IKA

designed for scientists

CBC 5 basic

Operating instructions EN

Device setup

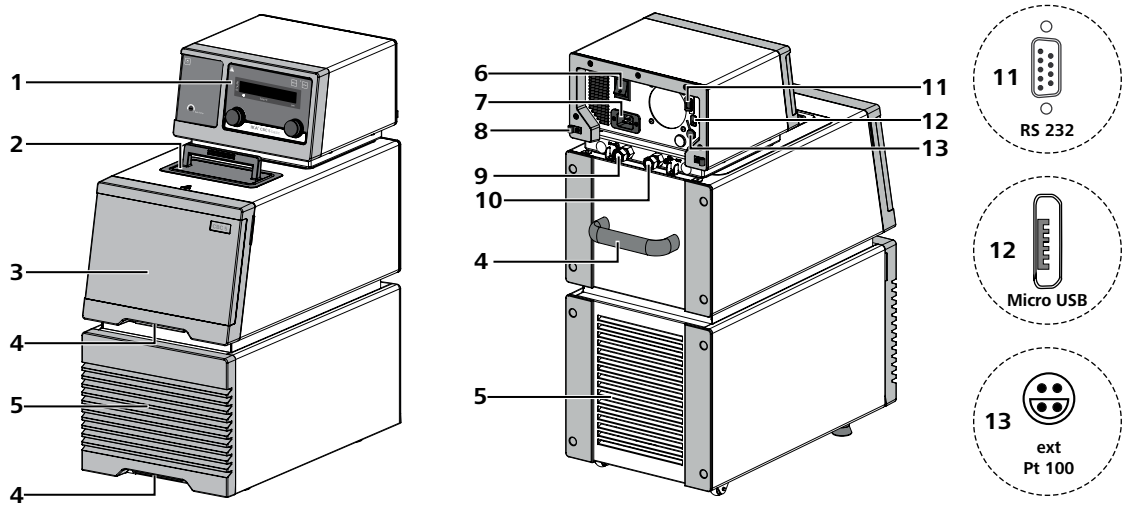

Fig. 1

Item	Designation
1	Operator panel and display
2	Filling opening lid
3	Front cover
4	Handle
5	Venting grid
6	Power switch
7	Power socket
8	Cable clip
9	Pump connection **IN**
10	Pump connection **OUT**
11	RS 232 port
12	USB port
13	External temperature sensor socket

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Declaration of Conformity

We declare under our sole responsibility that this product corresponds to the regulations 2014/35/EU, 2014/30/EU and 2011/65/EU and conforms with the standards or other normative documents: EN 61010-1, EN 61010-2-010, EN 61010-2-051, EN 61326-1, EN 60529 and DIN 12876-1.

A copy of the complete EU Declaration of Conformity or further declarations of conformity can be requested at sales@ika.com.

Explication of warning symbols

DANGER — Indicates an (extremly) hazardous situation, which, if not avoided, will result in death, serious injury.

WARNING — Indicates a hazardous situation, which, if not avoided, can result in death, serious injury.

CAUTION — Indicates a potentially hazardous situation, which, if not avoided, can result in injury.

NOTICE — Indicates practices which, if not avoided, can result in equipment damage.

CAUTION — Indicates a hazardous situation that cause from a hot surface!

Safety instructions

General information:

- **Read the operating instructions completely before starting up and follow the safety instructions.**
- Keep the operating instructions in a place where it can be accessed by everyone.
- Ensure that only trained staff work with the device.
- Follow the safety instructions, guidelines, occupational health, safety and accident prevention regulations.
- Set up the device in a spacious area on an even, stable, clean, non-slip, dry and fireproof surface.
- Do not operate the device in explosive atmospheres, with hazardous substances.
- Protect the device and accessories from bumping and impacting.
- Check the device and accessories for damage before each use. Do not use damaged components.
- Safe operation is only guaranteed with the accessories described in the "Accessories" section.
- The device must only be operated with the original mains cord.
- The socket for the mains cord must be easily accessible.
- Socket must be earthed (protective ground contact).
- The voltage stated on the type plate must correspond to the mains voltage.
- The device can only be disconnected from the mains supply by pulling out the mains plug or the connector plug.
- Disconnect the mains plug before attaching or changing any accessories.
- Disconnect the mains plug before cleaning, maintenance or moving the device.
- The device must only be opened by trained specialists, even during repair. The device must be unplugged from the power supply before opening. Live parts inside the device may still be live for some time after unplugging from the power supply.

⚠ NOTICE Coverings or parts that can be removed from the device must be put back on the device again to ensure safe operation, for example to keep foreign objects and liquids, etc. from getting into the device.

- The device must only be used as prescribed and as described in the operating instructions. This includes operation by instructed specialist personnel.
- When using critical or hazardous materials in your processes, **IKA®** recommends to use additional appropriate measures to ensure safety in the experiment. For example, users can implement measures that inhibit fire or explosions or comprehensive monitoring equipment.
- Process pathogenic material only in closed vessels under a suitable fume hood. Please contact **IKA®** application support if you have any question.

⚠ CAUTION If the mains switch is not within reach when device is operating, an **EMERGENCY STOP** switch that can be easily accessed must be installed in the work area.

- A laboratory circulator heats/refrigerates and circulates fluid according to specified parameters. This involves hazards due to high and low temperatures, fire and general hazards due to the device of electrical energy. The user safety can not be ensured simply with design requirements on the part of the device. Further hazard sources may arise due to the type of tempering fluid, e.g. by exceeding or undercutting certain temperature thresholds or by the breakage of the container and reaction with the carrier fluid. It is not possible to consider all eventualities. They remain largely subject to the judgment and responsibility of the operator. For this reason, it may become necessary for user to take other precautionary safety measures.
- Insufficient ventilation may result in the formation of explosive mixtures. Only use the device in well ventilated areas.

⚠ WARNING The safety circuit (safe temperature) must be adjusted so that the maximum permissible temperature cannot be exceeded even in the event of a fault. Check the safe temperature circuit on a regular basis (see section "Setting the safety temperature").

- When device is used for external circulation, extra precaution must be taken for hot/cold liquid leakage due to damaged hose.
  - Use suitable hoses for connection.
  - Secure hoses and tubes against slippage and avoid kinks.
  - Check hoses, tubes and bath at regular intervals for possible material fatigue (cracks/leaks).
- Mains cable should not get in contact with hot parts and fluids.

⚠ WARNING Do not start up the device if:
- It is damaged or leaking
- Cable (not only mains cable) is damaged.

- Be careful when filling a hot bath.

⚠ CAUTION At high operating temperature, the temperature of housing parts, surfaces and tubes can exceed 70 ° C.

⚠ CAUTION It is dangerous to touch the heater. The temperature of the heater can be very high.

- After a power failure during operation, the device may start automatically (depending on operating mode).
- Transport the device with care.
- Do not transport or empty the bath while it is still hot/cold. This may result in accidents, especially scalding injuries or frostbite.

⚠ CAUTION Because of the heavy weight of the device, at least two persons are needed for carrying the device.

Fluids:

⚠ CAUTION Beware of the risk of burning due to delay in boiling!

⚠ WARNING Only use fluids, which fulfill the requirements for safety, health and device compatibility. Be aware of the chemical hazards that may be associated with the bath fluid used. Observe all safety warnings for the fluids.

- Depending on the bath fluid used and the type of operation, toxic or flammable vapors can arise. Ensure suitable extraction.
- Do not use any fluid which may cause dangerous reactions during processing.
- Only use recommended bath fluid. Only use non-acid and non corroding fluid.

⚠ WARNING Only process and heat up any fluid that has a flash point higher than the adjusted safe temperature limit that has been set. The safe temperature limit must always be set to at least 25 °C lower than the flash point of the fluid used. Examine regularly the function of the safety temperature limiter.

⚠ NOTICE Never operate the device without sufficient heat carrier fluid! Check the fluid level detection at a regular basis (see the chapter "Filling and draining").

- Continuous monitoring of the bath and the filling level of the bath fluid is required, especially at high temperatures.
- To ensure a sufficient fluid circulation, the viscosity of the bath fluid must not exceed of 50mm²/s at the lowest operating temperature.

⚠ NOTICE If water is used at higher temperature, there is heavy loss of fluid due to the evaporation of the steam.

- Untreated tap water is not recommended. It is recommended to use distilled water or high purity water (ion exchangers) and add 0.1 g soda (sodium carbonate Na_2CO_3) /liter, to reduce corrosive properties.

⚠ CAUTION Risk of burning caused by vapor or hot water at the outlet of the cooling coil.

⚠ NOTICE Don't use following fluids:

- Untreated tap water
- Acids or bases
- Solutions with halides: chlorides, fluorides, bromides, iodides or sulfur
- Bleach (Sodium Hypochlorite)
- Solution with chromates or chromium salts
- Glycerine
- Ferrous water.

⚠ NOTICE When changing the bath fluid type, must remove the remaining water from the complete system (including hoses and external devices). When doing this, also open the stopper and union nuts caps of the pump outputs and inputs and blow compressed air through all the pump outputs and inputs! Beware of the risk of burning due to delay in boiling!

Correct use

- **Use:**
  Use **CBC 5** (Combined refrigerating and heating Bath Circulators) for heating/refrigerating and circulating fluids.

  Intended Use: Tabletop device.

- **Range of use (indoor use only):**
  - Laboratories
  - Schools
  - Pharmacies
  - Universities

This device is suitable for use in all areas except:
- Residential areas
- Areas that are connected directly to a low-voltage supply network that also supplies residential areas.

The safety of the user cannot be guaranteed:
- if the device is operated with accessories that are not supplied or recommended by the manufacturer
- if the device is operated improperly or in contrary to the manufacturer's specifications
- if the device or the printed circuit board are modified by third parties.

Unpacking

- **Unpacking:**
  - Please unpack the device carefully.
  - In the case of any damage a detailed report must be sent immediately (post, rail or forwarder).

⚠ NOTICE

Transport safety:
Open the lid (2) and remove the protection under the buoyage.

- **Delivery scope:**
  - **CBC 5 baisc**
  - Mains cables
  - Hose olive NW 12 (2 pieces) see Fig. 2
  - Screwdriver (use for safety circuit) see Fig. 3
  - User guide
  - Warranty card.

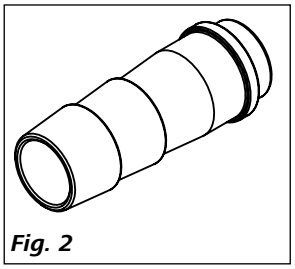


Fig. 2

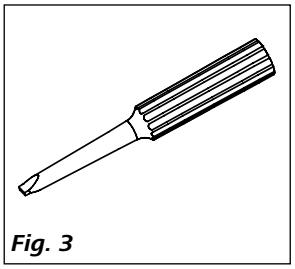


Fig. 3

Preparations

- **Setting up:**
  - Place the unit on an even, stable, clean, nonslip, dry and fireproof surface.
  - Keep at least 20 cm of open space on the front and rear side.
  - The place for installation should be large enough and provide sufficient air ventilation to ensure the room does not warm up excessively because of the heat from device radiates to the environment.
  - Do not set up the device in the immediate vicinity of heat sources and do not expose to sun light.
  - Cooling machine, pump motor and electronics produce intrinsic heat that is dissipated via the venting grids (5)! Never cover these venting grids!

Note: After setting up the device, wait at least one hour before starting the operation to avoid the damage to the cooling system.

- **Connecting the tubings:**
  Unscrew the union nuts and stoppers using a wrench (SW 19) from the pump connection **IN** (9) and **OUT** (10).

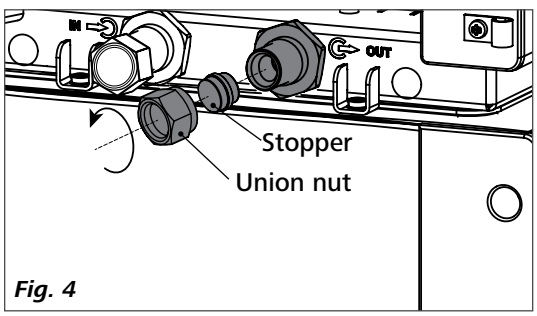


Fig. 4

- Connect the hoses for circulating the external system to the pump connectors M 16 x 1 for **IN** and **OUT** directly or with the olives.
- Screw the hose olive to the pump connection **IN** and **OUT** with union nuts. Slide the hoses (NW 12) onto the olives. The hoses must be secured with suitable clamps.

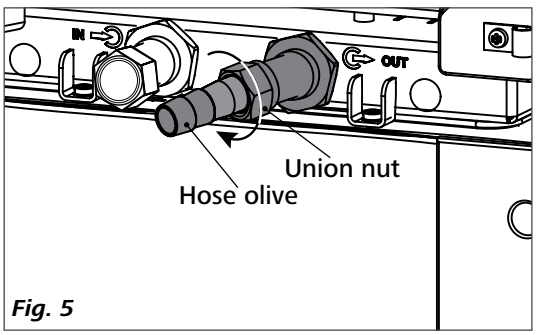


Fig. 5

Note: Please note the permissible temperature range of hoses. For hot fluids we recommend the **IKA®** LT 5.20 hoses.
When the external system is not necessary, please seal the pump connectors **IN** and **OUT** with the existing union nuts and stoppers.

- **Filling and draining:**
  - Before filling the fluid into the bath, open the front cover as indicated in following figure.

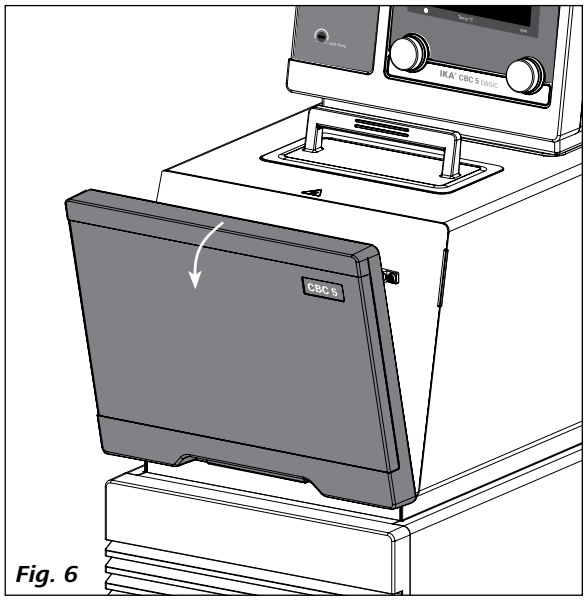


Fig. 6

  - Check and make sure that the drain valve is closed (Rotate clockwise to the stop position, see Fig. 7).

Note: Please note information in chapter "Commissioning".

  - Connect the mains plug and turn on the device with power switch (6).
  - The low level warning message appear on the display.
  - Open the lid (2) and fill fluid to the bath.

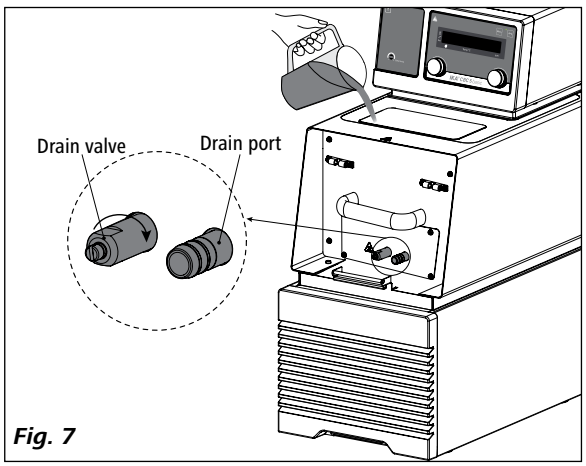


Fig. 7

Note: Pay attention to the fluid level information:

Low level

High level

  - To drain the fluid from the bath, connect a hose to the drain port and turn the drain valve in counter clockwise direction with a straight screwdriver.

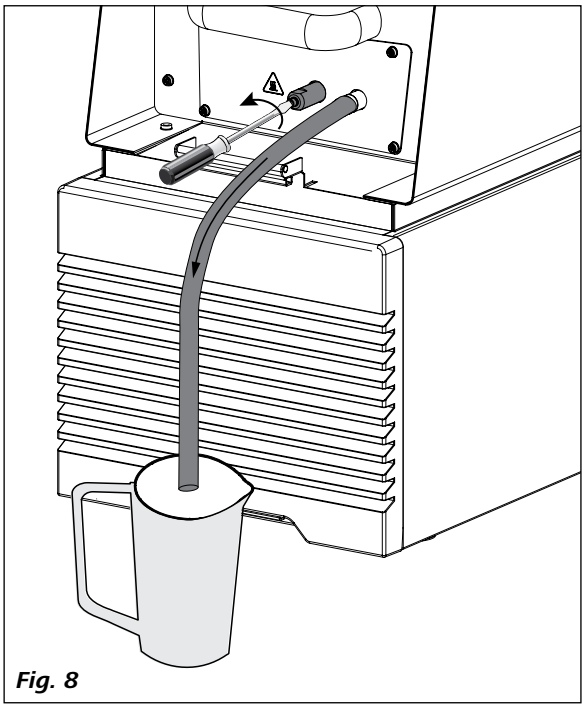


Fig. 8

Warning: do not empty the bath while it is still hot/cold, there is a risk of burning/freezing.

- **Fluids (Standard information for IKA® fluid):**

No.	IKA® Designation	Operating temperature range for open bath application (°C)	Operating temperature range for closed bath applications (°C)	Safety temperature (°C)	Flash point (°C)
0	CF.EG28.N10.80.8	-10 ... 80	-10 … 80	90	115
1	CF.EG39.N20.80.16	-20 … 80	-20 … 80	90	115
2	CF.EG44.N25.80.19	-25 … 80	-25 … 80	90	115
3	CF.EG48.N30.80.22	-30 … 80	-30 … 80	90	115
4	UF.Si.N30.150.10LV	-30 … 130	-30 … 150	145 ❶	>170
5	HF.Si.20.200.50	20 … 200	20 … 200	255	>280
6	HF.Si.20.250.50A	20 … 200	20 … 250	255	>280
7	Water ❷	5 … 95	5 … 95	-	-
8	Customized ❸				

The listed fluid temperature range may deviate from the device operating temperature ranges and settings.

Nomenclaturefor **IKA®** fluids:

CF.EG28.N10.80.8 --
- (5) Addition information
- (4) Viscosity (8 mm²/s)
- (3) Temperature range (-10 – 80 °C)
- (2) Chemical composition (Ethylene Glycol 28%)
- (1) Classification (Cooling fluid)

(1) Classification:
HF: Heating Fluid
CF: Cooling Fluid
UF: Universal Fluid

(2) Chemical composition:
Si: Silicone oil
EG: Ethylene Glycol

(3) Temperature range: (Minimum temperature. Maximum temperature)
N: Negative Temperature

(4) Viscosiy:
Viscosiy at 25 °C for Heating Fluid (HF)
Viscosity at -20 °C for Cooling Fluid (CF)
Viscosity at 25 °C for Universal Fluid (UF)

Dynamic viscosity [mPa•s] is a product of kinematic viscosity [mm²/s] and density [kg/m³] of the fluid divided by 1000.

(5) Additional information:
A: Oil Additives
LV: Low Viscosity

❶ ***Note:*** for open bath application!
❷ ***Note:*** Tap water may be unsuitable for operation because the calcium carbonate content may cause calcification. High purity water (from icon exchangers) and distilled or bi-distilled water are unsuitable for operation due to corrosive properties of these media. High purity water and distillates are suitable as a medium after adding 0.1 g soda (Na_2CO_3, sodium carbonate) per liter of water.
❸ ***Note:*** The temperature limit values are adjustable in accordance with the fluid used.

- **Moving the device:**
  Empty all fluid in the bath before moving device from one place to other place.
  The device must be lifted by two persons with the upper handles. For this purpose, take off the front cover (3).
  It can also be moved on flat surface by lifting and pushing the front of the device. It is easy to move the device with the help of the wheels.
  The angle of inclination should never be more than 10 ° at any direction when move the device!

  Note: The device must not be moved during operation. After moving the device, you must wait at least one hour before restarting the unit.

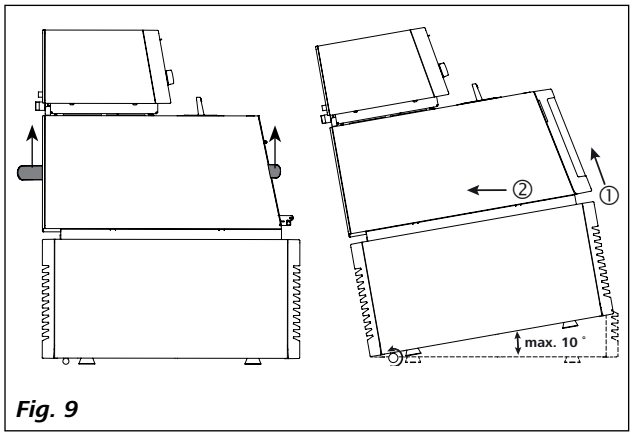


Fig. 9

Operator panel and display

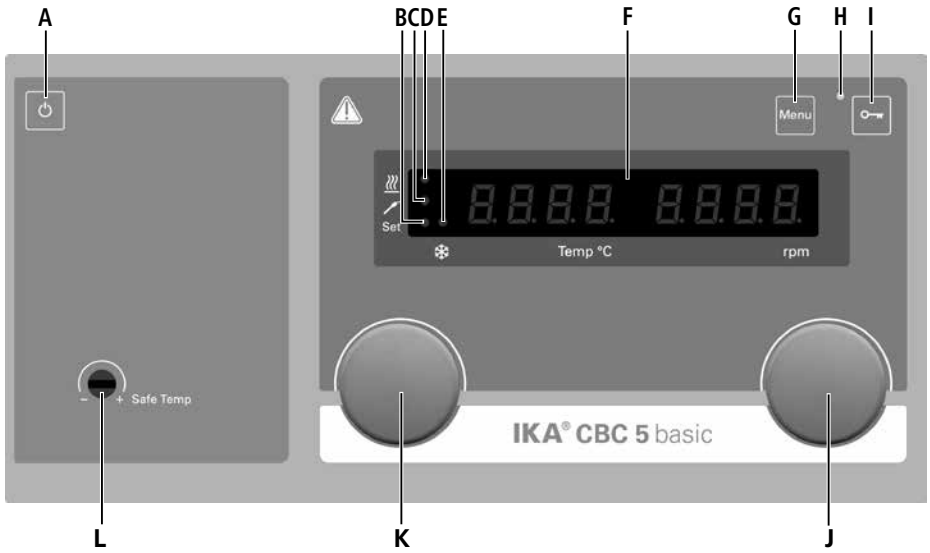


Fig. 10

Item	Designation	Function
A	**On/Off key:**	Switch on/off the circulator.
B	**LED, set:**	The LED lights up at the same time as the set value is displayed.
C	**LED, temperature sensor:**	Indicates that an external temperature sensor is connected.
D	**LED, heater:**	Indicate the heating function is activated.
E	**LED, refrigerating system:**	Indicates that the refrigerating function is activated.
F	**LED display:**	Display the settings and actual values.
G	**Menu key:**	Press it once: menu option is display. Press it a second time: back to the working screen.
H	**LED, lock:**	Indicates that the function of keys and knobs is deactivated.
I	**Lock key:**	Lock/unlock keys and knobs.
J	**Rotating/pressing knob:**	Set the pump speed value. Start/stop the pump function. Set and confirm the menu options.
K	**Rotating/pressing knob:**	Set the temperature value. Start/stop the heating/refrigerating function. Navigation, selecting the settings in the menu.
L	**Adjustable safety circuit:**	Adjust the safety temperature limit.

Setting the safety temperature

Seting the safety temperature with screwdriver delivered with the device.

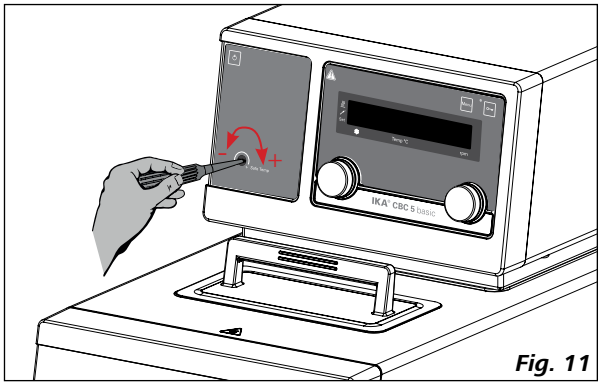


Fig. 11

The safety temperature setting will appear on the display.

Safety temperature

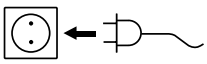
Factory setting: approximate max. value.
Adjustment range: 0 to 260 °C.

Note: The safety temperature must always be set to at least 25 °C lower than the flash point of the fluid used.

Commissioning

Note: Before commissioning, make sure that the device has not been moved in one hour!

Check whether the voltage specified on the type plate matches the mains voltage available.



The power socket used must be earthed (protective earthing).

If above conditions are met, the device is ready for operation after plugging in the mains plug.
If these conditions are not met, safe operation is not guaranteed and the device could be damaged.

Observe the ambient conditions (temperature, humidity, etc.) listed under "Technical Data".

After switching on the mains switch (6) at the back of the device or pressing the on/off key (A), all LED segments light up during the self test.

① 

Display field

② 

Software version (ver)

③ 

Operating mode (mode)

④ 

Safety temperature

⑤ 

Working setting

After that, following two screens appear alternately.

⑥ 

⑦ 

Then the device enters standby status and is ready for operation.

Change the temperature setting with left knob (K).
Change the pump speed setting with the right knob (J).

In standby status, activate the heating/refrigerating function by pressing the left knob (K). The device start heating/refrigerating function. Meanwhile, the pump and fan starts to run at once.
After pressing the mains switch (6) the start-up of the compressor is delayed (about 3 minutes).
In working status, press the right knob (J) to stop the pump function. The heating/refrigerating function and pump stops.

Note: In running status, the pump speed adjusts automatically according to the load. When the actual speed doesn't reach the setting speed, the actual speed and setting speed will appear on the screen alternately.

In standby status, press the right knob (J) to start the pump function. The heating/refrigerating function will not be activated.
In working status, press the left knob (K) to stop the heating/refrigerating function, the pump keep running.

Pressing the lock key (I) for about 2 seconds, the device control elements can be locked to prevent accidental changes that can be done during operation (LED (H) will light up).
To unlock the control elements, press the lock key again for about 2 seconds (LED (H) goes out).

Note: When the heating function is activated, you can review the external/internal actual temperature on the right of the display (speed display) by pressing the menu key (G). For details, see following table:

ET=0	ET=1	Temp. display	rpm display (pressing menu key (G))
activated	–	internal control temperature	external actual temperature
–	activated	external control temperature	internal actual temperature

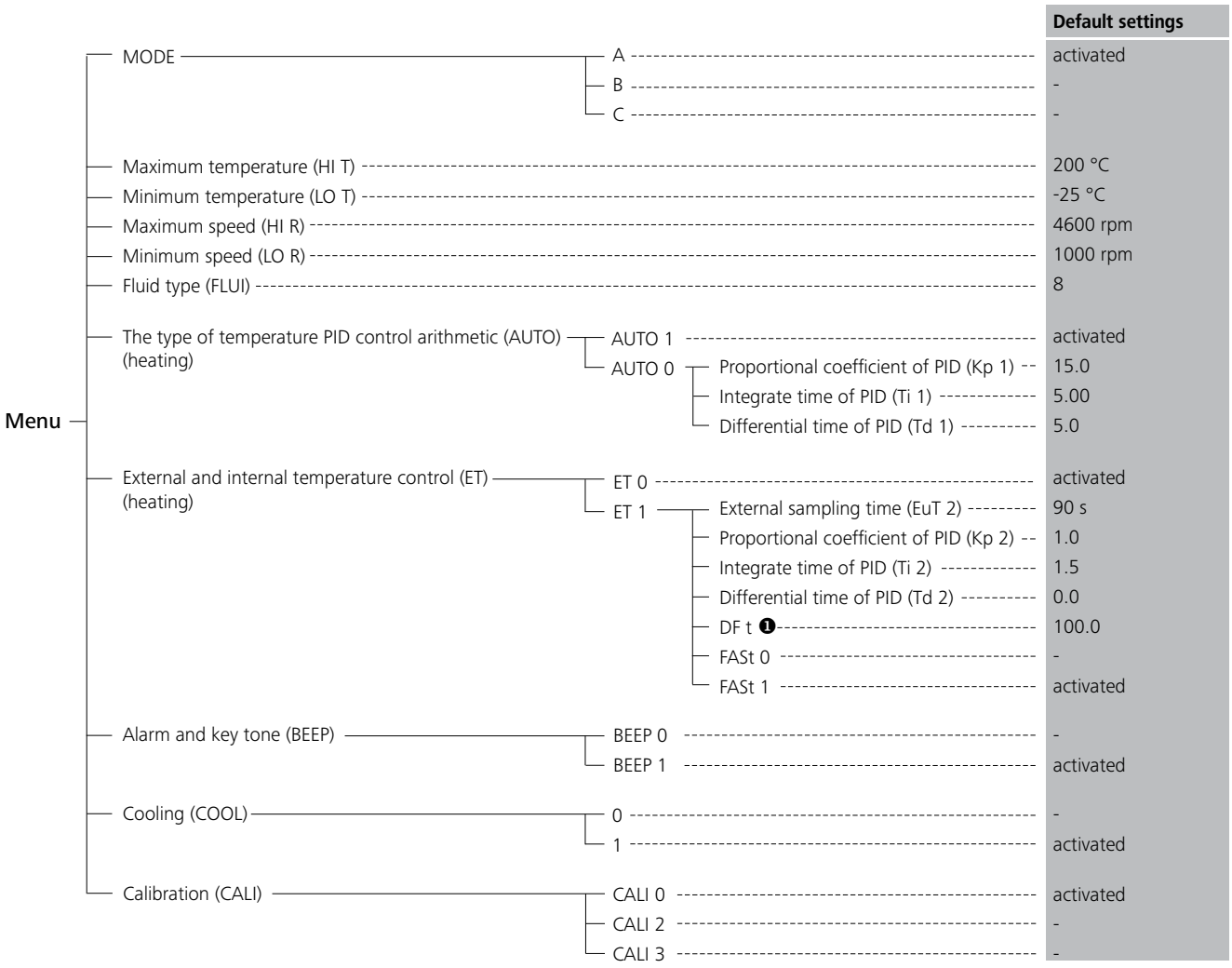
When **ET**=0, if external sensor is not connected, when pressing menu key (G), the right display shows "- - - -".

After pressing menu key (G) about 10 seconds, value in the right display will change back and show pump speed.

When the heating/refrigerating function is activated, you can enter the menu option by pressing menu key (G) about 3 seconds.

Menu settings

• **Menu structure:**



❶ ***Note:*** DF t: maximum temperature difference between internal and external temperature.

- **Basic guide to setting the menu options:**
  - ☞ Enter the menu by pressing "Menu" key (G).
  - ☞ Turn the left knob (K) to select a menu option.
  - ☞ Turn the right knob (J) to change the menu value settings.
  - ☞ Confirm the menu settings by pressing the right knob (J).

- **Operating mode (MODE):**

Mode A: After power on/power failure no automatic restart of functions.

Mode B: After power on/power failure automatic restart of functions, depending on previous settings.

Mode C: Set values (set in A or B) cannot be changed. After power on/power failure automatic restart of functions, depending on previous settings.

- **Maximum temperature (HI T):**

The maximum adjustable value: 200° C. This value can be limited additionally by the selected fluid (No., see "Fluid (Standard information for **IKA®** fluid)" fluid type).

Note: The maximum value is limited by the set safety temperature.

- **Minimum temperature (LO T):**

The minimum adjustable value: -25° C

- **Maximum speed (HI R):**

The maximum adjustable value: 4600 rpm.

- **Minimum speed (LO R):**

The minimum adjustable value: 1000 rpm

- **Fluid type** (**FLUI**)

The chosen fluid (No.) of the temperature setting is limited. See Section "**Fluid**".

- **Temperature control type (AUTO) (heating):**

AUTO 1:
AUTO 1 is the default setting. The optimum settings are determined automatically.

Heating up curve in auto-tuning control (Auto 1):

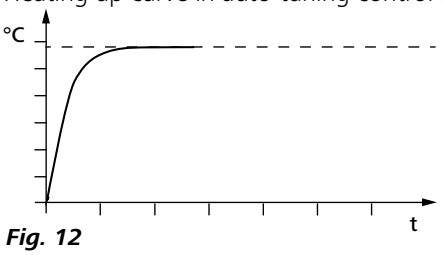


Fig. 12

AUTO 0:
For special requirements, AUTO 0 can be used with manual adjustment of the control parameters.

If the PID control (AUTO 0) option is selected, the following items including **Kp 1**, **Ti 1** and **Td 1** could be set. Otherwise they are not displayed in the menu list.

Note: Inappropriate settings may produce the following heating up curves:

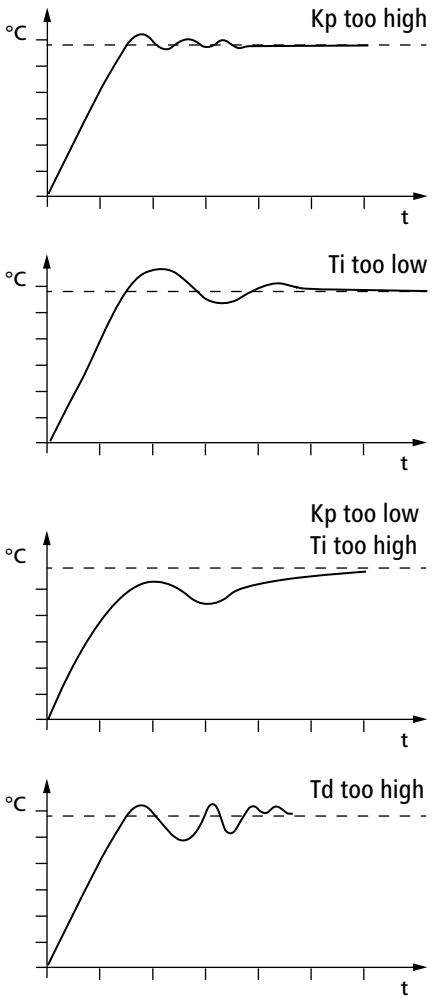


Fig. 13

Proportional coefficient of PID (Kp 1):

The proportional coefficient **Kp** is the controller amplification and determines how strongly the control deviation (the difference between the target temperature and actual temperature) directly affects the control variable (on-time of the heater). **Kp** values that are too large can lead to the controller overshooting.

Integral time of PID (Ti 1):

The integral time **Ti** (s) is the correction time and determines how strongly the duration of the control deviation affects the control variable. **Ti** compensates an existing control deviation. A high **Ti** means a smaller and slower effect on the control variable. Ti values that are too small can lead to instability of the controller.

Differential time of PID (Td 1):

The differential time **Td** (s) is the derivative time and determines how strongly the rate of change of the control deviation affects the control variable. **Td** compensates for rapid control deviations. A high Td means a smaller and slower effect on the control variable. **Td** values that are too small can lead to instability of the controller.

- **External and internal temperature control (ET) (heating):**

ET 0: internal temperature control
ET 1: external temperature control

If the external temperature control (**ET 1**) is selected, the following items **EuT 2** (sampling time), **Kp 2**, **Ti 2**, **Td 2**, **Df t** (maximum temperature difference between internal and external temperature) and **FAST** could be set. Otherwise they are not displayed in the menu list.

The sampling time **EuT 2** (s) is the interval over which the external control deviation and the respective control variable (dependent on **Kp 2**, **Ti 2**, **Td 2**, **Df t** and **FAST**) is determined.
EuT 2 must be adjusted to match the response characteristic (total of all time constants) of the external closed loop controlled system, so that the control variable can deliver a uniform and measurable change in the control deviation. **EuT 2** values that are too small or too large can lead to instability of the controller.

Dynamics of the external PID temperature control (**FAST**):

FAST=0: accurate, without overshoot
FAST=1: fast, with overshoot

- **Alarm and key tone (BEEP):**

BEEP 0: no alarm and key tone
BEEP 1: alarm and key tone is activated

- **Cooling (COOL):**

0: Cooling function is deactivated.
1: Cooling function is activated.

- **Calibration and adjustment (CALI):**

If **ET 0**: adjustment of the internal temperature measurement.
If **ET 1**: adjustment of the external temperature measurement.

CALI 0: Reset calibration
CALI 2: 2-point calibration
CALI 3: 3-point calibration

Example: 2-point calibration:
Dip the temperature sensor of the reference measuring device into the bath fluid:
- If **ET 0**: into the internal bath (open the lid (2))
- If **ET 1**: at the same position as the external Pt100 temperature sensor (13).

Select 2-point calibration in the menu. Press the right knob (J) to start the 2-point calibration.

Set the first point temperature (e.g. 80 °C). Confirm the setting by pressing the right knob (J).

Left area of the display appears the set value (80 °C) and the right area of the display appears the actual temperature value measured. The "Set" LED (B) flashes briefly.

The unit now starts and controls to the set value. When the temperature has reached the set value and has become constant, the "Set" LED (B) no longer flashes and the following display appears.
The temperature measured by the unit appears on the left hand side.

Input the calibration value from the reference mesuring device (e.g. 80.2 °C) with the right knob (J).

Confirm the value by pressing the right knob (J).
Back to previous screen for input a new value by pressing the left knob (K).

Back *OK*

The first point calibration is finished now.
Calibration of the other points is performed in the same way.

Interface and output

The device can be operated in "Remote" mode via the RS 232 interface (11) or the USB interface (12) connected to a PC and with the laboratory software Labworld*soft*®.

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

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

USB device drivers:
First download the latest driver from **IKA®** devices with USB interface from:
http://www.ika.com/ika/lws/download/usb-driver.zip.
Install the driver by running the setup file. Then connect the **IKA®** device through the USB data cable to the PC.
The data communication is via a virtual COM port.
Configuration, command syntax and commands of the virtual COM ports are as described in RS 232 interface.

RS 232 interface:
Configuration
- The functions of the interface connections between the stirrer machine and the automation system are chosen from the signals specified in EIA standard RS 232 in accordance with DIN 66 020 Part 1.
- For the electrical characteristics of the interface and the allocation of signal status, standard RS 232 applies in accordance with DIN 66 259 Part 1.
- Transmission procedure: asynchronous character transmission in start-stop mode.
- Type of transmission: full duplex.
- Character format: character representation in accordance with data format in DIN 66 022 for start-stop mode. 1 start bit; 7 character bits; 1 parity bit (even); 1 stop bit.
- Transmission speed: 9600 bit/s.
- Data flow control: none
- Access procedure: data transfer from the stirrer machine to the computer takes place only at the computer's request.

Command syntax and format:
The following applies to the command set:
- Commands are generally sent from the computer (Master) to the device (Slave).
- The device sends only at the computer's request. Even fault indications cannot be sent spontaneously from the device to the computer (automation system).
- Commands are transmitted in capital letters.
- Commands and parameters including successive parameters are separated by at least one space (Code: hex 0x20).
- Each individual command (incl. parameters and data) and each response are terminated with CR LF (Code: hex 0x0d hex 0x0A) and have a maximum length of 80 characters.
- The decimal separator in a number is a dot (Code: hex 0x2E).

The above details correspond as far as possible to the recommendations of the NAMUR working party (NAMUR recommendations for the design of electrical plug connections for analogue and digital signal transmission on individual items of laboratory control equipment, rev. 1.1).
The NAMUR commands and the additional specific **IKA®** commands serve only as low level commands for communication between the device and the PC. With a suitable terminal or communications programme these commands can be transmitted directly to the circulator equipment. The **IKA®** software package, Labworld*soft*®, provides a convenient tool for controlling circulating equipment and collecting data under MS Windows, and includes graphical entry features, for pump motor speed ramps for example.
The following table summarizes the (NAMUR) commands understood by the **IKA®** control equipment.

Commands:

NAMUR Commands	Function
IN_PV_1	Read the external actual temperature
IN_PV_2	Read the internal actual temperature
IN_PV_3	Read the safety actual temperature
IN_PV_4	Read the pump actual speed
IN_SP_1	Read the internal setting temperature (if ET=0) Read the external setting temperature (if ET=1)
IN_SP_3	Read the safety setting temperature
IN_SP_4	Read the pump setting speed
IN_TMODE	Read temperature control ET=0: internal regulation ET=1: external regulation
OUT_SP_1 xxx	Set the internal setting temperature XXX (if ET=0) Set the external setting temperature XXX (if ET=1)
OUT_SP_12@n	Set the WD safety temperature with echo of the set (defined) value.
OUT_SP_4 xxx	Set the pump speed XXX
OUT_SP_42@n	Set the WD-safety speed with echo of the set (defined) value.
OUT_TMODE_0	Set to internal temperature control
OUT_TMODE_1	Set to external temperature control
OUT_WD1@n	Start the watchdog mode 1 and set the time for the watchdog to n (20...1500) seconds. Echo of the Watchdog time. During a WD1-event, the tempering and pump functions are switched off. This command needs to be send within the watchdog time.
OUT_WD2@n	Start the watchdog mode 2 and set the watchdog time to n (20...1500) seconds. Echo of the watchdog time. During a WD2-event, the set temperature is changed to the WD safety temperature and the pump set speed is set to the WD safety speed. This command needs to be send within the watchdog time.
RESET	Reset the PC control and stop the device functions.
START_1	Start the tempering function
START_4	Start the pump function
STOP_1	Stop the tempering function
STOP_4	Stop the pump function

Connections between device and external devices:

PC 1.1 Cable: This cable is required to connect RS 232 port (11) to a PC.

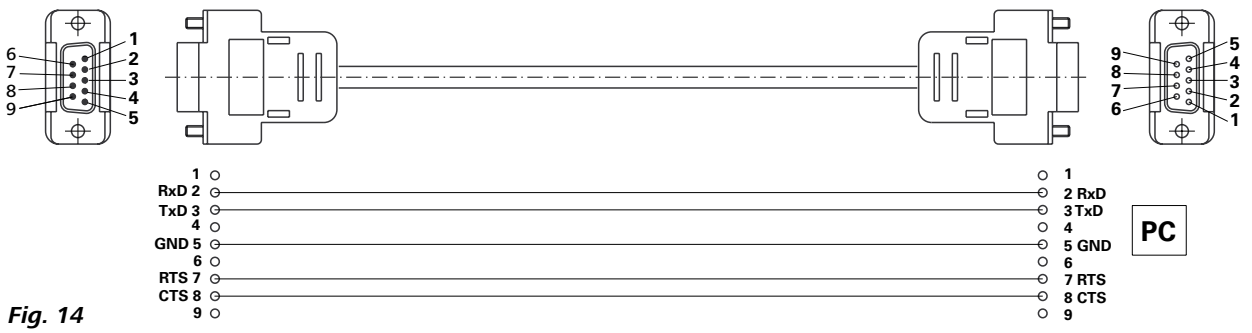
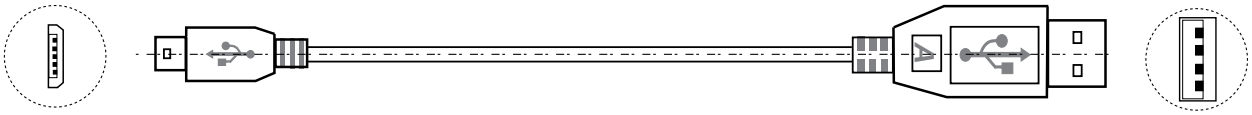


Fig. 14

USB 2.0 cable A - micro B: This cable is required to connect USB interface (12) to a PC.



USB micro B **USB A**

Fig. 15

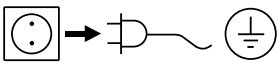
Maintenance and cleaning

To avoid contamination, it is essential to change the bath fluid from time to time.
If water is used for bath fluid, we recommend to add Water bath protective media. The protective media stops the growth of algae, bacteria and other microorganisms with its bactericidal effectiveness. It protects the bath fluid and provides a long period of use for the fluid.

To keep the full cooling performance, the dust filter of the cooler must be checked regularly and cleaned if necessary.
- Switch off the device and disconnect mains cable.
- Open the front venting grid (5).
- Remove the bracket.
- Clean condenser dust protection sheet with a vacuum cleaner or wash the sheet in the water and dry the sheet before assembly.

Note: Don't touch the condenser surface with hard parts.

Cleaning:



Disconnect main plug prior to cleaning!

Use only cleaning agents which have been approved by **IKA®** to clean the device.

Dirt	Cleaning agent
Dye	Isopropyl alcohol
Construction material	Water containing tenside/ isopropyl alcohol
Cosmetics	Water containing tenside/ isopropyl alcohol
isopropyl alcohol	Water containing tenside
Foodstuff	Water containing tenside
Fuel	Water containing tenside

For materials which are not listed, please request information from IKA® application support.
Wear protective gloves while cleaning the devices.
Electrical devices may not be placed in the cleansing agent for the purpose of cleaning.
Do not allow moisture to get into the device when cleaning.
If a different cleaning or decontamination method than the method defined by **IKA®** is planned, the user must ascertain with **IKA®** that this method does not damage the device.

Spare parts order:
When ordering spare parts, please give:
- machine type
- manufacturing number, see type plate
- item and designation of the spare parts, see **www.ika.com**
- software version.

Repair:
Please send in device for repair only after it has been cleaned and is free from any materials which may constitute a health hazard.
For repair, please request the "Decontamination Clearance Certificate" from **IKA®**, or download printout of it from the **IKA®** website **www.ika.com**.
If you require servicing, return the device in its original packaging. Storage packaging is not sufficient. Please also use suitable transport packaging.

Error codes

Any malfunctions during operation will be identified by an error message on the display.
Proceed as follows in such cases:
- Switch off device using the main switch at the back of the device
- Carry out corrective measures
- Restart device

Error code	Effect	Cause	Solution
Err 01	Pump off Heating/refrigerating off	No external sensor	- Check this sensor
Err 02	Pump off Heating/refrigerating off	Motor over current (rate current)	- Reduce pump motor speed - Use fluid with lower viscosity - Check if the pump impeller is blocked
Err 03	Pump off Heating/refrigerating off	Motor over current (Max current)	- Reduce pump motor speed - Use fluid with lower viscosity - Check if the pump impeller is blocked
Err 04	Pump off Heating/refrigerating off	Motor hall signal missing	- Reduce pump motor speed - Use fluid with lower viscosity - Check if the pump impeller is blocked
Err 05	Pump off Heating/refrigerating off	Too high liquid level	- Check the liquid level and buoyage
Err 06	Pump off Heating/refrigerating off	Too low liquid level	- Check the liquid level and buoyage
Err 07	Pump off Heating/refrigerating off	Too high voltage	- Check the mains power
Err 08	Pump off Heating/refrigerating off	Too low voltage	- Check the mains power
Err 09	Pump off Heating/refrigerating off	Device internal temperature is too high	- Check the ambient temperature and let the device cool down - Check the fan and clean the grids at the rear side
Err 10	Pump off Heating/refrigerating off	PC communication failure	- Check communication cable
Err 11	Pump off Heating/refrigerating off	Temperature difference between control sensor and safety sensor is too much	- Check safety temperature circuit and bath fluid
Err 12	Pump off Heating/refrigerating off	Safety temperature alarm	- Check the bath temperature measurement
Err 13	Pump off Heating/refrigerating off	Heater switched off by safety circuit	- Check safety temperature set value, fluid level
Err 14	Pump off Heating/refrigerating off	Fan error	- Restart the device
Err 15	Pump off Heating/refrigerating off	Safety shutdown of the compressor	- Restart the device
Err 16	Pump off Heating/refrigerating off	Errors at the compressor (suction side)	- Restart the device
Err 17	Pump off Heating/refrigerating off	Errors at the compressor (pressure side)	- Restart the device
Err 20	Pump off Heating/refrigerating off	Fan cooling system error	- Restart the device
Err 21	Pump off Heating/refrigerating off	Internal error	- Restart the device

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

Accessories

Tubing and hoses:

LT 5.20	Metal hose (isolated M16 x 1)
LT 5.21	PTFE hose (isolated M16 x 1)
H.PVC.8	PVC tube (nominal width 8 mm)
H.PVC.12	PVC tube (nominal width 12 mm)
H.SI.8	Silicone tube (nominal width 8 mm)
H.SI.12	Silicone tube (nominal width 12 mm)
H.PUR.8	PUR tube (nominal width 8 mm)
H.PUR.12	PUR tube (nominal width 12 mm)
H.FKM.8	FKM tube (nominal width 8 mm)
H.FKM.12	FKM tube (nominal width 12 mm)

See more accessories on ***www.ika.com***.

Tubing insulations:

ISO. 8	Insulation (8 mm)
ISO.12	Insulation (12 mm)

Additional accessories:

Pt 100.30	Temperature sensor
PC 1.1	Cable (RS 232)
Labworl*dsoft*®	

Technical data

Operating voltage	**VAC**	230 ± 10 % / 100–115 ± 10 %
Frequency	**Hz**	50 / 60
Max. input power	**W**	3000 (230 VAC) / 1750 (115 VAC)
Working temperature range	**°C**	- 25 ... + 200
Operating temperature range	**°C**	- 25 ... + 200
Temperature stability – internal temperature control 70 °C, water (according to DIN 12876)	**K**	± 0.02
Temperature control		PID
Temperature measurement, absolute accuracy Internal (int) (adjustable by calibration) External (ext) (adjustable by calibration)	 **K** **K**	 ± 0.2 ± 0.2
External Pt 100.3 temperature sensor tolerance to EN 60751 class A, ≤ ± (0.15 + 0.002 x |T|), e.g. at max. 100 °C (adjustable by calibration)	**K**	± 0.35 (at 100 °C)
Temperature setting		Knob
Temperature setting resolution	**K**	0.1
Temperature display		LED
Temperature display resolution	**K**	0.1
Classification according to DIN 12876-1		Class III (FL) suitable for flammable and non-flammable fluids
Safety circuit (adjustable)	**°C**	0 ... + 260
Safety temperature display		LED
Heating capacity	**W**	2500 (230 VAC) / 1250 (115 VAC) / 945 (100 VAC)
Cooling capacity according to DIN 12876 (at 4600 rpm): + 20 °C + 10 °C 0 °C - 10 °C - 20 °C	**W**	 350 (400 W at 3200 rpm) 320 (370 W at 3200 rpm) 270 (320 W at 3200 rpm) 190 (240 W at 3200 rpm) 80 (130 W at 3200 rpm)
Refrigerant		R134a ❶
Refrigerant quantity	**g**	230
Max. refrigerating system pressure	**bar**	20
Pump speed	**rpm**	1000 ... 4600
Max. pump pressure/suction	**bar**	0.61 / 0.45
Max. flow rate (at 0 bar)	**l/min**	31
Bath volume	**l**	5–7
Fluid maximum viscosity	**mm²/s**	50
Low level protection		Yes
Interface		USB, RS 232
Permitted on-time	**%**	100
Protection class according to EN 60 529		IP 21
Protection class		I
Excess voltage category		II
Contamination level		2
Permitted ambient temperature	**°C**	+ 5 ... + 32
Permitted ambient humidity	**%**	80
Dimension (W x D x H)	**mm**	275 x 490 x 690
Weight	**kg**	39.5
Operation at a terrestrial altitude	**m**	max. 2000

❶ ***Note:*** Refrigerant must be disposed of in accordance with local and national regulations.

Note: Complies to EN61000-3-11 subject to conditional connection: Zmax = 0.13 Ω. If necessary, consult your electricity supplier.

Subject to technical changes!

Warranty

In accordance with **IKA®** warranty conditions, the warranty period is 24 months. For claims under the warranty please contact your local dealer. You may also send the machine direct to our factory, enclosing the delivery invoice and giving reasons for the claim. You will be liable for freight costs.

The warranty does not cover worn out parts, nor does it apply to faults resulting from improper use, insufficient care or maintenance not carried out in accordance with the instructions in this operating manual.

Pump performance curve

Pump performance curve measured with water:
(Measurements done according DIN 12876-2 with water at 20°C; pump in a closed-loop circuit).

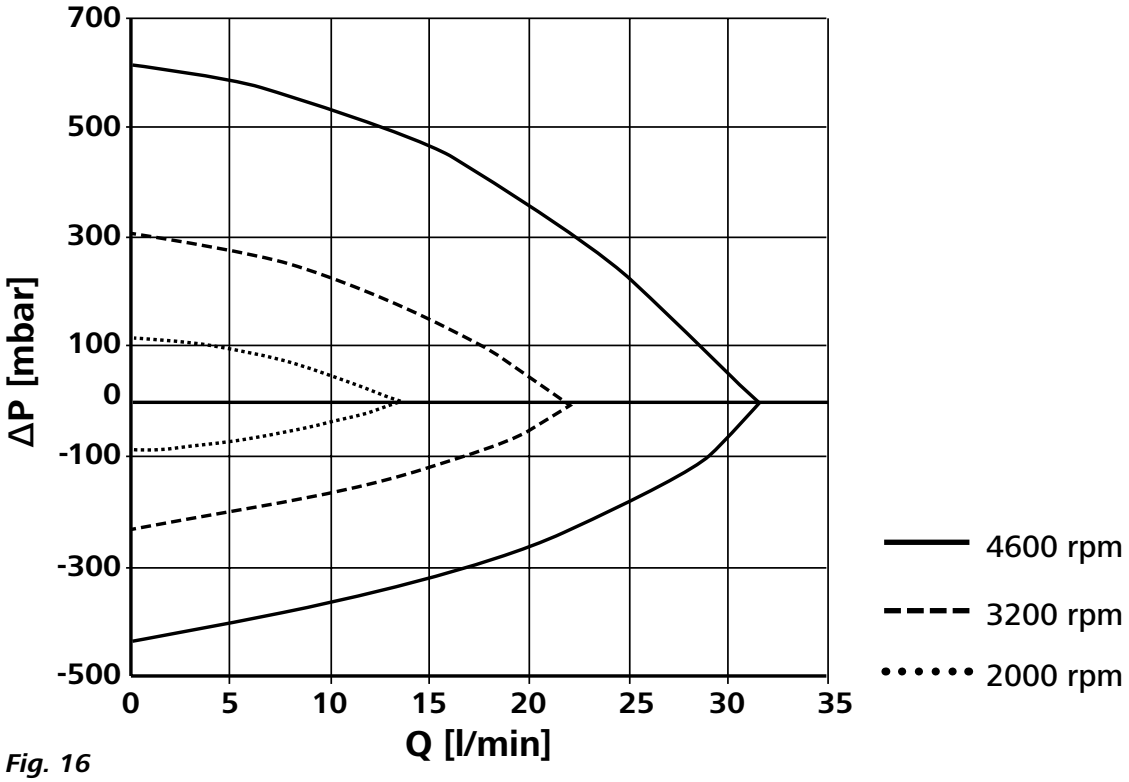


Fig. 16

IKA

designed for scientists

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