authorized service personnel. Any work on the electronics in the device should only be carried out by knowledgeable, trained personnel. Any attempt by the user to repair the device will immediately render the guarantee null and void. Please contact your local distributor in the event of a problem.

15. Warranty and Liability

The manufacturer agrees to correct for the original user of this product, either by repair, or at the manufacturer's election, by replacement, any defects in material or workmanship which develop within 24 months after delivery of this product to the original user. In the event of replacement, the replacement device will be warranted for the remainder of the original twenty-four (24) month period or ninety (90) days, whichever is longer.

If this product should require service, contact your distributor or manufacturer for necessary instructions.

This warranty shall not apply if the defect or malfunction was caused by accident, neglect, unreasonable use, improper service, or other causes not arising out of defects in material or workmanship.

There are no warranties, expressed or implied, including, but not limited to, those of merchantability or fitness for a particular purpose, which extended beyond the description and period set forth herein.

The manufacturer's sole obligation under this warranty is limited to the repair or replacement of a defective product and the manufacturer shall not, in any event, be liable for any incidental or consequential damage of any kind resulting from use or possession of the product.



▲WARNING

The onus is on the user to find out whether the device is suitable for his application. If in doubt clarify this with your dealer or with the manufacturer directly.

16. Dismantling, Transport and Storage

16.1 Dismantling

1. Switch off the unit by pressing the I/O key.
2. Disconnect the unit from the mains.
3. Now you may remove the instrument from the working area.



▲WARNING

The device may still be hot!

16.2 Transport and Storage

Prior to transport:

Switch the instrument off and unplug the power supply.

Place the instrument and its parts in its original packaging or another suitable container to protect it during transport. Close the packaging with adhesive tape.

Store the instrument in a dry environment. Please observe the specified conditions of the ambient (temperature and humidity).

Do not subject the instrument to mechanical shocks or vibration during transporting it.

In case you do not use the original packaging please mark the box with the following notes:

- Glass symbol (handle with care, fragile)
- Umbrella (keep dry)
- Content (list of content)



Please dispose of used instruments and defective components at your local recycling collection point. Prior to disposal, please sort according to materials: metal, glass, plastic, etc. Also be sure to dispose of the packing material in an environmental-friendly manner.

WEEE No. DE 54398924

17. Technical Data

Type M 26G2	
Operating the device:	<ul style="list-style-type: none"> • Control panel • RS485
Display:	<ul style="list-style-type: none"> • 2-line, backlit alphanumeric LCD display
Hotplate:	<ul style="list-style-type: none"> • Anodized aluminum • Round, diameter 140mm • Power: 500 Watt • Adjustable hotplate temperature (without Pt100) • Adjustable max. hotplate temperature (with Pt100) • Microprocessor controlled temperature control • Adjustable temperature range: RT ... 360°C • Setting accuracy: 0,2°C
Pt100 Connector:	<ul style="list-style-type: none"> • Connector for an external Pt100 probe • Adjustable Pt100 probe temperature • Microprocessor controlled temperature control • Adjustable temperature range: RT ... 250°C • Setting accuracy: 0,2°C • Programmable temperature ramp rate: 1°C/hour to 450°C/hour • Possibility of Pt100 probe calibration
Motor:	<ul style="list-style-type: none"> • Shaded-pole motor • Power: 25 Watt • Adjustable speed • Microprocessor controlled speed control • Adjustable speed range: 60 ... 1600min⁻¹ • Setting accuracy: 10min⁻¹ • Speed control stability: +/- 20min⁻¹ • Soft motor start • Adjustable safety stir function • Recommended stirring bar: <ul style="list-style-type: none"> -Length: 60mm (min: 30 ... max: 70mm), -Diameter: 8mm (min: 5 ... max: 12mm)
Timer:	<ul style="list-style-type: none"> • Adjustable switch off time • Adjustable time range: 24:00:00 h:m:s • Setting accuracy: 1 min
Safety functions:	<ul style="list-style-type: none"> • Programmable hotplate safety temperature (without Pt100) • Programmable probe safety function (with Pt100) • Connector for a second, independent safety-Pt100 • Detects and protects against the following hazardous situations: <ul style="list-style-type: none"> ○ Hotplate failure (hotplate exceeds max. allowed temperature) ○ Pt100 probe failure (disconnection or break of Pt100 probe) ○ Heating stage failure

	<ul style="list-style-type: none"> ○ Extreme rise or fall of temperature of the external Pt100 probe, e.g. drop out of the Pt100 probe or breakage of the glass (Differential Alarm) ○ Liquid detection of the Pt100 probe at switch on of the heating function (Out of Liquid) ○ Internal overheating of the device
Electrical power requirements:	<ul style="list-style-type: none"> ● 115/230 Volts, 50/60 Hz (see type label on rear panel)
Power consumption:	<ul style="list-style-type: none"> ● 545 Watt
Permissible ambient temperature:	<ul style="list-style-type: none"> ● 5°C ... 40°C
Permissible humidity:	<ul style="list-style-type: none"> ● 80% RH
Safety class:	<ul style="list-style-type: none"> ● IP32 (according DIN 40050)
Dimensions:	<ul style="list-style-type: none"> ● 145mm x 110mm x 220mm (B x H x T)
Weight:	<ul style="list-style-type: none"> ● 2,6kg

18. Repair Return Form

IMPORTANT:
-Calibration Service is automatically performed for instruments that require adjustments
-We contact you by sending a repair estimate.
-Repairs will only be carried out after your release.

CONTACT / USER INFORMATION:	
Contact:	Phone No.:
Fax No.:	E-Mail:
Billing:	Shipping:
Company:	Company:
Address:	Address

INSTRUMENT INFORMATION:	
Model:	Serial-No.:
Please describe all problems / malfunctions:	

OPERATION CONDITIONS (please fill in if applicable):		
Ambient temp. in °C:	Humidity:	Speed:
Load:	Volume:	Viscosity:
Temperature in °C	Sample temperature in °C:	Operating time:
Sample Description*:		

***NOTE:** If the instrument was exposed to hazardous material, it must be decontaminated **before** returning it to Goldleaf Scientific and the MSDS for hazardous material must be included with the instrument.

RETURN SHIPPING:			
UPS <input type="checkbox"/>	Air Parcel Post <input type="checkbox"/>	Collect** <input type="checkbox"/>	Other** <input type="checkbox"/>

**Your account number is required for UPS collect respectively the address and contact of your preferred forwarder if you choose any other transport means:

PACKAGING INSTRUCTIONS TO RETURN AN INSTRUMENT FOR REPAIR:

- Remove all accessories (e.g. homogenizer tools, stirring paddles, stands, clamps, cables) from the instrument
- Clean excess testing material off the instrument/accessory
- Include MSDS sheets for all hazardous materials used with this instrument
- Pack the instrument in its original box. If the box is not available, take care to wrap the instrument and accessories with enough material to support them.
- DO NOT send accessories unless there is a problem with them. When sending back, wrap each item to avoid contact with the instrument.
- Pack the instrument and related items in a strong box for shipping. Mark the outside of the box with handling instructions. Example: "Handle with care" or "Fragile- Delicate Instrument" and send to:

Goldleaf Scientific Attn: Repairs
3300 Harrison st suite 2
Riverside, CA 92503