

Julabo

■ When Temperature Matters

North America 2008/2009

Introducing NEW products



Highly Precise Temperature Control from -95 to +400°C



www.julabo.com

JULABO When Temperature Matters

JULABO is proud to introduce you to the most innovative **Temperature Control Instruments** in this new catalog. This new range of instruments has been specifically designed to make your work both easier and safer. No matter how demanding your application may be: You will find a variety of useful, unique features in each and every instrument for you and your daily challenges.



Ralph Juchheim, President



JULABO East is located across the Lehigh Valley International Airport in Allentown, PA.



JULABO West is located near San Diego in Vista, CA.

Welcome to JULABO!

JULABO was established in 1967 building its reputation upon innovative products and market leading support and service. We at JULABO are proud to continue that tradition by manufacturing locally. In 1993 JULABO USA, Inc. opened its facility in the Lehigh Valley of Pennsylvania.

In 2006, our newest facility in Vista, CA was added. Because JULABO puts their customers first, it is important to us to serve you, the customer, with improved efficiency. Our comprehensive teams of application engineers and specialists are standing by to assist you, the customer!



Pick & place assembly station (SMD)



Refrigeration production



Automated quality assurance

CE
IEC 61010
EN 61010
EN 61326
DIN 12876

Always up-to-date. National and international standards apply. Environmentally-friendly production processes according to valid regulations and recommendations.

Technical features



LED temperature display
for actual value and setpoint.
Resolution 0.1 °C



MULTI-DISPLAY (LED) for actual value, up to 3 setpoints, high/low temperature warning functions, high temperature cut-off, selected pump stage.
Resolution 0.1 °C



VFD¹⁾ COMFORT-DISPLAY features the functions of the MULTI-DISPLAY. Simultaneous indication of 3 values: actual value, setpoint and external actual value.
Resolution 0.1 °C or 0.01 °C



Illuminated display for selected pump stage and filling volume on 'Presto[®]', 'Magnum91' & 'Forte HT' models



LCD DIALOG-DISPLAY backlit, offers interactive operation in easy-to-read text with 4 lines x 20 digits



Keypad 1
for setpoint adjustments, automatic toggle to display the actual value



Keypad 2 like keypad 1, with additional warning and safety functions for high and low temperatures



Keypad 3 like keypad 2 with additional menu functions for pump stage, calibration ATC³, band limit TCF, program, etc.



Keypad 4 like keypad 1 for recirculating coolers of the 'FL' series



PID 1 PID temperature control:
Temperature stability $\pm 0.02 \dots \pm 0.2$ °C



PID 2 PID temperature control with drift compensation:
Temperature stability $\pm 0.01 \dots \pm 0.02$ °C



PID 3 PID cascade temperature control
Temperature stability ± 0.01 °C internally, $\leq \pm 0.1$ °C externally



Intelligent Cascade Control, self-optimizing, for optimal results.
Temperature stability ± 0.005 °C internally, $\leq \pm 0.05$ °C externally



Temperature Control Features for band limit, limit setting, co-speed factor, control dynamics



Absolute Temperature Calibration
1-point calibration



Absolute Temperature Calibration
3-point calibration



Intelligent pump system
Electronic adjustable pump settings



External Pt100 sensor connection for precise measurement and control directly in the external system



Interface –
Online communication



Interface – Online communication for highest demands, upgradeable with Profibus DP

JULABO early warning systems (patented) with intermittent tone and optical signal



- for low liquid level, ability to refill bath fluid before unit shuts down!



- for high temperature and
- low temperature limits, adjustable to automated cut-off



Integrated programmer with real time clock and keypad operation for 1 x 10 program steps



Integrated programmer with real time clock and convenient keypad operation for 6 x 60 program steps



'Stake' connections for solenoid valve or HSP booster pump/HST booster heater



Maintain cooling performance!

- Removable venting grid: Hassle-free cleaning of the condenser
- Front drain accessibility



Active Cooling Control: Cooling available throughout the entire temperature range



Proportional cooling control for powerful FP models (e.g. FP50-HL)



Heated bath cover plate: prevents condensation or ice build-up



Adjustable high temperature cut-off or dry-running protection



High temperature cut-off adjustable via display

Classification (according to DIN 12876-1) with first failure safe cut-off functions and signal



High temperature cut-off/dry running protection for non-flammable bath fluids (NFL)



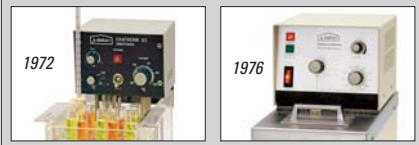
High temperature cut-off and low liquid level protection for flammable bath fluids (FL)

¹⁾ VFD: Vacuum Fluorescence Display

Always first – Decades of incorporating the latest technologies

The Seventies: **JULABO is the first** to implement

- **fully electronic temperature control**, for laboratory circulators and baths. Other manufacturers continue to rely on glass contact thermometers.
- **analog temperature setting**
- **fix-point setting (i.e. 25 °C and 37 °C)**



The Eighties: **JULABO is the first** to offer a range of benefits using the latest electronic components:

- **Illuminated displays for actual and setpoint values**, whilst fragile mercury-thermoregulators are still used by other manufacturers.
- **External measuring and control via Pt100 sensor**, to ensure high temperature stability directly in the external system.
- **Adjustable warning and safety functions for high and low temperatures**, exceeding the DIN recommendations.



The Nineties: The transition from analog to digital technology is successfully completed. JULABO products get a new design:

- Operation by keypad setting and reproducibility are significantly enhanced.
- Digital interfaces allow for direct connection of PCs for automation and documentation of processes.

The beginning of a new millenium is characterized by the introduction of

- 'Presto' Highly Dynamic Temperature Control Systems
- 'Forte HT' High Temperature Circulators



The perfect solution for every requirement and budget!

The totally NEW line, introduced in fall 2003, features three main product groups: '**Economy**', '**TopTech**' and '**HighTech**' Series. The appealing and registered design includes a number of unique technical advantages, as well as a range of new patented warning functions.



Further new products such as calibration baths and 'SemiChill' recirculating coolers for industrial applications expand the product range. Immersion coolers and water baths are equipped with the latest digital technology and offer great price/performance ratio.

During Achema 2006 JULABO presented

- **Recirculating Coolers: The FL Series**



- **'Magnum 91' – the powerful temperature control system**
- **Cryo-Compact Circulators**



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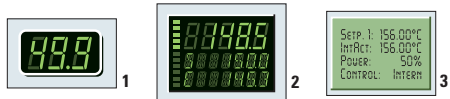
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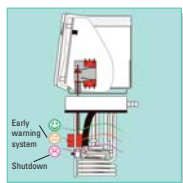
The 'Economy', 'TopTech' and 'HighTech' circulator series include user-friendly design and incorporate the latest state-of-the-art technology to give YOU the highest performance standards in the industry, as well as enhanced warning and safety functions!

JULABO sets bright standards



JULABO circulators and temperature control systems offer large, easy-to-read displays (LED) (fig. 1). The VFD COMFORT-DISPLAY (fig.2) allows simultaneous indication of 3 temperature values. The Temperature Control Systems additionally indicate the selected pump stage and filling volume. The backlit LCD Dialog-Display (fig.3) offers interactive operation with easy-to-read text.

JULABO early warning system (patented) for observation of the filling level



Fluid losses in the circulator bath are recognized before shutdown is necessary. An intermittent signal sounds and an optical signal is displayed. Refill the bath tank in time before the built-in low liquid level protection is triggered and the process is unnecessarily interrupted.

Outstanding: The professional JULABO control electronics

PID 1 PID1, PID2 and PID3 control offer fixed control parameters (Xp, Tn, Tv). These can be manually changed with PID2 and PID3 to reach an improved temperature stability, especially for external temperature control.

ICC ICC (Intelligent Cascade Control) represents the supreme solution temperature control. ICC offers perfect temperature control with self-optimizing PID control parameters.

TCF TCF offers additional functions such as band limit, limit setting, co-speed factor and control dynamics. For more details, please see page 66.

ICC temperature control is implemented in the JULABO circulators of the 'HighTech' series, Highly Dynamic Temperature Control Systems and LC6 Programmable Controller.

Highly Dynamic Temperature Control Systems 'Presto®' and 'Magnum 91' are at the forefront of liquid temperature control technology. They are suitable for highly demanding external temperature applications without the requirement to changing bath fluids (e.g. in wide temperature ranges from -40 to +250 °C).

Integrated and easy operation



The key arrangement is very similar for all JULABO products. The systems are simple to operate using the splash-proof and easy-to-clean keypads. The menu allows setting of additional functions for process optimization, such as for example autostart mode, interface configuration, etc.

JULABO early warning system (patented) for high and low temperature limits



If the selected limits are exceeded – caused by e.g. exothermic reactions – optical and audible alarms are triggered.

Low temperature protection with cut-off function

If a low temperature protection with cut-off function, instead of a warning function is preferred, it can be programmed using the keypad.

Intelligent pump systems

The new circulating pumps feature high performance data and high efficiency. The pump motor allows:

- SMART PUMP** • Electronic adjustment of the pump capacity in 4 stages via the keypad.
- Automatic adjustment of the pump capacity for changing viscosity levels.

- The 'HighTech' electronics ensure problem-free and safe operation – even using bath fluids with a high viscosity.

Integrated supplementary and protection functions

JULABO circulators and temperature control systems additionally incorporate

- Standby display and automatic self-test
- Monitoring of sensors and sensor temperature differentials
- Online diagnosis with 'BlackBox' function
- Overload protection for pump motor

Instruments with integrated refrigeration are suitable for wide working temperature ranges. For applications around ambient temperature, a unit with refrigeration is recommended.

Additional benefits of JULABO refrigeration systems

- Ventilation-air-cooling of condenser and compressor, air flow is typically from the front: directs discharged air to the rear.
- Permissible ambient temperature up to +40 °C for all single-stage models – only offered by JULABO! Ultra-low models with two-stage cascaded technology are suitable for ambient temperatures of up to 35 °C.
- No side vents – units can be located closely next to each other.
- No negative thermal impact to the left or right of the unit.



- Active Cooling Control: Cooling available throughout the entire temperature range.



- FP models: proportional cooling control – cooling capacity is automatically adjusted (saves energy).

- Automatic shutdown of the refrigeration unit when no cooling is required (except F12 refrigeration unit and models with ED circulator).
- Heated top cover plates on all JULABO ultra-low units prevent ice build-up and condensation at low temperatures.
- Overload protection for refrigeration unit.

Thermo-dynamics and processor technology

By combining highly intelligent control electronics, the latest refrigeration technology and optimized fluid dynamics, JULABO products achieve the market leading temperature stability and efficiency. Cooling is produced by a built-in cooling coil (9) in the bath tank. In the powerful units, cooling is adapted to the actual requirements of the application via a solenoid valve control system or a stepper motor controlled expansion valve to ensure high efficiency.

Highly Dynamic Temperature Control Systems (pages 41 to 44) provide a closed construction design (see illustration).

Equipped alternatively with fan-air-cooling or water-cooling, these systems ensure maximum performance across the entire working temperature range.

Front removable venting grid and drain!



JULABO Refrigerated Circulators, Temperature Control Systems and Recirculating Coolers have a removable venting grid.

Inevitable dust accumulation can easily be removed from the condenser. The drain is easily accessible from the front of the unit when the venting grid is removed.

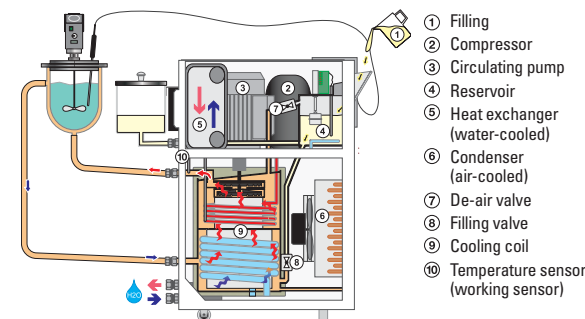
JULABO Model designations for Refrigeration Units

- F** = Frigus, Froid, Frio (stand for 'cold' in Latin, French and Spanish).
- FP** = Proportional cooling control energy-saving especially implemented in high performance units.
- FPW** = Water-cooled, powerful models. Benefit: Virtually no heat generation into ambient air, low noise level.

For cooling of FPW models, a cooling water system (industrial water) is recommended instead of tap water cooling – in recognition of environmental concerns.

The number after the model designation relates to the lowest achievable temperature inside the bath tank. Example: FP50 = -50 °C.

In combination with the basic circulator (pages 8 to 9) the **complete model designation** is formed (e.g. FP50-HL).



All natural resources deserve careful consideration, and especially precious potable water. Using tap water for cooling purposes in the laboratory is perhaps one of the most wasteful and easily resolved consumption problems!

JULABO Recirculating Coolers

The units have a keypad and LED display. They include a refrigerated unit with fan-air-cooling; more powerful units are alternatively available with water-cooling.

For simple cooling tasks of small objects, the AWC100 air-to-water recirculating cooler (illustrated on page 47) is sufficient.

The NEW 'FL' series



The new product line (details on pages 48 to 51) include recirculating coolers for applications requiring cooling capacities from 0.3 to 11 kW.

The 'FC' series is suitable for heating and cooling tasks from -20 to +80 °C with a high temperature stability.

For constant cooling via a cooling loop, JULABO offers a wide range of recirculating coolers (for details please refer to page 47 to 56). This product group is designed to remove heat and control temperature economically and with minimal impact on the environment.

Benefits of JULABO recirculating coolers:

- **Operation in ambient temperatures up to +40 °C**
- **No side vents** – units can be located closely next to each other.
- **No negative thermal impact** to the left or right of the unit.



- **Removable venting grid:** Hassle-free cleaning of the condenser
- **Drain easily accessible**

'SemiChill' Recirculating Coolers for most demanding requirements

These powerful units, up to 10 kW cooling capacity, are designed for special demands such as those required in semiconductor industries or common industrial fields. The modular concept allows YOU to customize your 'SemiChill' unit to your requirements.

What the JULABO product line features additionally ...

Lab Automation & Software



'EasyTemp' control software - free of charge!



'EasyTemp Professional': the software for more complex tasks. For details please refer to page 57.

Water Baths



The units offer keypad, LED display and splash proof main switch (pages 58/59).

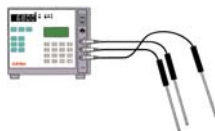
Shaking Water Baths



The units offer warning functions and electronically adjustable shaking frequency (pages 60/61).

Temperature Controllers, Programmable Controller and Programmer

for measuring, controlling and monitoring of any electrically heated equipment are described on pages 62 and 63.



JULABO units for special applications are illustrated on pages 63 and 64. FAQs are on pages 66 and 67!

- Combinatorial chemistry
- Beer forcing (aging) test
- MOCVD

The table on the next page allows you to choose the appropriate JULABO unit.



Selection criteria – Choose the appropriate JULABO unit for YOUR application

| JULABO Circulators | Catalog pages: | 10 to 13 | 14 to 17 | 18 to 19 | 20 to 21 | 22 to 23 | 24 to 25 | 26 to 27 | 28 to 30 | 37 to 39 | 41 to 44 | 47 to 51 | 52 to 55 | 53 to 55 | 58 to 61 |
|---|---------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Heating Immersion Circulators | +20 to +100/+150 °C | ● | | | | | | | | | | | | | |
| Bridge Mounted Circulator | +20 to +300 °C | ● | | | | | | | | | | | | | |
| Open Heating Bath Circulators | +20 to +60/+100 °C | ● | | | | | | | | | | | | | |
| Heating Circulators with Open Bath | +20 to +60/+100 °C | | ● | | | | | | | | | | | | |
| Heating Circulators | +20 to +100/+150 °C | | ● | | | | | | | | | | | | |
| Heating Circulators | +20 to +200 °C | | ● | | | | | | | | | | | | |
| Heating Circulators | +20 to +250/+300 °C | | ● | | | | | | | | | | | | |
| High Temperature Circulators | +40/+70 to +400 °C | | | ● | | | | | | | | | | | |
| Refrigerated/Heating Circulators | -20/-30 to +100 °C | | | | ● | ● | | | | | | | | | |
| Refrigerated/Heating Circulators | -20/-35 to +150 °C | | | | ● | | ● | | | | | | | | |
| Refrigerated/Heating Circulators | -20/-28 to +200 °C | | | | | ● | ● | | | | | | | | |
| Refrigerated/Heating Circulators | -30/-35 to +200 °C | | | | | ● | ● | | | | | | | | |
| Refrigerated/Heating Circulators | -40/-50 to +200 °C | | | | | ● | ● | | | | | | | | |
| Cryo-Compact Circulators | -30/-40 to +150 °C | | | | | | | ● | | | | | | | |
| Ultra-Low Refrigerated Circulators | -30/-40 to +200 °C | | | | | | | ● | | | | | | | |
| Ultra-Low Refrigerated Circulators | -60/-95 to +100 °C | | | | | | | | ● | | | | | | |
| Ultra-Low Refrigerated Circulators | -60/-91 to +150 °C | | | | | | | | ● | | | | | | |
| Visco Baths | +20 to +60/+100 °C | | | | | | | | | | | ● | | | |
| Visco Baths | +20 to +150 °C | | | | | | | | | | | ● | | | |
| Calibration Baths | -30 to +200 °C | | | | | | | | | | | ● | | | |
| Calibration Baths | +50 to +300 °C | | | | | | | | | | | ● | | | |
| Temperature Control Systems | | | | | | | | | | | | | | | |
| 'Presto' | -40/-50 to +250 °C | | | | | | | | | | | | | ● | |
| 'Presto' | -80 to +250 °C | | | | | | | | | | | | | ● | |
| 'Magnum 91' | -91 to +250 °C | | | | | | | | | | | | | ● | |
| Recirculating Coolers | | | | | | | | | | | | | | | |
| COMPACT Recirculating Coolers | +5/+20 to +40 °C | | | | | | | | | | | | | | ● |
| The 'FL' series | -20 to +40 °C | | | | | | | | | | | | | | ● |
| The 'FC' series | -10/-20 to +80 °C | | | | | | | | | | | | | | ● |
| 'SemiChill' | -20/+5 to +35/+80/+130 °C | | | | | | | | | | | | | | ● |
| Water Baths | +20 to +99.9 °C | | | | | | | | | | | | | | ● |
| Shaking Water Baths | +20 to +99.9 °C | | | | | | | | | | | | | | ● |
| Selection according to effective cooling capacity | | | | | | | | | | | | | | | |
| Circulators, Temperature Control Systems and Recirculating Coolers | | | | | | | | | | | | | | | |
| Cooling capacity at +20 °C working temperature | 0.15 to 0.26 kW | | | | ● | ● | ● | | | | | | | ● | |
| Cooling capacity at +20 °C working temperature | 0.38 to 0.6 kW | | | | ● | ● | ● | ● | ● | ● | | | | ● | ● |
| Cooling capacity at +20 °C working temperature | 0.68 to 0.96 kW | | | | ● | ● | ● | | ● | | | | | ● | ● |
| Cooling capacity at +20 °C working temperature | 1.2 to 5.5 kW | | | | | | | | ● | | | | | ● | ● |
| Cooling capacity at +20 °C working temperature | 7.0 to 11.0 kW | | | | | | | | | | | | | ● | ● |

The 'Economy' Series

-35 °C to +150 °C



ED & EH Circulators

The 'TopTech' Series

-88 °C to +200 °C



MB & MC Circulators



ME Circulator

For routine laboratory applications

- LED temperature display, resolution 0.1 °C
- Keypad 1
- PID temperature control
- Adjustable high temperature cut-off or dry-running protection

ED circulator (-30 °C to +100 °C)

S1 Classification I (DIN 12876-1) with adjustable high temperature cut-off. JULABO benefit: supplementary low liquid level protection

EH circulator (-35 °C to +150 °C)

S3 Classification III (DIN 12876-1) with adjustable high temperature cut-off and low liquid level protection



EH model (rear view) with connection for ③ Refrigeration unit

The product group with the broadest range of applications

- MULTI-DISPLAY (LED), resolution 0.1 °C
- Keypad 3 with menu functions PID2, ATC3
- PID2 PID temperature control
- ATC3 Absolute Temperature Calibration
- RS232 Online communication
- Early warning system for low liquid level
- Early warning system for high/low temperature limits
- Adjustable high temperature cut-off visible via LED

MB circulator (-30 °C to +100 °C)

S1 Classification I (DIN 12876-1) with supplementary low liquid level protection

MC circulator (-50 °C to +200 °C)

Intelligent pump system
S3 Classification III (DIN 12876-1)



MB/MC models (rear view) with connections for ② RS232 interface ③ Refrigeration unit/solenoid valve

The 'STAR' with programmer and connection for ext. Pt100 sensor

- VFD* COMFORT-DISPLAY, resolution 0.1 °C
- Illuminated display for pump stages 1 to 4
- Keypad 3 with menu functions PID3, ATC3, Smart Pump
- PID3 PID cascade temperature control
- ATC3 Absolute Temperature Calibration
- SMART PUMP Intelligent pump system
- Pt100 External sensor connection
- RS232 Online communication
- Integrated programmer
- Early warning system for low liquid level
- Early warning system for high/low temperature limits
- Adjustable high temperature cut-off visible via VFD
- S3** Classification III (DIN 12876-1)

ME model (rear view) as heating circulator

with connections for ① External Pt100 sensor ② RS232 interface ③ Refrigeration unit/solenoid valve



The 'HighTech' Series

-95 °C to +300 °C



HE & SE Circulators



HL & SL Circulators

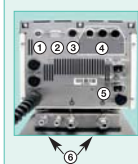
Supreme temperature control solutions for the most demanding applications with powerful pressure/suction pump systems

- VFD* COMFORT-DISPLAY, resolution 0.01 °C
- Illuminated display for pump stages 1 to 4
- Keypad 3 with menu functions ICC, TCF, ATC3, Smart Pump
- ICC Intelligent Cascade Control
- TCF Temperature Control Features
- ATC3 Absolute Temperature Calibration
- SMART PUMP Intelligent pump system
- Pt100 External sensor connection
- RS232 Online communication
- Integrated programmer
- Early warning system for low liquid level
- Early warning system for high/low temperature limits
- Adjustable high temperature cut-off visible via VFD
- Classification III (DIN 12876-1)

Top-of-the-line-models: even EASIER to use and upgradeable with HSP booster pump + HST booster heater

- VFD* COMFORT-DISPLAY, resolution 0.01 °C
- Illuminated display for pump stages 1 to 4
- LCD DIALOG-DISPLAY
- Keypad 3 with menu functions ICC, TCF, ATC3, Smart Pump
- ICC Intelligent Cascade Control
- TCF Temperature Control Features
- ATC3 Absolute Temperature Calibration
- SMART PUMP Intelligent pump system
- Pt100 External sensor connection
- RS232 Online communication
- Integrated programmer
- 'Stakei' connections for solenoid valve or booster heater/pump
- Early warning system for low liquid level
- Early warning system for high/low temperature limits
- Adjustable high temperature cut-off visible via VFD
- Classification III (DIN 12876-1)

The 'HighTech' series (rear view):



with connections for

- ① External Pt100 sensor
- ② RS232 / RS485 interface
- ③ Refrigeration unit / solenoid valve
- ④ **Electronic module** (option)
- ⑤ 'Stakei' connections (HL, SL models)
- ⑥ Connections for pump and cooling coil

Option for the 'HighTech' series:



Electronic module with analog connections
(order no. 8 900 100)

- Ⓐ Alarm output
- Ⓑ Standby input
- Ⓒ Analog interface with one input and two outputs for external programming, flow sensor or temperature recorder (current/voltage), scalable

JULABO Heating Immersion Circulators form the basis for the 'Economy' and 'TopTech' product line featuring a mechanically adjustable pressure pump (patented).

JULABO Heating Immersion Circulators are suitable for a wide range of applications and feature the following:

- For bath tanks up to 50 liters
- With bath attachment clamp for wall thickness to 1 inch
- Immersion depth 6.5 inches, reducible to 5.7 inches
- Wetted parts and housing made of high quality stainless steel or plastic
- Low liquid level protection, also for the ED model (classification I): Signals refilling is necessary before the boiling point of the bath fluid is reached



The 'Economy' Series

The 'ED' circulator is suitable for working temperatures to +100 °C when non-flammable bath fluids are used. Highly competitive model in respect of price/performance.

The 'EH' model covers an expanded working temperature range to +150 °C and is suitable for flammable bath fluids. The performance data is the same as for the 'ED' model.

The 'TopTech' Series

These units are designed for more demanding applications and provide an improved operating comfort with menu functions, warning and safety installations, such as

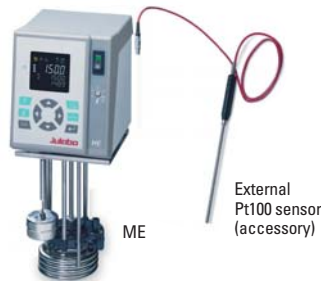
an early detection system with audible signal in case of fluid losses or if the setpoint temperature is exceeded. All models have an RS232 interface.



The 'MB' model is suitable for working temperatures to +100 °C and for small bath volumes up to 20 liters. It also features a **low noise level**.

The 'MC' model provides

- High pump capacity
- **Pump pressure control** and an expanded working temperature range to +200 °C.



The 'ME' model – **'STAR' of the 'TopTech' series** – includes the features of the 'MC' model. **Additional technical highlights are:**

- VFD COMFORT-DISPLAY for the SIMULTANEOUS indication of 3 temperature values and illuminated display for selected pump stage
- External Pt100 sensor
- Integrated programmer (1 x 10 program steps)

Accessories (pages 31, 32)

- Pump set for external temperature applications
- Installation cooling coil
- External Pt100 sensors (for ME model)

The 'HighTech' Series

The 'SE-Z' bridge mounted circulator is suitable for bath tanks up to 100 liters.

- With the stainless steel bridge (extendable from 12.2 to 26 inches) it can easily be placed on the bath tank.
- Immersion depth 4.7 to 7.5 inches
- Built-in cooling coil

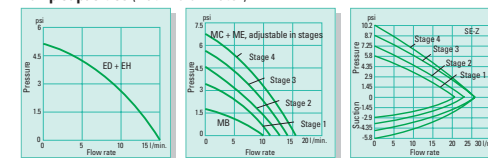


Additional features

- Working temperature range up to +300 °C
- VFD COMFORT-DISPLAY for the SIMULTANEOUS indication of 3 temperature values and illuminated display for selected pump stage
- Early detection system with audible signal (e. g. in case of fluid losses, etc.)
- External Pt100 sensor (accessory)
- Integrated programmer (1 x 10 program steps)

The powerful pressure and suction pump allows an optimum bath circulation and connection of external systems requiring temperature application.

Pump capacities (Bath fluid: Water)



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity | Cooling coil | Usable immersion depth in | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---------------|--------------|---------------------------|-------------------------|------------|--|
|------------------|--------------|--------------------------------------|----------------|---------------|---------------|--------------|---------------------------|-------------------------|------------|--|

Heating Immersion Circulators

– The 'Economy' Series –

Technical features (see fold-out page)



| | | | | | | | | | | |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|
| 9 115 000 | ED | 20 ... 100 | ±0.03 | 1 | see diag. | Optional | 3.2 – 5.7 | 5.1 x 5.9 x 13 | 7.3 | 115/60/9 |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|



| | | | | | | | | | | |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|
| 9 117 000 | EH | 20 ... 150 | ±0.03 | 1 | see diag. | Optional | 3.2 – 5.7 | 5.1 x 5.9 x 13 | 7.3 | 115/60/9 |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|

Heating Immersion Circulators

– The 'TopTech' Series –



| | | | | | | | | | | |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|
| 9 140 000 | MB | 20 ... 100 | ±0.02 | 1 | see diag. | Optional | 3.2 – 5.7 | 5.1 x 5.9 x 13 | 7.3 | 115/60/9 |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|



| | | | | | | | | | | |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|
| 9 150 000 | MC | 20 ... 200 | ±0.01 | 1 | see diag. | Optional | 3.2 – 5.7 | 5.1 x 5.9 x 13 | 8.8 | 115/60/9 |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|



| | | | | | | | | | | |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|
| 9 160 000 | ME | 20 ... 200 | ±0.01 | 1 | see diag. | Optional | 3.2 – 5.7 | 5.1 x 5.9 x 13 | 8.8 | 115/60/9 |
|-----------|----|------------|-------|---|-----------|----------|-----------|----------------|-----|----------|

Bridge Mounted Circulator



| | | | | | | | | | | |
|-----------|------|------------|-------|---|-----------|------------|-----------|-------------------|------|------------------|
| 9 250 218 | SE-Z | 20 ... 300 | ±0.01 | 3 | see diag. | Integrated | 4.7 – 7.5 | 12.6 x 6.7 x 15.8 | 17.6 | 208-230/50-60/14 |
|-----------|------|------------|-------|---|-----------|------------|-----------|-------------------|------|------------------|

¹⁾ For temperature applications at or near ambient use a counter cooling coil or JULABO immersion cooler.

²⁾ Other voltages available on request

Included with SE-Z: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

Open Heating Bath Circulators are used for accurate temperature control of samples placed in the circulator bath. The circulator – mounted on a bridge – can easily be removed from the bath.

Open bath tanks made of high quality stainless steel with insulated bath mantle, or bath tanks made of either Plexiglas® or Makrolon® are also available.

Open Heating Bath Circulators with transparent bath tank

- Plexiglas® (designation 'A') to +60 °C
- Makrolon® (designation 'M') to +100 °C

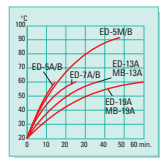
- Available:
- Space-saving units with a compact design (bath volume of 5 or 7 liters)
 - Units with large bath tanks, fitted with supports for test tube racks and handles

Accessories (see page 32)

- Test tube racks
- Immersion-height adjustable platforms
- Cooling coils

Heat-up times (230 V)

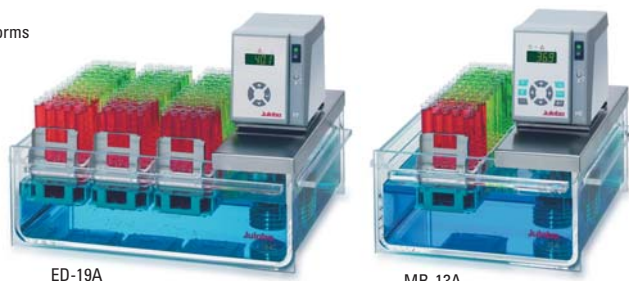
Bath fluid: Water



ED-5A/B ED-5M/B ED-7A/B

Insert capacity for test tubes 13 mm / 17 mm dia.

| | | | |
|---------|---------|----------------|----------------|
| ED-5A/B | ED-7A/B | ED-13A, ED-13M | ED-19A, ED-19M |
| ED-5M/B | | MB-13A | MB-19A |
| 60 / 40 | 90 / 60 | 90 / 60 | 270 / 180 |



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity l/min. psi | Cooling coil | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|--------------------------|--------------|---------------------------------------|-----------------------|-------------------------|------------|--|
|------------------|--------------|--------------------------------------|----------------|---------------|--------------------------|--------------|---------------------------------------|-----------------------|-------------------------|------------|--|

Open Heating Bath Circulators

– The 'Economy' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|---------|--|-------|------|------|-----|----------|-------------------|----|-------------------|------|----------|
| | | 999 | RS232 | PID1 | ATC3 | S1 | | | | | | |
| 9 115 317 | ED-5A/B | 20 ... 60 | ±0.03 | 1 | 15 | 5.1 | -- | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.7 | 115/60/9 |
| 9 115 317 | ED-7A/B | 20 ... 60 | ±0.03 | 1 | 15 | 5.1 | -- | 4.7 x 13.4 / 5.9 | 7 | 5.5 x 19.7 x 13.8 | 12.3 | 115/60/9 |
| 9 115 515 | ED-5M/B | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | -- | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.5 | 115/60/9 |
| 9 115 313 | ED-13A | 20 ... 60 | ±0.03 | 1 | 15 | 5.1 | Optional | 7.1 x 11.8 / 5.9 | 13 | 16.1 x 13 x 14.1 | 16.5 | 115/60/9 |
| 9 115 319 | ED-19A | 20 ... 60 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.2 x 11.8 / 5.9 | 19 | 21.7 x 13 x 14.1 | 18.7 | 115/60/9 |
| 9 115 513 | ED-13M | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 7.1 x 11.8 / 5.9 | 13 | 16.1 x 13 x 14.6 | 16.5 | 115/60/9 |
| 9 115 519 | ED-19M | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.2 x 11.8 / 5.9 | 19 | 21.7 x 13 x 14.6 | 18.7 | 115/60/9 |

Open Heating Bath Circulators

– The 'TopTech' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|--------|--|-------|------|------|-------|----------|-------------------|----|------------------|------|----------|
| | | 999 | RS232 | PID2 | ATC3 | RS232 | RS232 | ATC3 | S1 | | | |
| 9 140 313 | MB-13A | 20 ... 60 | ±0.02 | 1 | 10 | 1.7 | Optional | 7.1 x 11.8 / 5.9 | 13 | 16.1 x 13 x 14.1 | 16.5 | 115/60/9 |
| 9 140 319 | MB-19A | 20 ... 60 | ±0.02 | 1 | 10 | 1.7 | Optional | 14.2 x 11.8 / 5.9 | 19 | 21.7 x 13 x 14.1 | 18.7 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: use a counter cooling coil or JULABO immersion cooler.

²⁾ Other voltages available on request

Open Heating Bath Circulators with stainless steel bath tank

- Large bath opening for samples of any kind or JULABO test tube racks
- Fitted with supports and handles

Insert capacity for test tubes 13 mm / 17 mm dia.

| | | |
|-----------------------|-----------------------|-----------|
| ED-13 / MB-13 / MB-17 | ED-19 / ED-27 / MB-19 | ED-33 |
| 90 / 60 | 270 / 180 | 540 / 360 |

Accessories (see pages 31 and 32)

- Lift-up and flat bath covers
- Test tube racks
- Cooling coil
- Immersion-height adjustable platforms

Application Examples

for circulators on pages 12 & 13

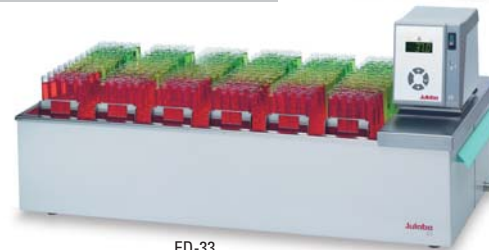
- Preparation of samples Temp. applications
- for serology and
 - clinical chemistry
 - Analyticals
 - Material testing



MB-13



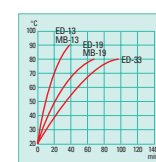
ED-19



ED-33

Heat-up times (230 V)

Bath fluid: Water



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity l/min. psi | Cooling coil | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|--------------------------|--------------|---------------------------------------|-----------------------|-------------------------|------------|--|
|------------------|--------------|--------------------------------------|----------------|---------------|--------------------------|--------------|---------------------------------------|-----------------------|-------------------------|------------|--|

Open Heating Bath Circulators

– The 'Economy' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|-------|--|-------|------|------|-----|----------|-------------------|----|--------------------|------|----------|
| | | 999 | RS232 | PID1 | ATC3 | S1 | | | | | | |
| 9 115 413 | ED-13 | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 7.1 x 11.8 / 5.9 | 13 | 15.4 x 13 x 14.6 | 17.6 | 115/60/9 |
| 9 115 419 | ED-19 | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.2 x 11.8 / 5.9 | 19 | 22.4 x 13 x 14.6 | 24.3 | 115/60/9 |
| 9 115 427 | ED-27 | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.1 x 11.8 / 7.9 | 27 | 22.4 x 14.6 x 16.5 | 28.7 | 115/60/9 |
| 9 115 433 | ED-33 | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Optional | 26.4 x 11.8 / 5.9 | 33 | 35.8 x 13 x 15 | 44.1 | 115/60/9 |

Open Heating Bath Circulators

– The 'TopTech' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|-------|--|-------|------|------|-------|----------|-------------------|----|------------------|------|----------|
| | | 999 | RS232 | PID2 | ATC3 | RS232 | RS232 | ATC3 | S1 | | | |
| 9 140 413 | MB-13 | 20 ... 100 | ±0.02 | 1 | 10 | 1.7 | Optional | 7.1 x 11.8 / 5.9 | 13 | 15.4 x 13 x 14.6 | 17.6 | 115/60/9 |
| 9 140 417 | MB-17 | 20 ... 100 | ±0.02 | 1 | 10 | 1.7 | Optional | 7.1 x 11.8 / 7.9 | 17 | 15.4 x 13 x 16.5 | 22.0 | 115/60/9 |
| 9 140 419 | MB-19 | 20 ... 100 | ±0.02 | 1 | 10 | 1.7 | Optional | 14.2 x 11.8 / 5.9 | 19 | 22.4 x 13 x 14.6 | 24.3 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: use a counter cooling coil or JULABO immersion cooler.

²⁾ Other voltages available on request

Heating Circulators with Open Bath with transparent bath tank

These units are designed for

- Temperature applications in the circulator bath
- as well as for temperature control of smaller external devices, such as measuring cells.

Bath tanks made of:

- Plexiglas® (designation 'A') to +60 °C
- Makrolon® (designation 'M') to +100 °C

The 'Economy' Series

ED-5A and ED-5M both offer the latest digital technology at highly competitive prices.

The 'TopTech' Series

These units are designed for more demanding applications and provide improved functionality with warning functions, such as

- **early detection system in case of liquid losses**

Accessories

- Large selection of test tube racks (see page 32)

Application Examples

for circulators on pages 14 & 15

- Clinical chemistry, analytics
- External temperature control, e.g. for measuring cells, photometers, refractometers, polarimeters

| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity Flow rate/Press. l/min. psi | Counter cooling coil | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---|----------------------|---------------------------------------|-----------------------|-------------------------|------------|--|
|------------------|--------------|--------------------------------------|----------------|---------------|---|----------------------|---------------------------------------|-----------------------|-------------------------|------------|--|

Heating Circulators with Open Bath

– The 'Economy' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|-------|--|-------|-------|------------------|-------|---------|-----------------|---|-------------------|------|----------|
| | | 489 | 800 | PID 1 | ATC ³ | RS232 | 800 | S1 | | | | |
| 9 115 305 | ED-5A | 20 ... 60 | ±0.03 | 1 | 15 | 5.1 | Integr. | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.7 | 115/60/9 |
| 9 115 505 | ED-5M | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Integr. | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.5 | 115/60/9 |

Heating Circulators with Open Bath

– The 'TopTech' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|-------|--|-------|-------|------------------|-------|---------|------------------|---|-------------------|------|----------|
| | | 800 | 800 | PID 2 | ATC ³ | RS232 | 800 | S1 | | | | |
| 9 140 305 | MB-5A | 20 ... 60 | ±0.02 | 1 | 10 | 1.7 | Integr. | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.7 | 115/60/9 |
| 9 140 307 | MB-7A | 20 ... 60 | ±0.02 | 1 | 10 | 1.7 | Integr. | 4.7 x 13.4 / 5.9 | 7 | 5.5 x 19.7 x 13.8 | 12.3 | 115/60/9 |
| 9 140 505 | MB-5M | 20 ... 100 | ±0.02 | 1 | 10 | 1.7 | Integr. | 4.7 x 9.5 / 5.9 | 5 | 5.5 x 15.8 x 13.8 | 11.5 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: counter-cooling with tap water via built-in cooling coil.

²⁾ Other voltages available on request

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

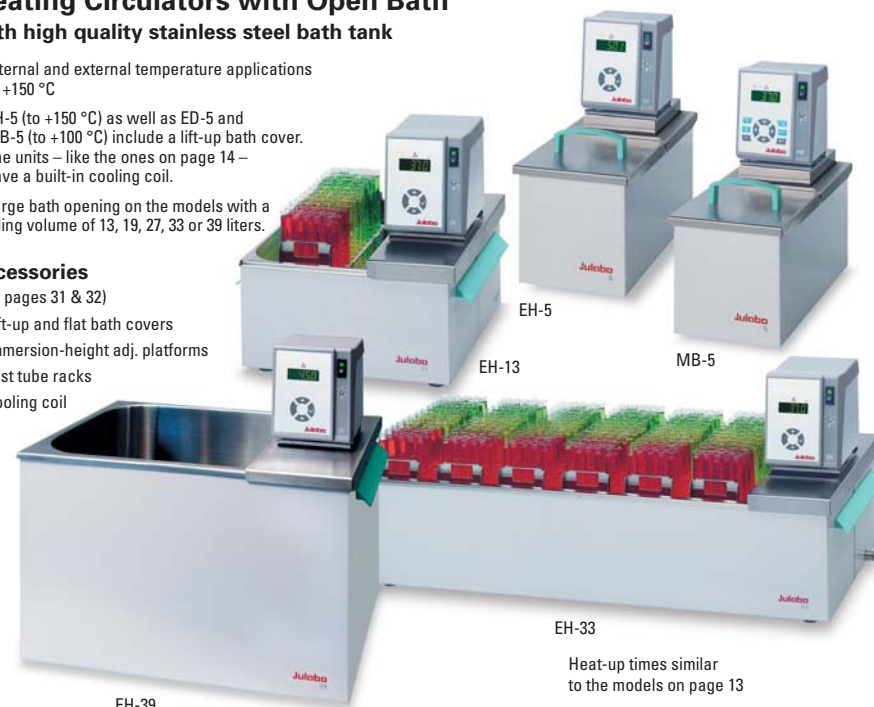
Heating Circulators with Open Bath with high quality stainless steel bath tank

- Internal and external temperature applications to +150 °C
- EH-5 (to +150 °C) as well as ED-5 and MB-5 (to +100 °C) include a lift-up bath cover. The units – like the ones on page 14 – have a built-in cooling coil.
- Large bath opening on the models with a filling volume of 13, 19, 27, 33 or 39 liters.

Accessories

(see pages 31 & 32)

- Lift-up and flat bath covers
- Immersion-height adj. platforms
- Test tube racks
- Cooling coil



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity Flow rate/Press. l/min. psi | Counter cooling coil | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---|----------------------|---------------------------------------|-----------------------|-------------------------|------------|--|
|------------------|--------------|--------------------------------------|----------------|---------------|---|----------------------|---------------------------------------|-----------------------|-------------------------|------------|--|

Heating Circulators with Open Bath

– The 'Economy' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|------|--|-------|-------|------------------|-------|---------|-----------------|-----|-----------------|------|----------|
| | | 489 | 800 | PID 1 | ATC ³ | RS232 | 800 | S1 | | | | |
| 9 115 405 | ED-5 | 20 ... 100 | ±0.03 | 1 | 15 | 5.1 | Integr. | 5.9 x 5.9 / 5.9 | 4.5 | 6.7 x 13 x 14.1 | 15.4 | 115/60/9 |

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|-------|--|-------|-------|------------------|-------|----------|--------------------|-----|--------------------|------|----------|
| | | 800 | 800 | PID 1 | ATC ³ | RS232 | 800 | S3 | | | | |
| 9 117 405 | EH-5 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Integr. | 5.9 x 5.9 / 5.9 | 4.5 | 6.7 x 13 x 14.1 | 15.4 | 115/60/9 |
| 9 117 413 | EH-13 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Optional | 7.1 x 11.8 / 5.9 | 13 | 15.4 x 13 x 14.6 | 17.6 | 115/60/9 |
| 9 117 419 | EH-19 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.2 x 11.8 / 5.9 | 19 | 22.4 x 13 x 14.6 | 24.3 | 115/60/9 |
| 9 117 427 | EH-27 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.1 x 11.8 / 7.9 | 27 | 22.4 x 14.6 x 16.5 | 28.7 | 115/60/9 |
| 9 117 433 | EH-33 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Optional | 26.4 x 11.8 / 5.9 | 33 | 35.8 x 13 x 15 | 44.1 | 115/60/9 |
| 9 117 439 | EH-39 | 20 ... 150 | ±0.03 | 1 | 15 | 5.1 | Optional | 14.1 x 11.8 / 11.8 | 39 | 21.3 x 13.4 x 20.5 | 41.9 | 115/60/9 |

Heating Circulators with Open Bath

– The 'TopTech' Series –

| | | Technical features (see fold-out page) | | | | | | | | | | |
|-----------|------|--|-------|-------|------------------|-------|---------|-----------------|-----|-----------------|------|----------|
| | | 800 | 800 | PID 2 | ATC ³ | RS232 | 800 | S1 | | | | |
| 9 140 405 | MB-5 | 20 ... 100 | ±0.02 | 1 | 10 | 1.7 | Integr. | 5.9 x 5.9 / 5.9 | 4.5 | 6.7 x 13 x 14.1 | 15.4 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: use a counter cooling coil or JULABO immersion cooler.

²⁾ Other voltages available on request

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

The 'TopTech' Series
for working temperatures to +200 °C

With patented early warning system at low liquid level

- External temperature control applications of closed systems
- Simultaneous operation in the circulator bath
- Electronically adjustable pump capacity 'Smart Pump'
- Built-in cooling coil
- Optional use of the MVS controller and solenoid valve (see pages 33 & 34) requires only low tap water consumption
- Warning and safety installations such as early detection system in case of fluid losses or if the setpoint temperature is exceeded
- RS232 interface

There are four 'MC' model combinations with differing filling volumes, bath openings and bath depths.

Additional benefits of the 'ME' circulators:

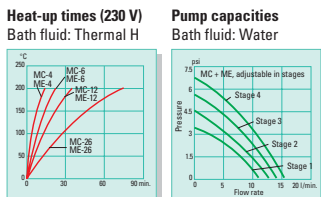
- External measurement and control with ext. Pt100 sensor
- VFD COMFORT-DISPLAY
- Temperature and time-dependent processes with integrated programmer
- Automatic control of exothermic reactions using tap water cooling (see pages 33 & 34 for details)

Accessories (see pages 32 & 33)

- External Pt100 sensor
- Bath lid with special cooling coil
- MVS controller and solenoid valve

Application Examples

- for circulators on pages 16 to 19
- External temperature control applications for
- Refractometers
 - Polarimeters
 - Photometers
 - Rotary viscometers



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity Flow rate/Pressure l/min./psi | Bath opening/bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---|--------------------------------------|-----------------------|-------------------------|------------|--|
| 9 150 504 | MC-4 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15 | 21.2 | 115/60/9 |
| 9 150 506 | MC-6 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 16.5 | 27.6 | 115/60/9 |
| 9 150 512 | MC-12 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 17.7 | 28.7 | 115/60/9 |
| 9 150 526 | MC-26 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 17.7 | 57.3 | 115/60/9 |

Technical features (see fold-out page)



| | | | | | | | | | | |
|-----------|-------|------------|-------|---|---------------|------------------|-----|--------------------|------|----------|
| 9 150 504 | MC-4 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15 | 21.2 | 115/60/9 |
| 9 150 506 | MC-6 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 16.5 | 27.6 | 115/60/9 |
| 9 150 512 | MC-12 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 17.7 | 28.7 | 115/60/9 |
| 9 150 526 | MC-26 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 17.7 | 57.3 | 115/60/9 |

Technical features: The red framed icons signify the differences to the 'MC' model



| | | | | | | | | | | |
|-----------|-------|------------|-------|---|---------------|------------------|-----|--------------------|------|----------|
| 9 160 504 | ME-4 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15 | 21.2 | 115/60/9 |
| 9 160 506 | ME-6 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 16.5 | 27.6 | 115/60/9 |
| 9 160 512 | ME-12 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 17.7 | 28.7 | 115/60/9 |
| 9 160 526 | ME-26 | 20 ... 200 | ±0.01 | 1 | 11-16 3.3-6.5 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 17.7 | 57.3 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: counter-cooling with tap water via built-in cooling coil. Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

²⁾ Other voltages available on request

The 'HighTech' Series
for working temperatures to +300 °C

MORE SPACE:
Pump connections on the rear

- External temperature control application to closed or open systems
- Highest precision and display resolution
- VFD COMFORT-DISPLAY for SIMULTANEOUS indication of 3 temperature values
- Powerful pressure and suction pump with electronically adjustable pump capacity 'Smart Pump'
- Adjustable pump capacity for varying viscosity levels of bath fluids
- Built-in cooling coil
- Programmer (1 x 10 program steps)
- Automatic control of exothermic reactions using tap water
- Professional PC connection – Profibus capability

Additional features of the top-of-the-line 'HL' circulators:

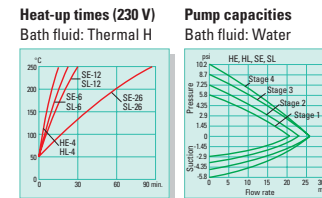
- Backlit LCD DIALOG-DISPLAY offers interactive operation in easy-to-read text
- Integrated programmer (6 x 60 steps)
- RS232 / RS485 interface
- Switchable between °C / °F

Accessories (see pages 32 & 33)

- Electronic module
- External Pt100 sensor
- Bath lid with special cooling coil
- Solenoid valve

Application Examples

- External temperature application processes, particularly e.g. a distillation apparatus or a miniplant installation



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity Flow rate/Pressure l/min./psi | Suction psi | Bath opening/ Bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---|-------------|---------------------------------------|-----------------------|-------------------------|--|
| 9 210 504 | HE-4 | 20 ... 250 | ±0.01 | 1 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15.8 | 115/60/10 |
| 9 250 506 | SE-6 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 17.3 | 208-230/50-60/14 |
| 9 250 512 | SE-12 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 18.5 | 208-230/50-60/14 |
| 9 250 526 | SE-26 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 18.5 | 208-230/50-60/14 |

Technical features: The red framed icons signify the differences to the 'ME' model (page 16)



| | | | | | | | | | | |
|-----------|-------|------------|-------|---|----------------|---------|------------------|-----|--------------------|------------------|
| 9 210 504 | HE-4 | 20 ... 250 | ±0.01 | 1 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15.8 | 115/60/10 |
| 9 250 506 | SE-6 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 17.3 | 208-230/50-60/14 |
| 9 250 512 | SE-12 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 18.5 | 208-230/50-60/14 |
| 9 250 526 | SE-26 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 18.5 | 208-230/50-60/14 |

Technical features: The red framed icons signify the differences to the 'HE'/'SE' models



| | | | | | | | | | | |
|-----------|-------|------------|-------|---|----------------|---------|------------------|-----|--------------------|------------------|
| 9 310 504 | HL-4 | 20 ... 250 | ±0.01 | 1 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 5.9 | 4.5 | 8.3 x 16.5 x 15.8 | 115/60/11 |
| 9 350 506 | SL-6 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 5.1 x 5.9 / 7.9 | 6 | 8.3 x 16.9 x 17.3 | 208-230/50-60/14 |
| 9 350 512 | SL-12 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 5.9 / 7.9 | 12 | 11.8 x 16.9 x 18.5 | 208-230/50-60/14 |
| 9 350 526 | SL-26 | 20 ... 300 | ±0.01 | 3 | 22-26 5.8-10.2 | 2.9-5.8 | 8.7 x 11.8 / 7.9 | 26 | 14.1 x 24 x 18.5 | 208-230/50-60/14 |

¹⁾ For temperature applications at or near ambient: counter-cooling with tap water via built-in cooling coil. Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

²⁾ Other voltages available on request

Forte HT30-M1 Forte HT60-M3

Working temperature range: **+70 °C ... +400 °C**

JULABO High Temperature Circulators have a compact, closed system and are ideally suited for wide working temperature ranges.

Benefits:

- Rapid heating according to diagram (A)
- High pump capacity, reducible via adapter (B)
- Small foot print
- Small filling volume
- Cooling water connection for applications at particularly high temperatures (cooling zone in unit)
- Wide working temperature range without changing bath fluids
- Avoids oxidation and cracking of the bath fluid. This ensures a prolonged lifetime of the bath fluids recommended by JULABO (e.g. Thermal H350).
- Can be easily integrated into a miniplant installation

- Time-saving filling process for the entire system with permanent air purge
- Expansion vessel (included as standard accessory) is used for filling process and serves as additional reservoir
- Automated De-Gas function
- Integrated warning, safety and supervision functions via 7 sensors

No unpleasant steam and odors



Separate control unit 'M1'

'HT30' circulator

- **Separate control unit:** with MULTI-DISPLAY (LED), LCD DIALOG-DISPLAY, illuminated display for filling level. Keypad is splash-proof.

Accessories (see page 34)

Technical specifications (see fold-out page)



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stability external °C | Temperature display/ resolution °C | Display for filling level | Heating capacity kW |
|------------------|--------------|------------------------|-----------------------------|------------------------------------|---------------------------|---------------------|
| 9 800 031 | HT30-M1 | +70 ... +400 | ±0.01 ... ±0.1 | LED + LCD / ±0.1 | illuminated display | 3 |
| 9 800 063 | HT60-M3 | +70 ... +400 | ±0.01 ... ±0.1 | LED + LCD / ±0.1 | illuminated display | 6 |
| 9 800 035 | HT30-M1-C.U. | +40 ... +400 | ±0.01 ... ±0.1 | LED + LCD / ±0.1 | illuminated display | 3 |
| 9 800 066 | HT60-M3-C.U. | +40 ... +400 | ±0.01 ... ±0.1 | LED + LCD / ±0.1 | illuminated display | 6 |

Forte HT30-M1, HT60-M3 with C.U. cooling unit

Working temperature range: **+40 °C ... +400 °C**

By using the optional C.U. cooling unit, the working temperature range can be broadened. Additionally, a higher cooling capacity is possible if a constant external water supply is connected.

Ambient temperatures up to +40 °C for all models!

Benefits:

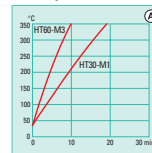
- Temperature application from +40 °C with controlled tap water cooling
- Rapid cooling to a low temperature value – see diagram (C)
- Dynamic control characteristics: Automatic control of exothermic reactions in the connected system (D)



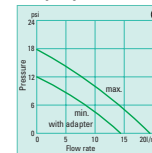
Separate control unit 'M3'

'HT60' circulator with C.U. cooling unit

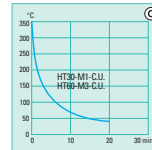
Heat-up times



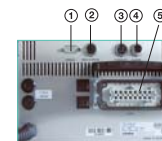
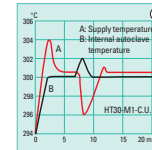
Pump capacities



Cool-down times



Automatic control with a 5 liter autoclave



Separate control unit (rear view)

- ① Serial interface RS232 / RS485
- ② Analog input for external programming
- ③ Standby input for ext. emergency cut-off
- ④ Connector for external alarm device
- ⑤ Connector for control cable to HT circulator

Bath fluid: JULABO Thermal H350

| Cooling cap. (water 20 °C) kW, max. | Pump capacity Flow rate l/min | Pressure psi | Filling vol. liters | IP class acc. to IEC 60529 | Dimensions Circulator / (W x L x H) in | Control unit | Weight incl. control unit lbs | Power requirement ¹⁾ V / Hz / A |
|-------------------------------------|-------------------------------|--------------|---------------------|----------------------------|--|-----------------|-------------------------------|--|
| - | 14 - 18 | 11.6 - 17.4 | 2 | IP31 | 9.1 x 9.1 x 22.8 | 9.8 x 9.8 x 7.1 | 59.5 | 208-230 / 60 / 14 |
| - | 14 - 18 | 11.6 - 17.4 | 2 | IP31 | 9.1 x 9.1 x 22.8 | 9.8 x 9.8 x 7.1 | 63.9 | 208-230 / 60 / 14 / 3Ph. |
| 15 | 14 - 18 | 11.6 - 17.4 | 2 | IP31 | 16.9 x 9.1 x 22.8 | 9.8 x 9.8 x 7.1 | 77.2 | 208-230 / 60 / 15 |
| 15 | 14 - 18 | 11.6 - 17.4 | 2 | IP31 | 16.9 x 9.1 x 22.8 | 9.8 x 9.8 x 7.1 | 81.6 | 208-230 / 60 / 15 / 3Ph. |

¹⁾ Other voltages available on request

The 'Economy' Series

for working temperatures from -30 °C to +100 °C

- Temperature control applications for external systems
- Simultaneous operation in the circulator bath
- Low noise level

- **ACC** Active Cooling Control throughout the entire temperature range
- Removable venting grid: Hassle-free cleaning of the condenser
- Drain easily accessible on front

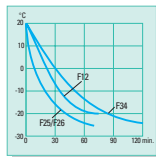
- No side ventilation slots
- Compact design

The 'ED' model combinations are appealing with respect to price/performance. They are suitable for non-flammable bath fluids.

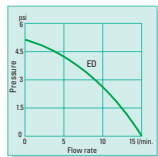
Application Examples for the models on pages 20 to 23

- Routine laboratory applications, such as temperature control of samples in the circulator bath
- External temperature control applications to
 - Measuring cells
 - Fermenters
 - Refractometers
 - Electrophoresis chambers
 - Polarimeters
 - Chromatography columns
 - Photometers
 - Rotary evaporators
 - Viscometers
 - Rheometers

Cool-down times
Bath fluid: Ethanol



Pump capacity
Bath fluid: Water



F12-ED

F25-ED



F26-ED

F34-ED

Harmony of Ecology + Economy

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) 20 0 -20°C | Pump capacity | Bath opening/ bath depth WxL/D in | Filling volume liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|--|---------------|-----------------------------------|-----------------------|-------------------------|--|
|------------------|--------------|------------------------|----------------|---------------|--|---------------|-----------------------------------|-----------------------|-------------------------|--|

Refrigerated/Heating Circulators

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) 20 0 -20°C | Pump capacity | Bath opening/ bath depth WxL/D in | Filling volume liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|--|---------------|-----------------------------------|-----------------------|-------------------------|--|
| 9 115 612 | F12-ED | -20 ... 100 | ±0.03 | 1 | 0.20 0.12 0.02 | | 5.1 x 5.9 / 5.1 | 4.5 | 7.9 x 14.1 x 22.1 | 115/60/12 |
| 9 115 625 | F25-ED | -28 ... 100 | ±0.03 | 1 | 0.35 0.25 0.06 | see diagram | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 24 | 115/60/13 |
| 9 115 626 | F26-ED | -28 ... 100 | ±0.03 | 1 | 0.26 0.20 0.06 | diagram | 4.7 x 5.5 / 5.5 | 4.5 | 16.5 x 16.5 x 16.5 | 115/60/13 |
| 9 115 634 | F34-ED | -30 ... 100 | ±0.03 | 1 | 0.45 0.32 0.14 | | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 24.4 | 115/60/14 |

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

¹⁾ Other voltages available on request

The 'Economy' Series

for working temperatures from -35 °C to +150 °C

Benefits of the 'EH' model combinations:

- Expanded operating temperature ranges
- Suitable for use with flammable bath fluids
- Classification III according to DIN 12876-1
- Refrigeration unit cut-off in case of a disturbance
- Large model selection

The F38-EH provides an extra large bath tank with large bath depth and is particularly suitable for temperature control applications for large volume objects which require temperature application in the bath.



F12-EH

F25-EH



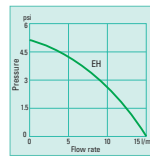
F32-EH

F33-EH

F38-EH

Pump capacity

Bath fluid: Water



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) 20 0 -20°C | Pump cap. | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|--|-----------|---------------------------------------|-----------------------|-------------------------|--|
|------------------|--------------|------------------------|----------------|---------------|--|-----------|---------------------------------------|-----------------------|-------------------------|--|

Refrigerated/Heating Circulators

Technical features (see fold-out page)



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) 20 0 -20°C | Pump cap. | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|--|-----------|---------------------------------------|-----------------------|-------------------------|--|
| 9 117 612 | F12-EH | -20 ... 100 | ±0.03 | 1 | 0.20 0.12 0.02 | | 5.1 x 5.9 / 5.1 | 4.5 | 7.9 x 14.1 x 22.1 | 115/60/12 |
| 9 117 625 | F25-EH | -28 ... 150 | ±0.03 | 1 | 0.35 0.25 0.06 | | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 24 | 115/60/13 |
| 9 117 632 | F32-EH | -35 ... 150 | ±0.03 | 1 | 0.45 0.39 0.15 | see | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 25.2 | 115/60/14 |
| 9 117 633 | F33-EH | -30 ... 150 | ±0.03 | 1 | 0.50 0.32 0.12 | diagr. | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 27.1 | 115/60/15 |
| 9 117 634 | F34-EH | -30 ... 150 | ±0.03 | 1 | 0.45 0.32 0.14 | | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 24.4 | 115/60/14 |
| 9 117 638 | F38-EH | -35 ... 80 | ±0.05 | 2 | 0.92 0.66 0.32 | | 13.8 x 16.1 / 10.6 | 45 | 18.1 x 27.6 x 35 | 208-230/60/18 |

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

¹⁾ Other voltages available on request

The 'TopTech' Series
for working temperatures from -28 °C to +200 °C

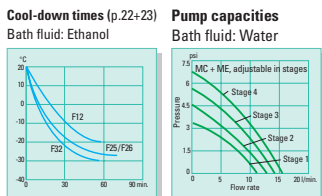
Rapid cool-down time
even at +200 °C

The units of the 'TopTech' series are designed for more demanding applications. They provide increased functionality with menu functions, warning and safety functions, such as

- **Patented early detection system with audible signal** in case of fluid losses or if the setpoint temperature is exceeded.
- **All models with RS232 interface.**

- ACC** • Active Cooling Control throughout the entire temperature range
- Removable venting grid: Hassle-free cleaning of condenser
- Drain easily accessible on front
- Energy-saving proportional cooling control on 'FP' models (page 23)

Please note the technical benefits and differences for the basic models MC and ME.



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth W x L / D in | Filling volume liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-----------|---------------------------------------|-----------------------|-------------------------|--|
| | | 20 | 0 | -20°C | | | | | | |

Refrigerated/Heating Circulators

Technical features



| | | | | | | | | | | |
|-----------|--------|-------------|-------|---|----------------|--------|-----------------|-----|-------------------|-----------|
| 9 150 612 | F12-MC | -20 ... 100 | ±0.02 | 1 | 0.20 0.12 0.02 | see | 5.1 x 5.9 / 5.1 | 4.5 | 7.9 x 14.1 x 22.1 | 115/60/12 |
| 9 150 625 | F25-MC | -28 ... 200 | ±0.02 | 1 | 0.35 0.25 0.06 | diagr. | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 24 | 115/60/13 |

Technical features: The red framed icons signify the differences to the 'MC' model

| | | | | | | | | | | |
|-----------|--------|-------------|-------|---|----------------|--------|-----------------|-----|--------------------|-----------|
| 9 160 625 | F25-ME | -28 ... 200 | ±0.01 | 1 | 0.35 0.25 0.06 | see | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 24 | 115/60/13 |
| 9 160 626 | F26-ME | -28 ... 200 | ±0.01 | 1 | 0.26 0.20 0.06 | diagr. | 4.7 x 5.5 / 5.5 | 4.5 | 16.5 x 16.5 x 16.5 | 115/60/13 |

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

¹⁾ Other voltages available on request

The 'TopTech' Series
for working temperatures from -50 °C to +200 °C

The major benefit of these models is the increased cooling performance. Optionally available with the MC or ME basic circulator:

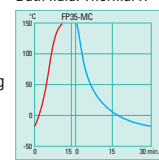
FP35-MC

This refrigerated/heating circulator is designed for

- external temperature applications requiring fast temperature changes (in combination with rheometers for example).

Heat-up/Cool-down times

Bath fluid: Thermal H

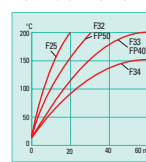


Benefits

- Small bath volume
 - Rapid heating and cooling
- Also available as 'HighTech' circulator (page 25)

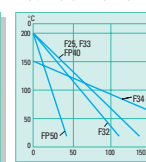
Heat-up times (p. 22-24)

Bath fluid: Thermal H



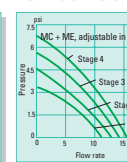
Cool-down times (p. 21-24)

Bath fluid: Thermal H



Pump capacities

Bath fluid: Water



External Pt100 sensor (accessory)

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth WxL/D in | Filling vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-----------|-----------------------------------|---------------------|-------------------------|--|
| | | 20 | 0 | -20 | -30 | -40°C | | | | |

Technical features

(see fold-out page)



| | | | | | | | | | | | |
|-----------|---------|-------------|-------|---|--------------------------|----|-----------------|------------------|--------------------|--------------------|-----------|
| 9 150 632 | F32-MC | -35 ... 200 | ±0.02 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 25.2 | 115/60/14 | |
| 9 150 633 | F33-MC | -30 ... 200 | ±0.02 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 27.1 | 115/60/15 | |
| 9 150 634 | F34-MC | -30 ... 150 | ±0.02 | 1 | 0.45 0.32 0.14 0.03 | -- | see | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 24.4 | 115/60/14 |
| 9 150 618 | FP35-MC | -35 ... 150 | ±0.02 | 1 | 0.45 0.39 0.15 0.05 | -- | diagram | 7.1 x 4.7 / 2 | 2.5 | 12.2 x 16.5 x 25.2 | 115/60/14 |
| 9 150 640 | FP40-MC | -40 ... 200 | ±0.02 | 2 | 0.68 0.50 0.32 0.17 0.04 | | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 27.1 | 208-230/60/13 | |
| 9 150 650 | FP50-MC | -50 ... 200 | ±0.02 | 2 | 0.90 0.80 0.50 0.32 0.16 | | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 27.6 | 208-230/60/14 | |



| | | | | | | | | | | | |
|-----------|---------|-------------|-------|---|--------------------------|---------|-----------------|------------------|--------------------|------------------|-----------|
| 9 160 632 | F32-ME | -35 ... 200 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 25.2 | 115/60/14 | |
| 9 160 633 | F33-ME | -30 ... 200 | ±0.01 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 27.1 | 115/60/15 | |
| 9 160 634 | F34-ME | -30 ... 150 | ±0.01 | 1 | 0.45 0.32 0.14 0.03 | -- | see | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 24.4 | 115/60/14 |
| 9 160 640 | FP40-ME | -40 ... 200 | ±0.01 | 2 | 0.68 0.50 0.32 0.17 0.04 | diagram | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 27.1 | 208-230/60/13 | |
| 9 160 650 | FP50-ME | -50 ... 200 | ±0.01 | 2 | 0.90 0.80 0.50 0.32 0.16 | | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 27.6 | 208-230/60/14 | |

Included with each unit: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)

¹⁾ Other voltages available on request

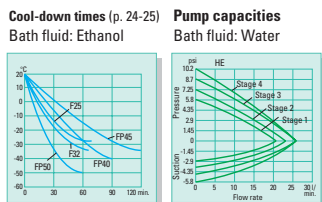
The 'HighTech' Series
for working temperatures from -50 °C to +200 °C

Benefits of the 'HE' refrigerated circulators:

- Highest precision and display resolution
- VFD COMFORT-DISPLAY for SIMULTANEOUS indication of 3 temperature values
- 'ICC' self-optimizing control electronics
- RS232 interface
- Professional PC connection – Profibus capability
- Integrated programmer (1 x 10 steps) with real time clock
- Powerful pressure and suction pump with electronically adjustable pump capacity
- Adjustable pump capacity for varying viscosity levels of bath fluids
- **Patented early detection system with audible signal** in case of fluid losses or if the setpoint is exceeded

With new pump technology

- Active Cooling Control throughout the entire temperature range
- Removable venting grid: Hassle-free cleaning of the condenser
- Drain easily accessible on front
- Energy-saving proportional cooling control on 'FP' models
- Electronic module with analog connections for all models on pages 24 and 25 (accessory).



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth WxL/D in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-------------|-----------------------------------|-------------------|-------------------------|--|
| 9 210 625 | F25-HE | -28 ... 200 | ±0.01 | 1 | 0.35 0.25 0.06 | -- -- | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 25.2 | 115/60/13 |
| 9 210 632 | F32-HE | -35 ... 200 | ±0.01 | 1 | 0.45 0.39 0.15 0.06 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 26 | 115/60/14 |
| 9 210 633 | F33-HE | -30 ... 200 | ±0.01 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 28 | 115/60/15 |
| 9 210 634 | F34-HE | -30 ... 150 | ±0.01 | 1 | 0.45 0.32 0.14 0.03 | -- | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 25.2 | 115/60/14 |
| 9 210 640 | FP40-HE | -40 ... 200 | ±0.01 | 2 | 0.68 0.50 0.32 0.17 0.04 | see diagram | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 28 | 208-230/60/14 |
| 9 210 645 | FP45-HE | -42 ... 200 | ±0.01 | 2 | 0.85 0.70 0.42 0.28 0.08 | -- | 9.1 x 10.2 / 7.9 | 26 | 15 x 22.8 x 27.1 | 208-230/60/14 |
| 9 210 650 | FP50-HE | -50 ... 200 | ±0.01 | 2 | 0.90 0.80 0.50 0.32 0.16 | -- | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 28.4 | 208-230/60/14 |

Technical features: The red framed icons signify the differences to the 'ME' model

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth WxL/D in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-----------|-----------------------------------|-------------------|-------------------------|--|
| 9 310 625 | F25-HL | -28 ... 200 | ±0.01 | 1 | 0.35 0.25 0.06 | -- -- | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 25.2 | 115/60/13 |
| 9 310 632 | F32-HL | -35 ... 200 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 26 | 115/60/14 |
| 9 310 633 | F33-HL | -30 ... 200 | ±0.01 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 28 | 115/60/15 |
| 9 310 634 | F34-HL | -30 ... 150 | ±0.01 | 1 | 0.45 0.32 0.14 0.03 | -- | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 25.2 | 115/60/14 |
| 9 310 618 | FP35-HL | -35 ... 150 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 2 | 2.5 | 12.2 x 16.5 x 26 | 115/60/15 |
| 9 310 640 | FP40-HL | -40 ... 200 | ±0.01 | 2 | 0.68 0.50 0.32 0.17 0.04 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 28 | 208-230/60/14 |
| 9 310 645 | FP45-HL | -42 ... 200 | ±0.01 | 2 | 0.85 0.70 0.42 0.28 0.08 | -- | 9.1 x 10.2 / 7.9 | 26 | 15 x 22.8 x 27.1 | 208-230/60/14 |
| 9 310 650 | FP50-HL | -50 ... 200 | ±0.01 | 2 | 0.90 0.80 0.50 0.32 0.16 | -- | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 28.4 | 208-230/60/14 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

¹⁾ Other voltages available on request

The 'HighTech' Series
for working temperatures from -50 °C to +200 °C

Additional features of the top-of-the-line 'HL' circulators compared to the 'HE' combinations are:

- Backlit LCD DIALOG-DISPLAY offers interactive operation in easy-to-read text
- Integrated programmer (6 x 60 program steps) with real time clock
- RS232 / RS485 interface
- Switchable between °C / °F

Application Examples for the models on pages 24 & 25

- External temperature application processes particularly e.g. a distillation apparatus or a miniplant installation
- Jacketed reaction vessels
- Autoclaves
- Kilo labs

FP35-HL

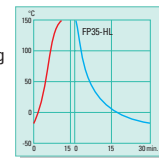
This refrigerated/heating circulator is designed for

- external temperature applications requiring fast temperature changes (in combination with rheometers for example).

Benefits

- Small bath volume
 - Rapid heating and cooling
 - External Pt100 sensor (accessory)
- Also available as 'TopTech' circulator (page 23)

Heat-up/Cool-down times
Bath fluid: Thermal H10S



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth WxL/D in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-----------|-----------------------------------|-------------------|-------------------------|--|
| 9 310 625 | F25-HL | -28 ... 200 | ±0.01 | 1 | 0.35 0.25 0.06 | -- -- | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 25.2 | 115/60/13 |
| 9 310 632 | F32-HL | -35 ... 200 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 26 | 115/60/14 |
| 9 310 633 | F33-HL | -30 ... 200 | ±0.01 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 28 | 115/60/15 |
| 9 310 634 | F34-HL | -30 ... 150 | ±0.01 | 1 | 0.45 0.32 0.14 0.03 | -- | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 25.2 | 115/60/14 |
| 9 310 618 | FP35-HL | -35 ... 150 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 2 | 2.5 | 12.2 x 16.5 x 26 | 115/60/15 |
| 9 310 640 | FP40-HL | -40 ... 200 | ±0.01 | 2 | 0.68 0.50 0.32 0.17 0.04 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 28 | 208-230/60/14 |
| 9 310 645 | FP45-HL | -42 ... 200 | ±0.01 | 2 | 0.85 0.70 0.42 0.28 0.08 | -- | 9.1 x 10.2 / 7.9 | 26 | 15 x 22.8 x 27.1 | 208-230/60/14 |
| 9 310 650 | FP50-HL | -50 ... 200 | ±0.01 | 2 | 0.90 0.80 0.50 0.32 0.16 | -- | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 28.4 | 208-230/60/14 |

Technical features: The red framed icons signify the differences to the 'HE' model

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth WxL/D in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-----------|-----------------------------------|-------------------|-------------------------|--|
| 9 310 625 | F25-HL | -28 ... 200 | ±0.01 | 1 | 0.35 0.25 0.06 | -- -- | 4.7 x 5.5 / 5.5 | 4.5 | 9.1 x 16.5 x 25.2 | 115/60/13 |
| 9 310 632 | F32-HL | -35 ... 200 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 5.9 | 8 | 12.2 x 16.5 x 26 | 115/60/14 |
| 9 310 633 | F33-HL | -30 ... 200 | ±0.01 | 1 | 0.50 0.32 0.12 0.03 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.1 x 18.1 x 28 | 115/60/15 |
| 9 310 634 | F34-HL | -30 ... 150 | ±0.01 | 1 | 0.45 0.32 0.14 0.03 | -- | 9.5 x 11.8 / 5.9 | 20 | 15 x 22.8 x 25.2 | 115/60/14 |
| 9 310 618 | FP35-HL | -35 ... 150 | ±0.01 | 1 | 0.45 0.39 0.15 0.05 | -- | 7.1 x 4.7 / 2 | 2.5 | 12.2 x 16.5 x 26 | 115/60/15 |
| 9 310 640 | FP40-HL | -40 ... 200 | ±0.01 | 2 | 0.68 0.50 0.32 0.17 0.04 | -- | 9.1 x 5.5 / 7.9 | 16 | 14.6 x 18.1 x 28 | 208-230/60/14 |
| 9 310 645 | FP45-HL | -42 ... 200 | ±0.01 | 2 | 0.85 0.70 0.42 0.28 0.08 | -- | 9.1 x 10.2 / 7.9 | 26 | 15 x 22.8 x 27.1 | 208-230/60/14 |
| 9 310 650 | FP50-HL | -50 ... 200 | ±0.01 | 2 | 0.90 0.80 0.50 0.32 0.16 | -- | 7.1 x 4.7 / 5.9 | 8 | 16.5 x 19.3 x 28.4 | 208-230/60/14 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

¹⁾ Other voltages available on request

Working temperatures from ...

The NEW 'CF' series offers YOU powerful performance with a small foot print to increase bench space for technical systems, or to free up valuable fume hood space.

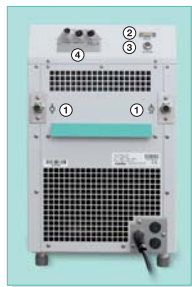


The 'Economy' Series
- for routine applications -

- Working temperatures up to +150 °C with pressure pump
- Ergonomic design and convenient operation
- Keypad with a splash-proof and easy to clean LED display
- RS232 interface

The 'HighTech' Series
- the perfect solution for high demands -

- Working temperatures up to +200 °C with pressure and suction pump and electronically adjustable pump capacity
- VFD COMFORT-DISPLAY, LCD DIALOG-DISPLAY
- Self-optimizing ICC temperature control
- RS232/RS485 interface
- Connection for external Pt100 sensor
- Integrated programmer and many other features (see icons)
- Electronic module with analog connections (accessory)



Rear view

- ① Pump connections
 - ② RS232 interface
- CF31 and CF41 additionally provide:
- ③ Connection for external Pt100 sensor
 - ④ Electronic module optional (Order no. 8 900 100)



... -30 °C/-40 °C to +150 °C/+200 °C

Ambient temperatures up to +40 °C

Cryo-Compact Circulators

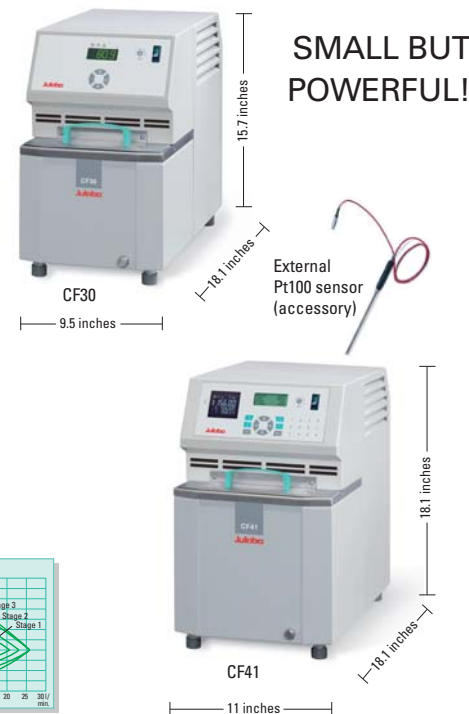
provide the latest technology from the JULABO circulator program.

Benefits:

- MICROPROCESSOR electronics with high temperature stability, warning and safety functions
- Integration of the latest components for highly reliable refrigeration and pump performance
- Wetted parts made of high quality stainless steel or plastic

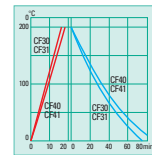
Application Examples

- External temperature application processes particularly e.g. a distillation apparatus or a miniplant installation
- Temperature application to small objects, sensors, etc. in the circulator bath

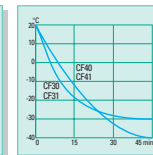


Accessories (see pages 31 to 33)

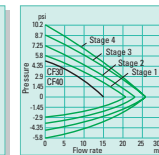
Heat-up/Cool-down times (230V)
Bath fluid: Thermal H



Cool-down times
Bath fluid: Ethanol



Pump capacities
Bath fluid: Water



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth W x L x H in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-------------|---------------------------------------|-------------------|-------------------------|--|
| 9 400 330 | CF30 | -30 ... 150 | ±0.03 | 1 | 0.32 0.25 0.15 -- | see diagram | 6.3 x 1.2 / 5.5 | 3.5 | 9.5 x 18.1 x 15.8 | 115/60/13 |
| 9 400 340 | CF40 | -40 ... 150 | ±0.03 | 1 | 0.47 0.40 0.28 0.12 | see diagram | 7.5 x 1.2 / 7.5 | 5.5 | 11 x 18.1 x 18.1 | 115/60/16 |

The 'Economy' Series

Technical features (see fold-out page)

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth W x L x H in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-------------|---------------------------------------|-------------------|-------------------------|--|
| 9 400 330 | CF30 | -30 ... 150 | ±0.03 | 1 | 0.32 0.25 0.15 -- | see diagram | 6.3 x 1.2 / 5.5 | 3.5 | 9.5 x 18.1 x 15.8 | 115/60/13 |
| 9 400 340 | CF40 | -40 ... 150 | ±0.03 | 1 | 0.47 0.40 0.28 0.12 | see diagram | 7.5 x 1.2 / 7.5 | 5.5 | 11 x 18.1 x 18.1 | 115/60/16 |

The 'HighTech' Series

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Pump cap. | Bath opening/ bath depth W x L x H in | Fill. vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---|-------------|---------------------------------------|-------------------|-------------------------|--|
| 9 400 331 | CF31 | -30 ... 200 | ±0.02 | 1 | 0.32 0.25 0.15 -- | see diagram | 6.3 x 1.2 / 5.5 | 3.5 | 9.5 x 18.1 x 15.8 | 115/60/14 |
| 9 400 341 | CF41 | -40 ... 200 | ±0.02 | 1 | 0.47 0.40 0.28 0.12 | see diagram | 7.5 x 1.2 / 7.5 | 5.5 | 11 x 18.1 x 18.1 | 115/60/16 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

¹⁾ Other voltages available on request

The 'HighTech' Series

for working temperatures from -60 °C to +150 °C

Benefits

of the powerful ultra-low refrigerated circulators on pages 28 to 30:

- Cooling capacities to 5.5 kW, heating capacity 3 kW and the electronically controlled pressure and suction pump with 16 psi pressure capacity



• Energy-saving proportional cooling control



• Active Cooling Control throughout the entire temperature range



• Removable venting grid: Hassle-free cleaning of the condenser
• Drain easily accessible on front



• Heated bath cover plate: Prevents ice build-up and condensation in humid environments (except FP51-SL)

FP models: fan-air-cooling
FPW models: water-cooled unit

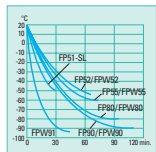
The COMPACT FP51-SL has a bath opening of 7.1 x 4.7 inches (depth: 7.9 inches).

All other ultra-low models

- have an insulated filling port (2.8 inches dia.)
- are upgradable with supplementary heater and pump (page 30)
- also available with large bath opening (page 30)

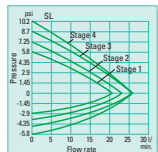
Cool-down times

Bath fluid: Ethanol



Pump capacities

Bath fluid: Water



Application Examples

for models on pages 28 & 30

- Jacketed reaction vessels
- Autoclaves, miniplant installations
- Kilo labs
- Process development



FP51-SL

FPW55-SL

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump cap. | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|-----------|---|-------------------|-------------------------|------------|--|
| 20 | 0 | -20 | -40 | -60°C | | | | | | |

Ultra-Low Refrigerated Circulators

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump cap. | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|--------------|---|--------------------|-------------------------|--------------------------|--|
| 9 350 751 | FP51-SL | -51 ... 200 | ±0.05 | 3 | | 2.0 1.5 1.0 0.26 -- 11 | 18.1 x 21.7 x 35 | 198.4 | 208-230 / 60 / 16 / 3Ph. | |
| 9 350 752N | FP52-SL | -60 ... 100 | ±0.05 | 3 | see dia-gram | 3.0 2.8 1.6 0.65 0.1 24 | 23.2 x 29.9 x 45.7 | 343.9 | 208-230 / 60 / 16 / 3Ph. | |
| 9 350 753N | FPW52-SL | -60 ... 100 | ±0.05 | 3 | | 3.0 2.8 1.6 0.65 0.1 24 | 23.2 x 29.9 x 45.7 | 337.3 | 208-230 / 60 / 24 / 3Ph. | |
| 9 350 755N | FP55-SL | -55 ... 100 | ±0.05 | 3 | | 5.2 4.1 2.2 0.7 0.13 27 | 33.5 x 29.9 x 45.7 | 401.2 | 208-230 / 60 / 28 / 3Ph. | |
| 9 350 756N | FPW55-SL | -60 ... 100 | ±0.05 | 3 | | 5.5 4.1 2.2 1.0 0.13 27 | 23.2 x 29.9 x 45.7 | 359.3 | 208-230 / 60 / 28 / 3Ph. | |

Ultra-Low Refrigerated Circulators, with extended working temperature ranges

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump cap. | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|--------------|---|--------------------|-------------------------|--------------------------|--|
| 9 350 752N150 | FP52-SL | -60 ... 150 | ±0.05 | 3 | see dia-gram | 3.0 2.8 1.6 0.65 0.1 24 | 23.2 x 29.9 x 45.7 | 343.9 | 208-230 / 60 / 16 / 3Ph. | |
| 9 350 753N150 | FPW52-SL | -60 ... 150 | ±0.05 | 3 | | 3.0 2.8 1.6 0.65 0.1 24 | 23.2 x 29.9 x 45.7 | 337.3 | 208-230 / 60 / 16 / 3Ph. | |
| 9 350 755N150 | FP55-SL | -55 ... 150 | ±0.05 | 3 | | 5.2 4.1 2.2 0.7 0.13 27 | 33.5 x 29.9 x 45.7 | 401.2 | 208-230 / 60 / 31 / 3Ph. | |
| 9 350 756N150 | FPW55-SL | -60 ... 150 | ±0.05 | 3 | | 5.5 4.1 2.2 1.0 0.13 27 | 23.2 x 29.9 x 45.7 | 359.3 | 208-230 / 60 / 31 / 3Ph. | |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)
 FPW models: Cooling water connection G³/₄" male with barbed fittings for tubing 1/2" inner dia.
¹⁾ Other voltages available on request

**The 'TopTech' Series/
The 'HighTech' Series**

for working temperatures from -88 °C to +100 °C

A real PLUS:
heated bath cover plates

Benefits

- Small foot print
- Two-stage cascaded technology
- Bath opening: 5.1 x 5.9 inches (depth: 6.3 inches)



• Active Cooling Control throughout entire temperature range



• Removable venting grid: Hassle-free cleaning of the condenser
• Drain easily accessible on front



• Heated bath cover plate: Prevents ice build-up and condensation in humid environments

The units are suitable for various internal and external temperature applications:

- with pressure pump to 6.5 psi ('TopTech' Series)
 - with pressure and suction pump to 16 psi ('HighTech' Series)
- The pump pressure is electronically adjustable in stages.

Application Examples

- Freezing point determination
- Calibration at low temperatures
- Petroleum testing
- Cell cultivation at low temperatures

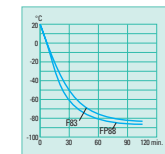


F83-ME

FP88-HL

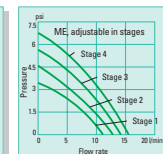
Cool-down times

Bath fluid: Ethanol



Pump capacities

Bath fluid: Water



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump capacity | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|---------------|---|-------------------|-------------------------|------------|--|
| 20 | 0 | -20 | -40 | -60 -80°C | | | | | | |

The 'TopTech' Series

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump capacity | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|---------------|---|-------------------|-------------------------|------------|--|
| 9 160 683 | F83-ME | -83 ... 50 | ±0.02 | 1.3 | see diagram | 0.9 0.78 0.72 0.6 0.38 0.12 | 8 | 21.7 x 24 x 35.4 | 255.7 | 208-230 / 60 / 16 |
| 9 160 688 | FP88-ME | -88 ... 100 | ±0.02 | 1.3 | | 1.0 0.96 0.92 0.73 0.59 0.15 | 8 | 21.7 x 24 x 35.4 | 262.3 | 208-230 / 60 / 16 |

The 'HighTech' Series

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Pump capacity | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|---------------|---|-------------------|-------------------------|------------|--|
| 9 310 683 | F83-HL | -83 ... 50 | ±0.02 | 1.3 | see diagram | 0.9 0.78 0.72 0.6 0.38 0.12 | 8 | 21.7 x 23.6 x 36.2 | 260.1 | 208-230 / 60 / 16 |
| 9 310 688 | FP88-HL | -88 ... 100 | ±0.02 | 1.3 | | 1.0 0.96 0.92 0.73 0.59 0.15 | 8 | 21.7 x 23.6 x 36.2 | 266.8 | 208-230 / 60 / 16 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)
¹⁾ Other voltages available on request

The 'HighTech' Series

for working temperatures from -95 °C to +150 °C

**ULTRA-LOW
and powerful!**

These powerful two-stage ultra-low refrigerated circulators additionally provide:

- **High cooling capacities at low temperatures**
- **Wide working temperature ranges**
(benefits and pump capacities: page 28).

Upgradable:

Ultra-low units on pages 28 and 30 are upgradable (except F95-SL and FW95-SL):



① HST booster heater (6 kW)
(order no. 8 810 011 or 8 810 012)
= Total: 9 kW
The electronic module (page 32)
(order no. 8 900 100) is required for
control of the HST booster heater!

② HSP booster pump max. 43.5 psi- 30 l/min. (except for FP51-SL)
(reduces cooling capacity by 0.4 kW) (order no. 8 810 015)

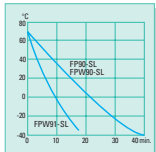
Option: Bath opening



All models to +100 °C on pages
28 and 30 (except FP51-SL/F(W)95-SL)
are available with a bath opening
of 11 x 9.1 inches (depth: 8.7 inches)
(order no. without 'N')

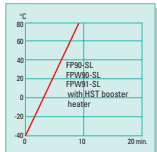
Cool-down times

Bath fluid: Thermal H55



Rapid heating

Bath fluid: Thermal H55



FPW91-SL

FP90-SL

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) | Fill. vol. liters in | Dimensions W x L x H | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|---------------|---|----------------------|----------------------|------------|--|
| | | 0 | -20 | -40 | -60 | -80°C | | | |

Ultra-Low Refrigerated Circulators

| | | | | | | | | | |
|-------------|----------|-------------|-------|---|----------------------------|----|--------------------|-------|--------------------------|
| 9 350 790 N | FP90-SL | -90 ... 100 | ±0.05 | 3 | 1.8 1.7 1.6 1.35 0.75 0.15 | 22 | 23.2 x 29.9 x 45.7 | 429.9 | 208-230 / 60 / 29 / 3Ph. |
| 9 350 791 N | FPW90-SL | -90 ... 100 | ±0.05 | 3 | 1.8 1.7 1.6 1.35 0.75 0.15 | 22 | 23.2 x 29.9 x 45.7 | 414.5 | 208-230 / 60 / 26 / 3Ph. |
| 9 350 793 N | FPW91-SL | -91 ... 100 | ±0.2 | 3 | 5.2 4.7 4.0 3.5 2.3 0.8 | 22 | 33.5 x 29.9 x 45.7 | 652.6 | 208-230 / 60 / 32 / 3Ph. |
| 9 350 795 N | F95-SL | -95 ... 0 | ±0.05 | 3 | -- 2.0 1.9 1.65 1.2 0.36 | 22 | 23.2 x 29.9 x 45.7 | 443.1 | 208-230 / 60 / 28 / 3Ph. |
| 9 350 796 N | FW95-SL | -95 ... 0 | ±0.05 | 3 | -- 2.0 1.9 1.65 1.2 0.36 | 22 | 23.2 x 29.9 x 45.7 | 436.5 | 208-230 / 60 / 28 / 3Ph. |

Ultra-Low Refrigerated Circulators, with extended working temperature ranges

| | | | | | | | | | |
|---------------|----------|-------------|-------|---|----------------------------|----|--------------------|-------|--------------------------|
| 9 350 790N150 | FP90-SL | -90 ... 150 | ±0.05 | 3 | 1.8 1.7 1.6 1.35 0.75 0.15 | 22 | 23.2 x 29.9 x 45.7 | 421.1 | 208-230 / 60 / 29 / 3Ph. |
| 9 350 791N150 | FPW90-SL | -90 ... 150 | ±0.05 | 3 | 1.8 1.7 1.6 1.35 0.75 0.15 | 22 | 23.2 x 29.9 x 45.7 | 414.5 | 208-230 / 60 / 26 / 3Ph. |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male) FPW models: Cooling water connection G3/4" male with barbed fittings for tubing 1/2" inner dia. ¹⁾ Other voltages available on request

Bath Fluids

JULABO offers a broad range of bath fluids that will suit your needs.
Please contact JULABO or consult www.julabo.com for detailed information.



Bath fluid

| Order No. | Description | Suitable for |
|-----------|-------------|--------------|
|-----------|-------------|--------------|

Heating Immersion Circulators (pages 10 and 11)

for combination with any bath tank. For attachment either use a bath clamp or a stand rod.

| | | |
|---|--|--------------------|
| 8 970 020 | Stand rod (for attachment to a laboratory stand) | ED, EH, MB, MC, ME |
| 8 970 421 | Bath attachment clamp for wall thickness up to 60 mm | ED, EH, MB, MC, ME |
| External temperature application | | |
| 8 970 140 | Pump set | ED, EH, MB, MC, ME |
| Counter-cooling with tap water | | |
| 8 970 105 | Installation cooling coil (for tap water cooling) | ED, EH, MB, MC, ME |
| | Tubing | see page 32 |
| | External Pt100 sensors | ME |
| Protection grid | | |
| 8 970 003 | Protection grid for heater/pump/float | ED, EH, MB, MC, ME |



Pump set, with the bath attachment clamp removed

Large selection of bath tanks

| Stainless steel bath tanks to +150 °C | | Internal Dimensions / Exterior Dimensions | | |
|--|---------------|--|------------------|--------------------|
| | | W x L / D inches | W x L / H inches | |
| 9 902 405 | Bath tank 5 | 13 x 5.9 / 5.9 | 15 x 7.5 / 7.1 | ED, EH, MB, MC, ME |
| 9 902 413 | Bath tank 13 | 13 x 11.8 / 5.9 | 15 x 13 / 7.1 | |
| 9 902 417 | Bath tank 17 | 13 x 11.8 / 7.9 | 15 x 13 / 9.1 | |
| 9 902 419 | Bath tank 19 | 19.7 x 11.8 / 5.9 | 22.1 x 13 / 7.1 | |
| 9 902 427 | Bath tank 27 | 19.7 x 11.8 / 7.9 | 22.1 x 13 / 9.1 | |
| 9 902 433 | Bath tank 33 | 32.7 x 11.8 / 5.9 | 35.4 x 13 / 7.9 | ED, EH, MC, ME |
| 9 902 439 | Bath tank 39 | 19.7 x 11.8 / 11.8 | 21.3 x 13 / 13.8 | ED, EH, MC, ME |
| Plexiglas® bath tanks to +60 °C | | Internal Dimensions / Exterior Dimensions | | |
| 9 900 305 | Bath tank 5A | 15.4 x 4.7 / 5.9 | 16.1 x 5.5 / 6.7 | ED, MB |
| 9 900 307 | Bath tank 7A | 19.3 x 4.7 / 5.9 | 20.1 x 5.5 / 6.7 | ED, MB |
| 9 900 313 | Bath tank 13A | 12.6 x 11.8 / 5.9 | 16.1 x 13 / 6.7 | ED, MB, MC |
| 9 900 319 | Bath tank 19A | 18.5 x 11.8 / 5.9 | 21.7 x 13 / 6.7 | ED, MB, MC |
| Makrolon® bath tanks to +100 °C | | Internal Dimensions / Exterior Dimensions | | |
| 9 900 505 | Bath tank 5M | 15.4 x 4.7 / 5.9 | 16.1 x 5.5 / 7.1 | ED, MB |
| 9 900 513 | Bath tank 13M | 12.6 x 11.8 / 5.9 | 16.1 x 13 / 7.1 | ED |
| 9 900 519 | Bath tank 19M | 18.5 x 11.8 / 5.9 | 21.7 x 13 / 7.1 | ED |



Protection grid



Stainless steel bath tanks



Plexiglas®/Makrolon® bath tanks



Polypropylene® test tube rack with stainless steel frame



Immersion-height adjustable platform



Lift-up bath cover



External Pt100 sensor/M+R inline Pt100 sensor



Electronic module

| Order No. | Description | Suitable for |
|-----------|-------------|--------------|
|-----------|-------------|--------------|

Open Heating Bath, Heating, Refrigerated/Heating Circulators (pages 12 to 30)

JULABO offers the perfect accessory for the unit YOU selected:

| Test tube racks, made of Plexiglas® | Immersion depth | Insert capacity |
|--|---|--|
| 8 960 000 030 for 20 test tubes, 100 x 17 mm dia. | 2.2 in | |
| 8 960 002 042 for 36 test tubes, 40 x 10/11 mm dia. | 1.2 in | |
| 8 960 003 046 for 30 test tubes, 50 x 12/13 mm dia. | 1.8 in | Bath tanks: 5A / 5M 7A |
| 8 960 010 062 for 20 test tubes, 160 x 17 mm dia. | 3.9 in | Max. qty.: 2 3 |
| 8 960 013 056 for 6 Falcon tubes, 50 ml | 3.7 in | |
| 8 970 304 for 60 tubes, 16/17 mm dia. | made of Polypropylene® to 80 °C 3.1 in | Bath tanks: 13/13A/13M/17 19/19A/19M/27 33 |
| 8 970 306 for 90 tubes, 12/13 mm dia. | 2.6 in | Max. qty.: 1 3 6 |
| 8 970 307 for 50 tubes, 16/17 mm dia. | 3.1 in | |
| 8 970 308 for 90 tubes, 12/13 mm dia. | made of stainless steel to 150 °C 2.6 in | Bath tanks: 13/13A/13M/17 19/19A/19M/27 33 |
| 8 970 309 for 90 microliter tubes 11/12 mm dia. | 1.2 in | Max. qty.: 1 3 6 |
| 8 970 310 for 21 tubes, 30 mm dia. | 3.5 in | |
| 8 970 320 for 28 tubes, 16/17 mm dia. | made of stainless steel to 150 °C 3.1 in | Bath tank: 5 and F12, F25, F26 |
| 8 970 321 for 38 tubes, 12/13 mm dia. | 2.6 in | Max. qty.: 1 |
| 8 970 502 Immersion-height adjustable platform | | Bath tanks: 19, 27, F34, FP45 |
| 8 970 503 Immersion-height adjustable platform | | Bath tanks: 13, 17 |
| 8 910 040 Castor platform | | FP40, FP50 |
| 8 970 180 Installation cooling coil | | ED, EH, MB |

Bath covers / Hollow balls

| | |
|--|-------------------|
| 8 970 255 Lift-up bath cover | Bath tanks 13, 17 |
| 8 970 256 Lift-up bath cover | Bath tanks 19, 27 |
| 8 970 257 Lift-up bath cover | Bath tank 33 |
| 8 970 263 Flat stainless steel bath cover | Bath tank 39 |
| 8 970 290 Flat stainless steel bath cover | Bath tanks 13, 17 |
| 8 970 291 Flat stainless steel bath cover | Bath tanks 19, 27 |
| 8 970 292 Flat stainless steel bath cover | Bath tank 33 |
| 8 970 010 Hollow balls, Polypropylene®, 20 mm dia. (pack of 1000) | All bath tanks |

External Pt100 sensors

| | |
|---|--------------------------------|
| 8 981 003 200 x 6 mm dia., stainless steel, 1.5 m cable | ME, HE, HL, SE, SL, CF31, CF41 |
| 8 981 005 200 x 6 mm dia., glass, 1.5 m cable | |
| 8 981 006 20 x 2 mm dia., stainless steel, 1.0 m cable | |
| 8 981 010 300 x 6 mm dia., stainless steel, 1.5 m cable | |
| 8 981 011 300 x 6 mm dia., glass, 1.5 m cable | |
| 8 981 013 600 x 6 mm dia., stainless steel/Teflon coated, 3 m cable | |
| 8 981 014 1200 x 6 mm dia., stainless steel/Teflon coated, 3 m cable | |
| 8 891 019 12" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 002 24" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 004 36" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 006 48" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 981 020 M + R in-line Pt100 sensor (including 2 fittings M16x1 male) | |
| 8 981 103 3.5 m Extension cable for Pt100 sensor | |
| 8 981 030 TCCB Thermo-Couple Converter Box | |

Automation

In addition to the digital interfaces, an electronic module with analog connections can be retrofitted to all circulators of the 'HighTech' series. This module provides one input and two outputs for external programming, flow sensor or temperature recorder. Inputs/outputs are scalable (current or voltage). A standby input and an alarm output are also implemented.

| | |
|--|----------------------------|
| 8 900 100 Electronic module with analog connections | HE, HL, SE, SL, CF31, CF41 |
|--|----------------------------|

CR® and Viton® tubing / Tubing insulation / Tube clamps

| | |
|--|---|
| 8 930 008 1 m CR® tubing, 8 mm inner dia. (-20 ... +120 °C) | ED, EH, MB, MC, ME, HE, HL, SE, SL, CF models |
| 8 930 010 1 m CR® tubing, 10 mm inner dia. (-20 ... +120 °C) | ED, EH, MB, MC, ME |
| 8 930 012 1 m CR® tubing, 12 mm inner dia. (-20 ... +120 °C) | HE, HL, SE, SL, CF models |
| 8 930 108 1 m Viton® tubing, 8 mm inner dia. (-50 ... +200 °C) | MC, ME, HE, HL, SE, SL, CF models |
| 8 930 110 1 m Viton® tubing, 10 mm inner dia. (-50 ... +200 °C) | EH, MC, ME |
| 8 930 112 1 m Viton® tubing, 12 mm inner dia. (-50 ... +200 °C) | HE, HL, SE, SL, CF models |
| 8 930 410 1 m Insulation for tubing 8 mm or 10 mm inner dia. | CR® and Viton® tubing |
| 8 930 412 1 m Insulation for tubing 12 mm inner dia. | Temperature range -50 ... +100 °C |
| 8 970 480 2 Tube clamps, size 1 | Tubing 8 mm inner dia. |
| 8 970 481 2 Tube clamps, size 2 | Tubing 10 or 12 mm inner dia. |

| Order No. | Description | Suitable for |
|-----------|-------------|--------------|
|-----------|-------------|--------------|

Metal tubing, flexible, triple insulated, -100 ... +350 °C

| | | |
|-------------------------------------|-------------------------|----------------------------|
| 8 930 209 0.5 m Metal tubing | 2 fittings M16x1 female | HE, HL, SE, SL, CF31, CF41 |
| 8 930 210 1 m Metal tubing | | |
| 8 930 211 1.5 m Metal tubing | | |
| 8 930 214 3 m Metal tubing | | |

Metal tubing, flexible, insulated, -50 ... +200 °C

| | | |
|-------------------------------------|-------------------------|----------------------------|
| 8 930 220 0.5 m Metal tubing | 2 fittings M16x1 female | HE, HL, SE, SL, CF31, CF41 |
| 8 930 221 1 m Metal tubing | | |
| 8 930 222 1.5 m Metal tubing | | |
| 8 930 223 3 m Metal tubing | | |

| | |
|--|-------------------------------|
| 8 970 443 Adapter M16x1 male to M16x1 male | Connecting metal tubing |
| 8 970 444 Adapter for metal tubing M10x1 male to M16x1 male | EH, MC, ME |
| 8 970 750 Icing protection sleeve for pump connectors | SL, ultra-low circulators |
| 8 970 751 Pump nozzle insulation set | ME, HL, ultra-low circulators |

Prevent ice formation at low temperatures (see page 35):

| | |
|--|---------------------|
| 8 970 700 Condensation trap with bath lid | FP50, FP51 |
| 8 970 702 Condensation trap with bath lid | F83, FP88 |
| 8 970 705 Insulated filling nozzle with condensation trap | FP(W)52/55/90/91/95 |

Cooling installations / Booster heaters / Booster pump

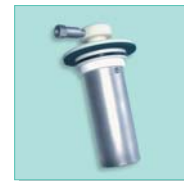
| | |
|--|--|
| 9 790 000 MVS solenoid valve controller for tap water cooling | MB, MC, ME, HE, SE |
| 8 980 700 Solenoid valve for tap water cooling (for tubing 8 mm inner dia.) | MB, MC, ME, HE, SE |
| 8 980 703 Solenoid valve for tap water cooling (for tubing 8 mm inner dia.) | HL, SL |
| 8 970 240 Bath lid with special cooling coil | ME-4/-6, MC-4/-6, HE-4, HL-4, SE-6, SL-6 |
| 8 970 242 Bath lid with special cooling coil | ME-12, SE-12, SL-12 |
| 8 970 243 Bath lid with special cooling coil | F32, FP50 |
| 8 810 010 HST booster heater 4 kW | SL-12, FP40-HL, FP45-HL, FP50-HL |
| 8 810 011 HST booster heater 6 kW | FP51-SL |
| 8 810 012 HST booster heater 6 kW | FP52, FPW52, FP55, FPW55 |
| 8 810 015 HSP booster pump 30 l/min. - 3 bar max. | FP90, FPW90, FPW91 |

Connectors / Valves / Adapters, etc.

| | |
|--|------------------------------------|
| 8 970 410 D + S level-adaptor (to maintain constant fluid level in ext. bath) | HE, HL, SE, SL |
| 8 970 456 Shut-off valve for loop circuit (max. +90 °C), M16x1 | HE, HL, SE, SL |
| 8 970 457 Shut-off valve for loop circuit (max. +200 °C), M16x1 | HE, HL, SE, SL, CF31, CF41 |
| 8 980 701 Solenoid valve set for loop circuit (max. +100 °C), M16x1 | HL, SL |
| 8 970 452 Drain tap (max. +150 °C) | Bath tanks 4, 6, 12, 26, CF models |
| 8 970 450 Drain tap (max. +200 °C) | Bath tanks 4, 6, 12, 26, CF models |
| 8 970 470 Twin distributing adapter with barbed fittings | Tubing 8 mm inner dia. |
| 8 970 472 Twin distributing adapter with barbed fittings | Tubing 10 mm inner dia. |
| 8 970 471 Twin distributing adapter with barbed fittings | Tubing 12 mm inner dia. |
| 8 970 473 T-connection M16x1 female to 2 x M16x1 male | HE, HL, SE, SL |
| 8 970 445 2 Barbed fittings for tubing 12 mm inner dia. | HE, HL, SE, SL, CF models |
| 8 970 447 2 Barbed fittings for tubing 10 mm inner dia. | HE, HL, SE, SL |
| 8 970 446 2 Barbed fittings for tubing 8 mm inner dia. | HE, HL, SE, SL, CF models |
| 8 970 460 2 Barbed fittings for tubing 8 mm inner dia., M10x1 | ED, EH, MB, MC, ME |
| 8 970 468 2 Barbed fittings for tubing 12 mm inner dia., M10x1 | ED, EH, MB, MC, ME |
| 8 970 490 2 Collar nuts M16x1 female | HE, HL, SE, SL, CF models |
| 8 970 492 1 Collar nut M10x1 male | ED, EH, MB, MC, ME |
| 8 970 442 2 Elbow fittings 90°, M16x1 female/male | HE, HL, SE, SL, CF models |
| 8 890 004 2 Adapters M16x1 female to NPT 1/4" male | |
| 8 890 005 2 Adapters M16x1 female to NPT 1/4" female | |
| 8 890 006 2 Adapters M16x1 female to tube 3/8" male | |
| 8 890 007 2 Adapters M16x1 female to NPT 3/8" female | |
| 8 890 008 2 Adapters M16x1 female to NPT 1/2" male | |
| 8 890 009 2 Adapters M16x1 female to NPT 1/2" female | |
| 8 890 010 2 Adapters M16x1 male to NPT 1/4" female | |
| 8 891 008 1 Adapter M16x1 male to BSP 1/2" female | |
| 8 891 009 1 Adapter M16x1 male to BSP 3/8" female | |
| 8 890 011 2 Adapters M16x1 female to tube 1/4" male | |
| 8 890 012 2 Adapters M16x1 female to tube 3/8" male | |
| 8 890 013 2 Adapters M16x1 female to tube 1/2" male | |
| 8 890 024 2 Adapters M16x1 female to M16x1 female | |



Metal tubing, triple insulated



Insulated filling nozzle with condensation trap



MVS controller, solenoid valve



Bath lid with special cooling coil



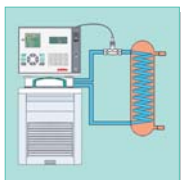
D+S level-adaptor



Manufacturer's Calibration Certificate



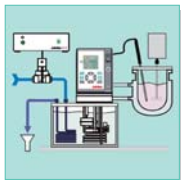
C.U. cooling unit



M+R in-line Pt100 sensor



Circulator, ext. sensor, special cooling coil, solenoid valve



ME circulator, MVS controller and solenoid valve

| Order No. | Description | Suitable for |
|-----------|--|--------------------|
| 8 902 901 | Manufacturer's Calibration Certificates 1-point calibration certificate | JULABO circulators |
| 8 902 903 | 3-point calibration certificate | |
| 8 902 905 | 5-point calibration certificate | |

'Forte HT' High Temperature Circulators (pages 18 & 19)

| | | |
|-----------|---|--------------------|
| 9 790 100 | C.U. cooling unit | HT60-M1 HT60-M3 |
| 8 970 802 | Adapter for pressure reduction (11.6 psi) | |
| 8 970 811 | Level indicator (with sight glass) | |
| 8 970 435 | Handle | |
| 8 980 125 | 5 m Extension cable (for separate control unit to HT circulator) | |
| 8 980 704 | Solenoid valve for controlled tap water cooling with 2 m tubing 8 mm inner dia. | |

JULABO circulators and cooling units

are suitable for a variety of applications. A selection of application examples are listed here.

External temperature application, measurement and control

The ME circulators and all models of the 'HighTech' series provide a connection for an external Pt100 sensor (available in lengths of 20 to 1200 mm, made of stainless steel, glass or Teflon-coated stainless steel). The illustration shows an M+R in-line Pt100 sensor (order no. 8 981 020) installed in the return line of the loop circuit to ensure precise constant temperature control. The circulator permanently indicates the actual external temperature on the display.

Controlled exothermic reactions

The illustration shows the temperature application to an external jacketed glass vessel in combination with an HL-4. The automatic solenoid valve controller implemented in the HL and SL models instantly compensates a sudden increase of the actual temperature in combination with

- 8 981 003 External Pt100 sensor
- 8 970 240 Bath lid with special cooling coil
- 8 980 703 Solenoid valve for tap water cooling

For ME, HE and SE models, you will also need:

- 9 790 000 MVS solenoid valve controller
- 8 980 700 Solenoid valve for tap water cooling (instead of 8 980 703)

Economic cooling water consumption

Heating circulators provide a built-in cooling coil to perform counter-cooling with tap water for applications at or near ambient temperature.

To ensure controlled tap water usage with the MB, MC, ME, HE and SE models, we recommend the following:

- 9 790 000 MVS solenoid valve controller
- 8 980 700 Solenoid valve for tap water cooling

The heating circulators HL and SL of the 'HighTech' series already provide an automatic solenoid valve controller. So only the

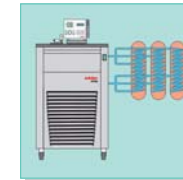
- 8 980 703 Solenoid valve for tap water cooling is required for direct plug-in to the 'Stakei' connection.

Large external applications or various smaller external systems

To accomplish these tasks, the use of the powerful ultra-low circulators of the 'HighTech' series with a heater capacity of 3 kW and a maximum pump pressure of 16 psi is recommended. These capacities can be increased with the following:

- 8 810 012 HST booster heater 6 kW
- 8 810 015 HSP booster pump 30 l/min. – 43.5 psi max.

When using the HST booster heater, the electronic module with analog connections (order no. 8 900 100) is required.

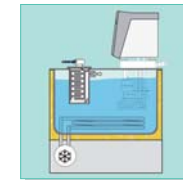


FP90-SL with 3 objects requiring temp. application

Condensation traps

When humidity comes into contact with the bath fluid at ultra-low temperatures, ice crystals may occur. This has a negative impact on the efficiency of the refrigerated unit and therefore the lowest achievable temperature.

Condensation traps are the perfect solution: They are especially integrated into the filling port or bath opening of the relevant models. Humidity is trapped in the immersed cube before reaching the bath fluid. Remove the trapped ice from time to time in order to maintain full performance.



Condensation trap immersed in the filling port

Recirculating coolers (pages 47 to 52)

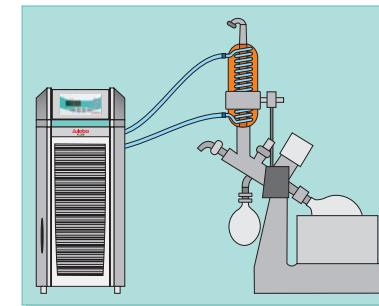
Professional cooling of rotary evaporators

Today precious tap water is still often used for cooling purposes. Negative environmental and other aspects are:

- Low efficiency - no control of characteristic temperature
- High cost for water and waste water

Benefits of using JULABO recirculating coolers:

- High condensation efficiency
- Adjustable working temperature, e.g. +10 °C or -10 °C
- Constant pump performance
- If a powerful recirculating cooler is used, multiple external systems (e.g. rotary evaporators) can be connected.



FL300 recirculating cooler with rotary evaporator

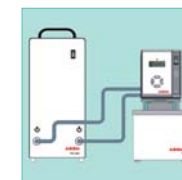
Flow-through cooler and immersion coolers (page 36)

These units are employed for counter-cooling in combination with heating circulators. This allows for sub ambient temperature applications.

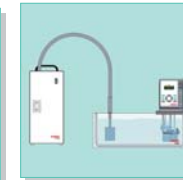
Advantages:

- Environmentally friendly
- Reduced tap water consumption
- Reduced energy consumption

Immersion coolers are also recommended for rapidly cooling fluids to low temperatures or as a dry-ice substitute.



FD200 flow-through cooler and circulator



FT200 immersion cooler e.g. used to cool an MB-13

Immersion Coolers

Benefits and applications:

- Save precious tap water!
- MORE efficient cooling
- REDUCED energy consumption
- Rapid cooling of liquids down to low temperatures, e.g. in a Dewar vessel
- Dry-ice substitution
- For counter-cooling in combination with heating circulators
- Immersion probe made of high quality stainless steel

Immersion Coolers with temperature control and display

FT402 and FT902 provide a keypad and water resistant main switch (patented). They are supplied with a Pt100 sensor, stainless steel, 200 x 6 mm dia.

Optional sensors available:

- 8 981 005 Pt100 sensor, 200 x 6 mm dia., glass, 1.5 m cable
- 8 981 010 Pt100 sensor, 300 x 6 mm dia., stainless steel, 1.5 m cable

Flow-Through Cooler



FD200

The FD200 is used for cooling the loop circuit of a closed system. The cooler needs to be connected in the return line of a heating circulator.

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Temp. display/ resolution °C | Cooling capacity kW | | | | | Immersion probe/ flexible probe (L x dia.) in | Connection tube (L) in | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|------------------------------|---------------------|------|------|------|-------|---|------------------------|-------------------------|--|
| | | | | | +20 | +10 | -20 | -40 | -80°C | | | | |
| 9 650 820 | FT200 | -20...30 | -- | -- | 0.25 | 0.2 | 0.04 | -- | -- | 3.5 x 1.6 | 47.2 | 7.1 x 10.6 x 15.4 | 115/60/4 |
| 9 650 840 | FT400 | -40...30 | -- | -- | 0.45 | 0.36 | 0.14 | 0.03 | -- | 4.7 x 2 | 47.2 | 7.9 x 11.8 x 16.9 | 115/60/4 |
| 9 650 890 | FT900 | -90...30 | -- | -- | 0.3 | 0.27 | 0.24 | 0.2 | 0.07 | 25.6 x 0.6 flexible | 63 | 15 x 21.7 x 23.6 | 115/60/7 |

Immersion Coolers

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Temp. display/ resolution °C | Cooling capacity kW | | | | | Immersion probe/ flexible probe (L x dia.) in | Connection tube (L) in | Dimensions W x L x H in | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|------------------------------|---------------------|------|------|------|-------|---|------------------------|-------------------------|--|
| | | | | | +20 | +10 | -20 | -40 | -80°C | | | | |
| 9 650 842 | FT402 | -40...30 | ±0.5 | LED/0.1 | 0.45 | 0.36 | 0.14 | 0.03 | -- | 4.7 x 2 | 47.2 | 7.9 x 11.8 x 16.9 | 115/60/4 |
| 9 650 892 | FT902 | -90...30 | ±1 | LED/0.1 | 0.3 | 0.27 | 0.24 | 0.2 | 0.07 | 25.6 x 0.6 flexible | 63 | 15 x 21.7 x 23.6 | 115/60/7 |

Included with each unit: Pt100 sensor 200 x 6 mm dia.

Accessories

8 970 400 Clamp for cooler probe for open baths (FT200, FT400, FT402)

Flow-Through Cooler

| | | | | | | | | | | | | | |
|-----------|-------|---------|----|----|------|------|----|----|----|----|----|-------------------|----------|
| 9 655 825 | FD200 | 10...30 | -- | -- | 0.22 | 0.18 | -- | -- | -- | -- | -- | 7.1 x 10.6 x 15.4 | 115/60/4 |
|-----------|-------|---------|----|----|------|------|----|----|----|----|----|-------------------|----------|

Included with FD200: 2 each barbed fittings for tubing 8 and 12 mm inner dia.
For details on tubing/tubing insulation please refer to page 32.

¹⁾ Other voltages available on request

Visco Baths

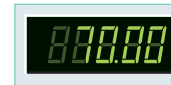
for highly precise temperature applications in the bath tank

- Temperature setting to 0.01 °C
- Display resolution 0.01 °C
- Temperature stability ±0.01 °C
- Programmer with real time clock
- Built-in cooling coil for applications at or near ambient using tap water cooling

ME-31A is supplied with a Plexiglas® bath tank, ME-16G includes a glass bath tank.

The top-of-the-line model ME-18V is supplied with a stainless steel bath tank with insulated walls and two transparent windows of 7.3 x 9.6 inches made of high quality multiple-layer insulated glass.

Using JULABO refrigeration units in combination with a special cooling coil, temperatures of 0 °C, -20 °C or -40 °C can be reached. Please contact JULABO!



Stability 0.01 °C



ME-31A

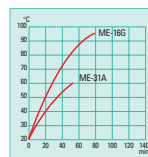


ME-16G

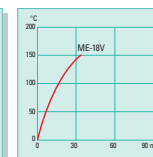
Application Examples

- Measuring tasks with capillary viscometers
- Use of densimeters and other related products
- ME-18V can be used according to standard ASTM D445

Heat-up times (230 V)
Bath fluid: Water



Heat-up times (230 V)
Bath fluid: Thermal H



ME-18V

For more viscometers! Available as option:

Cover with 4 round openings 2.0 inches dia. for ME-18V (order no. 8 970 294)



Cover with 5 round openings 2.0 inches dia. for ME-31A (order no. 8 970 295)

| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stab. °C | Heat. cap. kW | Pump capacity Flow rate/Pressure l/min. psi | Bath opening/ number/ bath depth in | Qty. of visco-meters | Fill. vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|----------------|---------------|---|-------------------------------------|----------------------|-------------------|-------------------------|------------|--|
| 9 160 331 | ME-31A | 20 ... 60 | ±0.01 | 1 | 11-16 3.3-6.5 | 3.5 x 3.5 / 3 x / 14.6 | 3 | 31 | 19.7 x 7.9 x 22.1 | 24.3 | 115/60/9 |
| 9 160 616 | ME-16G | 20 ... 100 | ±0.01 | 1 | 11-16 3.3-6.5 | 3 x 3 / 2 x / 12.2 | 2 | 16 | dia. 11.4 x 18.9 | 19.8 | 115/60/9 |
| 9 160 518 | ME-18V | 20 ... 150 | ±0.01 | 1 | 11-16 3.3-6.5 | 3.5 x 3.5 / 2 x / 14.6 | 2 | 18 | 14.1 x 9.5 x 21.3 | 37.5 | 115/60/9 |

Visco Baths

Technical features



| | | | | | | | | | | | |
|-----------|--------|------------|-------|---|---------------|------------------------|---|----|-------------------|------|----------|
| 9 160 331 | ME-31A | 20 ... 60 | ±0.01 | 1 | 11-16 3.3-6.5 | 3.5 x 3.5 / 3 x / 14.6 | 3 | 31 | 19.7 x 7.9 x 22.1 | 24.3 | 115/60/9 |
| 9 160 616 | ME-16G | 20 ... 100 | ±0.01 | 1 | 11-16 3.3-6.5 | 3 x 3 / 2 x / 12.2 | 2 | 16 | dia. 11.4 x 18.9 | 19.8 | 115/60/9 |
| 9 160 518 | ME-18V | 20 ... 150 | ±0.01 | 1 | 11-16 3.3-6.5 | 3.5 x 3.5 / 2 x / 14.6 | 2 | 18 | 14.1 x 9.5 x 21.3 | 37.5 | 115/60/9 |

¹⁾ For temperature applications at or near ambient: counter-cooling with tap water via built-in cooling coil.

²⁾ Other voltages available on request

for working temperatures from +50 °C to +300 °C

These units are designed specifically for applications in calibration laboratories and conform to the requirements specified by DIN ISO 9001:2000.

Calibration baths include a constant level temperature chamber. The circulating pump transports the bath fluid through the overflowing temperature chamber to the circulator bath. The following values are achieved while a constant liquid level is maintained:

- Highest temperature stability to ±0.005 °C
- Temperature display in °C or °F

Temperature values (reproducible to 0.01°C) are set via the splash-proof keypad and are clearly visible on the bright VFD COMFORT-DISPLAY.

Up to 3 frequently required setpoint temperatures can be stored and recalled any time.

Simultaneous indication of 3 temperature values!

Using the precision Pt100 reference sensor it is possible to have the reference temperature displayed. Based on this, additional calibration certificates according to ISO and DKD can be issued.

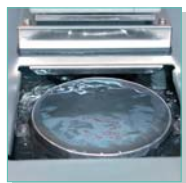
Display resolution 0.01 °C across the temperature range!

Additional benefits

- Ease of operation
- Low noise level
- Compact design



- Removable circulator with temperature chamber



- Temperature chamber with uniform overflow

Temperature uniformity
Bath fluid: JULABO Thermal H

| At °C | SL-8K | SL-14K |
|-------|--------|---------|
| +100 | 0.01 K | 0.005 K |
| +150 | 0.02 K | 0.008 K |
| +200 | 0.03 K | 0.008 K |
| +250 | 0.03 K | 0.008 K |

Application Examples

Calibration of thermometers, thermocouples, thermistors, and RTDs that needs to be carried out in regular intervals according to national and international standards.



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stability °C | Heating capacity kW | Pump capacity Flow rate /min. Pressure psi | Bath opening/ Usable bath depth in | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement V/Hz/A |
|------------------|--------------|------------------------|--------------------|---------------------|--|------------------------------------|-----------------------|-------------------------|------------|--------------------------|
|------------------|--------------|------------------------|--------------------|---------------------|--|------------------------------------|-----------------------|-------------------------|------------|--------------------------|

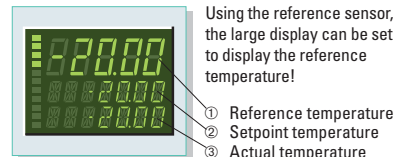
Calibration Baths

| Technical features | 9 350 508 | 9 350 514 | SL-8K | SL-14K | +50 ... +300 | ±0.005 | 3 | 22-26 | 5.8-10.2 | dia. 4.7 / 6.7 | 8 | 8.7 x 18.1 x 18.5 | 35.3 | 208-230/50-60/14 |
|--------------------|-----------|-----------|-------|--------|--------------|--------|---|-------|----------|----------------|---|-------------------|------|------------------|
| | | | | | | | | | | | | | | |

for working temperatures from -30 °C to +200 °C with refrigeration unit

Reference temperature can be measured and permanently displayed via an adapted highly accurate digital sensor (patented).

VFD COMFORT-DISPLAY



Using the reference sensor, the large display can be set to display the reference temperature!

- ① Reference temperature
- ② Setpoint temperature
- ③ Actual temperature

Outstanding and new!
Only offered by JULABO.

Save the extra costs of purchasing a highly accurate digital thermometer!
(details see page 40)

Accessory included with all models:

- 8 970 246** Bath cover with openings and Viton® sleeves:
2 x 3 mm, 2 x 4 mm and 2 x 6 mm inner dia.



Accessories

- 8 981 002** Precision Pt100 reference sensor 180 x 4 mm dia.
9 660 003 FL300 recirculating cooler for models SL-8K and SL-14K

Viton® sleeves (2 pcs.)

| Order No. | for sensor |
|------------------|------------|
| 8 930 602 | 2 mm dia. |
| 8 930 603 | 3 mm dia. |
| 8 930 604 | 4 mm dia. |
| 8 930 605 | 5 mm dia. |
| 8 930 606 | 6 mm dia. |
| 8 930 608 | 8 mm dia. |

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stability °C | Heating capacity kW | Cooling cap. kW (Bath fluid: Ethanol) 20 0 -20°C | Pump capacity Flow rate / Pressure l/min. psi | Bath opening/ Usable bath depth in | Filling vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|--------------------|---------------------|--|---|------------------------------------|---------------------|-------------------------|--|
|------------------|--------------|------------------------|--------------------|---------------------|--|---|------------------------------------|---------------------|-------------------------|--|

Calibration Baths with integrated refrigeration unit

| Technical features | 9 350 627 | 9 350 628 | FK30-SL | FK31-SL | -30 ... +200 | ±0.005 | 1 | 0.46 | 0.34 | 0.15 | 22-26 | 5.8-10.2 | dia. 4.7 / 6.7 | 14 | 12.6 x 17.7 x 31.1 | 115/60/16 |
|--------------------|-----------|-----------|---------|---------|--------------|--------|---|------|------|------|-------|----------|----------------|----|--------------------|-----------|
| | | | | | | | | | | | | | | | | |

¹⁾ Other voltages available on request

Precision Pt100 reference sensor (Order No. 8 981 002)

This special sensor for calibration technology provides
 • **integrated measuring electronics and RS232 connection**

The sensor is inside a high quality stainless steel tube and is suitable for use with the JULABO calibration baths.



| | |
|--------------------|--|
| Measuring range | -40.00 ... +300.00 °C |
| Measuring accuracy | ±0.05 °C +0.05 % of reading (-40.00 to -0.01 °C) ±0.05 °C (0.00 to +100.00 °C) ±0.05 °C +0.05 % of reading (+100.01 to +300.00 °C) |
| Dimensions | 180 x 4 mm, 1 m cable |
| Immersion depth | 90 mm min., 140 mm max. |

DKD and ISO Calibration Certificates

When purchasing a JULABO calibration bath YOU decide which certificates you require. We take care of the rest!

YOU obtain the calibration solution including the requested certificate ready for immediate use for calibration services, production, quality assurance, etc.

| JULABO Order No. | Description |
|------------------|-------------|
|------------------|-------------|

Certificates for the calibration of the circulator

| | | |
|-----------|--|--|
| 8 902 113 | ISO-3-point calibration certificate | Calibration at 3 selectable measuring points |
| 8 902 115 | ISO-5-point calibration certificate | Calibration at 5 selectable measuring points |
| 8 902 123 | DKD-3-point calibration certificate | Calibration at 3 selectable measuring points |
| 8 902 125 | DKD-5-point calibration certificate | Calibration at 5 selectable measuring points |

Certificates for the calibration of the precision reference sensor

| | | |
|-----------|--|--|
| 8 902 213 | ISO-3-point calibration certificate | Calibration at 3 selectable measuring points |
| 8 902 215 | ISO-5-point calibration certificate | Calibration at 5 selectable measuring points |
| 8 902 223 | DKD-3-point calibration certificate | Calibration at 3 selectable measuring points |
| 8 902 225 | DKD-5-point calibration certificate | Calibration at 5 selectable measuring points |

NIST calibration certificate

NIST calibration certificates are available upon request. Please contact JULABO.

Example: DKD calibration certificate



Example: ISO calibration certificate



Presto® and Magnum 91

– External temperature applications in wide temperature ranges

JULABO offers a sophisticated range of Highly Dynamic Temperature Control Systems on pages 41 to 46.

The systems provide many unique features compared to conventional heating and cooling circulators.

- ▶ **Presto®**: Sealed system design allows for extended temperature ranges, for example from -40 to +250 °C or from -80 to +170 °C – without the requirement to change bath fluids.
- ▶ **Presto®** avoids oxidation and ensures prolonged lifetime of the bath fluid.
- ▶ **Presto®** is time-saving: rapid heat-up and cool-down times throughout the entire temperature range, control for unsupervised continuous operation.

- ▶ **Presto®** compensates exothermic and endothermic reactions quickly and with exceptional temperature accuracy.
- ▶ **Presto®** is hydraulically sealed to prevent unpleasant vapors and odors.
- ▶ **Presto®** does not allow absorption of air humidity into the bath fluid. This prevents condensation and ice build-up.

Bright VFD COMFORT-DISPLAY

- For actual value, setpoint Resolution 0.01 °C
- Illuminated displays for A: selected pump stage B: filling volume
- Status displays (heating, cooling, etc.)

Remote device 'RD'

- Backlit, 4-line LCD-DISPLAY for user-friendly operation
- Splash-proof keypad for setpoint, actual temperature, pump pressure control
- System status, high/low temperature warning functions with intermittent tone
- Integrated programmer with real time clock for 6 x 60 program steps
- Best reproducibility of all set values



Keypad, splash-proof

- ① Start key for filling process
- ② Key to toggle display from setpoint / actual value
- ③ High temperature cut-off according to DIN 12876-1
- ③a High temperature cut-off for cooled fluid in reservoir




Analog/digital connections

- External Pt100 sensor
- Serial interface RS232 / RS485
- Analog input for external programming
- Standby input for external emergency cut-off
- Connector for external alarm device
- Control cable for remote device 'RD' or 5 m extension cable (accessory)

Presto® benefits:

- Small space required
 - LH40, LH45, LH46 and LH85 can be placed under lab bench
- LH45, LH46 and LH85: Combination of air and water cooling, i.e. automatic changeover at high ambient temperatures or interruption of cooling water
- Handles and castors allow easy relocation
- Time-saving filling process for the entire system with permanent air purge

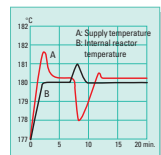
- Reservoir with cooling device and integrated high temperature cut-off
- Integrated warning, safety and supervision functions via 9 sensors
- Optional expansion vessels (accessories)
- Automated De-Gas function
- Small filling volume enhances instrument performance
- Adjustable pump
- IP class according to IEC 60529: IP31

-  • Active Cooling Control: Cooling available throughout entire temperature range
-  • Proportional cooling control: energy-saving performance
-  • Removable venting grid: Hassle-free cleaning of the condenser
- Drain port easily accessible on the front

Highly dynamic control

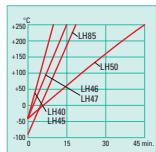
The diagram on the right shows how the LH45 automatically compensates an exothermic reaction in order to keep the setpoint temperature in the connected 2 liter reactor.

Automatic control of an exothermic reaction with a 2 liter reactor



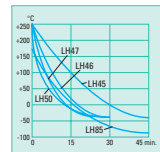
Heat-up times

Bath fluid: Thermal HL



Cool-down times

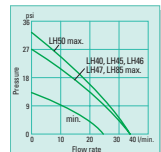
Bath fluid: Thermal HL



Presto®

Pump capacities

Bath fluid: Thermal HL



More space in your lab:



LH40 / LH45

Can be placed under the bench!



LH46 / LH85

Small foot print. High capacity.



LH50 (LH47 with venting grid)

| JULABO Order No. | JULABO Model | Working temp. range °C | Temperature stability in external system °C | Temperature display / Resolution °C | Indication of pump pressure and filling volume | Heating capacity kW |
|------------------|--------------|------------------------|---|-------------------------------------|--|---------------------|
|------------------|--------------|------------------------|---|-------------------------------------|--|---------------------|

Technical features (see fold-out page)



| | | | | | | |
|-----------|------|--------------|-----------------|-------------------|----------------|-----|
| 9 410 140 | LH40 | -40 ... +250 | ±0.01 ... ±0.05 | VFD + LCD / ±0.01 | on VFD display | 2.6 |
| 9 410 145 | LH45 | -40 ... +250 | ±0.01 ... ±0.05 | VFD + LCD / ±0.01 | on VFD display | 2.6 |
| 9 410 146 | LH46 | -45 ... +250 | ±0.01 ... ±0.05 | VFD + LCD / ±0.01 | on VFD display | 1.8 |
| 9 410 147 | LH47 | -45 ... +250 | ±0.01 ... ±0.05 | VFD + LCD / ±0.01 | on VFD display | 1.8 |
| 9 410 150 | LH50 | -50 ... +250 | ±0.01 ... ±0.1 | VFD + LCD / ±0.01 | on VFD display | 6.0 |
| 9 410 185 | LH85 | -80 ... +250 | ±0.01 ... ±0.05 | VFD + LCD / ±0.01 | on VFD display | 1.8 |

Included with each unit: 1.5 m CR® tubing for overflow

Application Examples

- Jacketed reactors, autoclaves, e.g. for polymerization, polycondensation
- Combinatorial chemistry, reaction blocks, organic synthesis
- Reaction calorimeters
- Distillation, pilot plants
- Calibration
- Semiconductor industry

| Cooling capacity kW ¹⁾ (Bath fluid: JULABO Thermal Ethanol) | Cooling of compressor | Pump capacity Flow rate / Pressure l/min. psi | Filling vol. liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V / Hz / A |
|---|-----------------------|---|------------------------|-------------------------------|---------------|---|
|---|-----------------------|---|------------------------|-------------------------------|---------------|---|

Technical features (see fold-out page)



| | | | | | | | | | | | | |
|-----|-----|-----|------|-----|-----|-----------|-------|-------------|------|--------------------|-------|--|
| 1.5 | 1.0 | 0.4 | 0.05 | -- | -- | air | 24-33 | 11.6 - 23.2 | 4.0 | 11.8 x 19.3 x 25.2 | 156.5 | 208-230 / 60 / 16 |
| 1.5 | 1.2 | 0.5 | 0.1 | -- | -- | air/water | 24-33 | 11.6 - 23.2 | 4.0 | 11.8 x 19.3 x 25.2 | 169.8 | 208-230 / 60 / 16 |
| 2.5 | 2.1 | 0.9 | 0.1 | -- | -- | air/water | 24-33 | 11.6 - 23.2 | 6.0 | 19.7 x 23.2 x 25.2 | 227.1 | 208-230 / 60 / 16 |
| 2.5 | 3.0 | 1.3 | 0.3 | -- | -- | air | 24-33 | 11.6 - 23.2 | 11.0 | 15.8 x 21.7 x 50 | 330.7 | 208-230 / 60 / 16 / 3Ph. ³⁾ |
| 5.5 | 7.0 | 2.8 | 0.9 | -- | -- | water | 24-35 | 11.6 - 31.9 | 18.0 | 15.8 x 21.7 x 50 | 401.2 | 208-230 / 60 / 24 / 3Ph. ³⁾ |
| 1.5 | 1.0 | 0.9 | 0.7 | 0.5 | 0.1 | air/water | 24-33 | 11.6 - 23.2 | 6.0 | 19.7 x 23.2 x 25.2 | 286.6 | 208-230 / 60 / 16 |

¹⁾ Cooling capacity measured at pump stage 1 = 24 l/min. – 11.6 psi (and water-cooling on models LH45, LH85, LH50)

²⁾ Other voltages available on request

³⁾ 32A power supply line necessary for LH47 and LH50

Magnum 91

- The Powerful Temperature Control System -

Magnum 91 offers the same benefits as the **Presto®** models. This system is particularly suitable for temperature control of external systems because it provides:

- Working temperature range from -91 to +250 °C
- High heating and cooling capacities
- Strong pump performance (adjustable)
- Integrated expansion vessel
- IP class according to IEC 60529: IP20

Cooling of the two-stage refrigeration unit can be performed via the built-in cooling water connections G 3/4" using industrial water.

Additional benefits

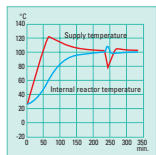
- Convenient arrangement of operating elements
- Keypad control
- Large VFD COMFORT-DISPLAY
- Backlit LCD display for user-friendly operation
- Connections for external Pt100 sensor – as well as other analog and digital connectors

Application Examples

- Reactor systems up to 50 liters
- Pilot plants, Kilo labs
- Polymerization, polycondensation, etc.

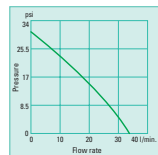
Automatic control

of an exothermic reaction with a 30 liter reactor



Pump capacity

Bath fluid: Thermal HL



Magnum 91

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stability in external system °C | Temperature display / resolution °C | Indication of pump pressure and filling volume | Heating capacity kW |
|------------------|--------------|------------------------|---------------------------------------|-------------------------------------|--|---------------------|
| 9 410 191 | Magnum 91 | -91 ... +250 | ±0.05 ... ±0.2 | VFD + LCD / ±0.01 | on illuminated display | 6.0 |

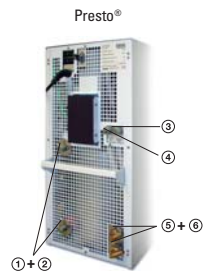
Technical features (see fold-out page)



| Order No. | Model | Temp. range | Temp. stability | Temp. display | Temp. resolution | Temp. control | Heating capacity |
|-----------|-----------|--------------|-----------------|---------------|------------------|------------------------|------------------|
| 9 410 191 | Magnum 91 | -91 ... +250 | ±0.05 ... ±0.2 | VFD + LCD | ±0.01 | on illuminated display | 6.0 |

| Cooling capacity kW (Bath fluid: JULABO Thermal) | Cooling of compressor | Pump capacity Flow rate / Pressure l/min. / psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|--|-----------------------|---|-----------------------|-------------------------|------------|--|
| +200 +20 -20 -40 -60 -80°C | water | 24-35 11.6-32.1 | 21.5 | 28 x 34.7 x 65 | 948.0 | 208-230 / 60 / 35 / 3Ph. |

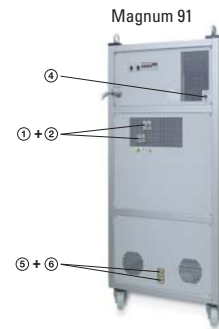
¹⁾ Other voltages available on request



Pump and cooling water connections

Rear view:

- ① + ② Pump connections M16x1 male
- ③ Expansion vessel connection M16x1 male
- ④ Overflow connector
- ⑤ + ⑥ Cooling water connections G 3/4" with barbed fittings for tubing 1/2" inner dia.



Bath Fluids

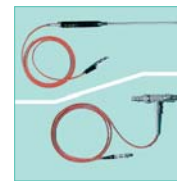
JULABO offers a broad range of bath fluids that will suit your needs. Please contact JULABO or consult www.julabo.com for detailed information.

Accessories

| Order No. | Description | Suitable for |
|-----------|--|---------------------|
| 8 981 003 | 200 x 6 mm dia., stainless steel, 1.5 m cable | Presto® + Magnum 91 |
| 8 981 005 | 200 x 6 mm dia., glass, 1.5 m cable | |
| 8 981 006 | 20 x 2 mm dia., stainless steel, 1.0 m cable | |
| 8 981 010 | 300 x 6 mm dia., stainless steel, 1.5 m cable | |
| 8 981 011 | 300 x 6 mm dia., glass, 1.5 m cable | |
| 8 981 013 | 600 x 6 mm dia., stainless steel/Teflon coated, 3 m cable | |
| 8 981 014 | 1200 x 6 mm dia., stainless steel/Teflon coated, 3 m cable | |
| 8 891 019 | 12" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 002 | 24" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 004 | 36" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 891 006 | 48" x 1/4" dia. stainless steel/Teflon coated, 12' cable | |
| 8 981 020 | M + R in-line Pt100 sensor (including 2 fittings M16x1 male) | |
| 8 981 103 | 3.5 m Extension cable for Pt100 sensor | |
| 8 981 030 | TCCB Thermo-Couple Converter Box | |



Bath fluid



External Pt100 sensor / M+R in-line Pt100 sensor

Metal tubing, flexible, triple insulated, -100 ... +350 °C

| Order No. | Description | Suitable for |
|-----------|--------------------|---------------------|
| 8 930 209 | 0.5 m Metal tubing | Presto® + Magnum 91 |
| 8 930 210 | 1 m Metal tubing | |
| 8 930 211 | 1.5 m Metal tubing | |
| 8 930 214 | 3 m Metal tubing | |

Metal tubing, flexible, insulated, -50 ... +200 °C

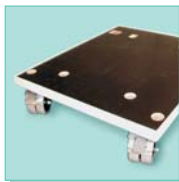
| Order No. | Description | Suitable for |
|-----------|--------------------|---------------------|
| 8 930 220 | 0.5 m Metal tubing | Presto® + Magnum 91 |
| 8 930 221 | 1 m Metal tubing | |
| 8 930 222 | 1.5 m Metal tubing | |
| 8 930 223 | 3 m Metal tubing | |



Metal tubing, triple insulated

Earthquake anchors

| | | |
|-----------|--------------------|-----------|
| 8 920 055 | Earthquake anchors | Magnum 91 |
|-----------|--------------------|-----------|



Castor platform

| Order No. | Description | Suitable for |
|-----------|-------------|--------------|
|-----------|-------------|--------------|

Additional accessories

| | | |
|-----------|--|--------------------------------|
| 8 970 443 | Adapter M16x1 male to M16x1 male | Connecting metal tubing |
| 8 970 750 | Icing protection sleeve for pump connectors | Presto® + Magnum 91 |
| 8 970 041 | Castor platform with 2 brakes - Dimensions (WxLxH): 22 x 18.7 x 4.9 in | Presto® LH40, LH45, LH46, LH85 |
| 8 970 830 | Expansion vessel 2 liters | Presto® LH40, LH45, LH46, LH85 |
| 8 970 831 | Expansion vessel 5 liters | Presto® LH47, LH50 |
| 8 980 127 | 5 m Extension cable for remote device RD | Presto® |

Connectors / Valves / Adapters, etc.

| | | |
|-----------|---|---------------------|
| 8 970 457 | Shut-off valve for loop circuit (max. +200 °C), M16x1 | Presto® + Magnum 91 |
| 8 970 490 | 2 Collar nuts M16x1 female | |
| 8 970 442 | 2 Elbow fittings 90°, M16x1 female/male | Presto® + Magnum 91 |
| 8 890 004 | 2 Adapters M16x1 female to NPT 1/4" male | |
| 8 890 005 | 2 Adapters M16x1 female to NPT 1/4" female | |
| 8 890 006 | 2 Adapters M16x1 female to NPT 3/8" male | |
| 8 890 007 | 2 Adapters M16x1 female to NPT 3/8" female | |
| 8 890 008 | 2 Adapters M16x1 female to NPT 1/2" male | |
| 8 890 009 | 2 Adapters M16x1 female to NPT 1/2" female | |
| 8 890 010 | 2 Adapters M16x1 male to NPT 1/4" female | |
| 8 891 008 | 1 Adapter M16x1 male to BSP 1/2" female | |
| 8 891 009 | 1 Adapter M16x1 male to BSP 3/4" female | |
| 8 890 011 | 2 Adapters M16x1 female to tube 1/4" male | |
| 8 890 012 | 2 Adapters M16x1 female to tube 3/8" male | |
| 8 890 013 | 2 Adapters M16x1 female to tube 1/2" male | |
| 8 890 024 | 2 Adapters M16x1 female to M16x1 female | |



Expansion vessel (rear view)

Software / Lab automation

| | | |
|-----------|--|---------------------|
| 8 901 102 | 'EasyTemp' control software (free download www.julabo.com) | Presto® + Magnum 91 |
| 8 901 105 | 'EasyTemp Professional' control software, incl. USB dongle | |
| 8 980 073 | RS232 interface cable, 2.5 m | |
| 8 900 110 | USB Interface adapter cable | |
| 8 900 015 | PBM Profibus DP Master | |
| 8 900 002 | PB-2 Option: integrated Profibus DP | |



FREE of charge



Application:
Magnum 91 with jacketed 30 liter glass reactor

Perfect:
Presto® and Magnum 91 are the perfect solution for temperature control of reactors. Please contact JULABO and ask for the most suitable unit for your requirements.

For YOUR convenience!
Get detailed information about functioning, operation and setup from the interactive Presto® CD-ROM, which you can order free of charge at www.julabo.com!

Environmentally friendly solutions for cooling applications

JULABO Recirculating Coolers are designed to economically dissipate process heat from external systems via a

cooling loop. This has the benefit of saving precious tap water, reducing costs and increasing efficiency.

Benefits of JULABO recirculating coolers (pages 47 to 56)

- Environmentally friendly operation with reduced energy consumption
- Prevents contamination in the cooling loop
- Waste water does not contain hazardous substances
- High condensation efficiency
- Constant working temperature
- Constant pump performance
- Temperature adjustable to sub ambient temperatures, if required down to -20 °C
- Suitable for heating and cooling applications (pages 52 to 55)
- Rapid amortization period

COMPACT Recirculating Coolers

These models with a small foot print are designed for applications that do not require a large amount of cooling performance.

AWC100 Air-to-Water Recirculating Cooler:



AWC100

This unit does not include a refrigeration unit. The cooling principle: Warm bath fluid is pumped through the heat exchanger. The heat exchanger is cooled by a ventilator motor and thus withdraws the produced heat. The ventilator motor is adjustable in 2 stages.

F200 Recirculating Cooler



F200

With the integrated refrigeration unit and the cooling coil in the bath tank a constant cooling performance is achieved. The setpoint is adjustable.

AWC100 and F200 offer: Filling opening with cover and filling level indicator

Application Examples

- Cooling of Peltier elements, particularly for analytical devices and CCD cameras
- Polarimeters, refractometers

Application Examples

- Electrophoresis chambers
- Condensers for glass installations
- Calorimeters, lasers with low heat generation

| JULABO Order No. | JULABO Model | Working temp. range °C | Cooling capacity varying with the temp. difference between return line temp. and ambient temp., Watts | | | | Pump capacity Flow rate / Press. l/min. psi | Filling vol. liters | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A | |
|------------------|--------------|------------------------|---|----|----|------|---|---------------------|-------------------------|--|----------|
| | | | 20 | 15 | 10 | 5 °C | 2.9 | 2.9 | 0.9 | 7.9 x 13.4 x 11.8 | 115/60/1 |

Air-to-Water Recirculating Cooler

| | | | | | | | | | | | | |
|-----------|--------|-----------|----------|-----|-----|-----|-----|-----|-----|-----|-------------------|----------|
| 9 630 100 | AWC100 | +20...+40 | Stage 1: | 400 | 320 | 220 | 120 | 2.9 | 2.9 | 0.9 | 7.9 x 13.4 x 11.8 | 115/60/1 |
| | | | Stage 2: | 550 | 440 | 300 | 180 | | | | | |

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stability °C | Cooling capacity Watts | | | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V/Hz/A | |
|------------------|--------------|------------------------|--------------------|------------------------|-----|-------|---|-----------------------|-------------------------|-------------------|--|----------|
| | | | | +20 | +10 | +5 °C | 8 | 1.7 | 3.0 | 7.5 x 13.8 x 16.1 | 41.9 | 115/60/9 |

Recirculating Cooler

| | | | | | | | | | | | | |
|-----------|------|------------|----|-----|-----|-----|---|-----|-----|-------------------|------|----------|
| 9 620 020 | F200 | +5 ... +40 | ±3 | 200 | 180 | 130 | 8 | 1.7 | 3.0 | 7.5 x 13.8 x 16.1 | 41.9 | 115/60/9 |
|-----------|------|------------|----|-----|-----|-----|---|-----|-----|-------------------|------|----------|

Included with: AWC100: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)
F200: Pump connections for tubing 10 mm inner dia.

¹⁾ Other voltages available on request

The NEW 'FL' Series

Recirculating coolers from the new FL generation offer YOU:

- Ergonomic design and easy operation
- Splash-proof keypad with large, bright LED display and integrated main switch
- Industrial grade main switch (models > 2.5 kW cooling capacity)
- Reliable MICROPROCESSOR PID temperature control
- Filling level indicator
- Pressure indicator from model FL1201 upwards
- Powerful immersion pumps, suitable for continuous operation
- Pump capacities from 5.1 to 87.6 psi
- Adjustable bypass for pump pressure from model FL1203 upwards
- Suitable fluids: water, water-glycol mixture and JULABO Thermal bath fluids
- Permissible temperature in return line +80 °C
- Easy filling
- Cooling capacities from 0.3 to 11 kW
- Patented low liquid level protection with optical and audible alarm signal
- Integrated stainless steel bath tanks with large volumes
- Wetted parts are made of high quality stainless steel or plastic
- Removable venting grid for hassle-free cleaning of condenser, front drain accessibility
- No side vents. Benefit: Recirculating coolers can be placed right next to other equipment.
- Recessed grips for easy relocation integrated in the housing
- IP class according to IEC 60529: IP21
- Operation in ambient temperatures up to +40 °C for all models

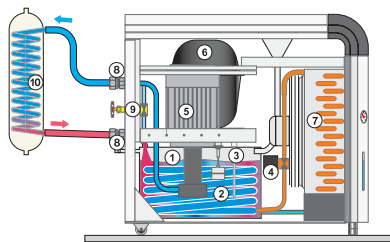
- A Filling from the top; with hinged protective lid
- B Splash-proof keypad
- C Integrated main switch
- D Bright LED temperature display
- E RS232 interface
- F Alarm output (dry contact)
- G Pressure indicator
- H Filling level indicator
- I Drain port
- J Removable venting grid



The Recirculating Coolers of the FL series will make YOUR work easier and save YOU time.

The pump inlet and outlet with connection thread and barbed fittings as well as the lockable overflow are located on the back of the unit. Furthermore: manually adjustable bypass (universal globe valve), to reduce the pump capacity from model FL1203 upwards (e.g. for applications involving glass devices)

The generation of the required cooling capacity occurs through the cooling coil ② integrated in the bath tank ①. Control electronics and temperature sensor ③ control the solenoid valve ④. The immersed circulating pump ⑤ delivers the cooled fluid with a high degree of efficiency through a circuit to an externally connected system ⑩.



- ① Bath tank
- ② Cooling coil
- ③ Temperature sensor
- ④ Solenoid valve
- ⑤ Circulating pump
- ⑥ Compressor
- ⑦ Condenser
- ⑧ Pump connections
- ⑨ Bypass for pump pressure
- ⑩ Externally connected system

Model designation and comments

FL = with fan-air-cooling
FLW = with water-cooling, powerful models (alternatively)



Can be placed under counter top!



FL300

FL601

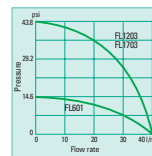


FL1201, FL1703

Application Examples
for models on pages 49 to 51

- Rotary evaporators
- Autoclaves
- Reaction vessels
- Soxhlet installations
- Distillation apparatus
- Vacuum systems
- Gas chromatographs
- Spectrometers
- Semiconductor industry
- Dosing & glueing technique
- Diffusion pumps
- Mass spectrometers

Pump capacities
Bath fluid: Water



Recirculating Coolers

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Cooling capacity kW | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|-----------------------|---|-----------------------|-------------------------|------------|--|
| 9 660 003 | FL300 | -20 ... +40 | ±0.5 | 0.3 0.25 0.2 0.15 0.1 | 15 5.1 | 3 ... 4.5 | 9.8 x 19.7 x 23.6 | 86.0 | 115 / 60 / 6 |
| 9 661 006 | FL601 | -20 ... +40 | ±0.5 | 0.6 0.5 0.4 0.33 0.2 | 40 14.6 | 5.5 ... 8 | 12.6 x 19.7 x 23.6 | 105.8 | 115 / 60 / 10 |
| 9 661 012 | FL1201 | -20 ... +40 | ±0.5 | 1.2 1.0 0.9 0.6 0.3 | 40 14.6 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 167.6 | 115 / 60 / 14 |
| 9 663 012 | FL1203 | -20 ... +40 | ±0.5 | 1.2 0.9 0.8 0.5 0.2 | 40 7.3-43.8 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 200.6 | 115 / 60 / 18 |
| 9 661 017 | FL1701 | -20 ... +40 | ±0.5 | 1.7 1.5 1.1 0.85 0.4 | 40 14.6 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 187.4 | 115 / 60 / 17 |
| 9 663 017 | FL1703 | -20 ... +40 | ±0.5 | 1.7 1.4 1.0 0.75 0.3 | 40 7.3-43.8 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 200.6 | 115 / 60 / 19 |

Technical features
(see fold-out page)



| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Cooling capacity kW | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|----------------------|---|-----------------------|-------------------------|------------|--|
| 9 671 017 | FLW1701 | -20 ... +40 | ±0.5 | 1.7 1.5 1.1 0.85 0.4 | 40 14.6 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 180.8 | 115 / 60 / 17 |
| 9 673 017 | FLW1703 | -20 ... +40 | ±0.5 | 1.7 1.4 1.0 0.75 0.3 | 40 7.3-43.8 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 194.0 | 115 / 60 / 18 |

Recirculating Coolers (water-cooled)

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Cooling capacity kW | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|----------------------|---|-----------------------|-------------------------|------------|--|
| 9 671 017 | FLW1701 | -20 ... +40 | ±0.5 | 1.7 1.5 1.1 0.85 0.4 | 40 14.6 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 180.8 | 115 / 60 / 17 |
| 9 673 017 | FLW1703 | -20 ... +40 | ±0.5 | 1.7 1.4 1.0 0.75 0.3 | 40 7.3-43.8 | 12 ... 17 | 19.7 x 29.9 x 25.2 | 194.0 | 115 / 60 / 18 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)
FL1203, FL1703 and FLW1703: 2 barbed fittings for tubing 3/4" inner dia. (pump connections G3/4" male)

¹⁾ Other voltages available on request

Models FL2503 through FLW4006

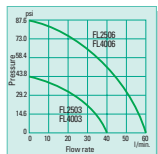
These powerful recirculating coolers provide high cooling capacities, strong pump performance and a bath volume of up to 27 liters so that high power reserves are available for constant cooling of the external system.

Benefits of models FL2503 through FLW11006:

- **Early warning function to monitor condenser cleanliness.** All units designed with easy-access condenser.
- Pump motor and compressor overload protection (on all models)
- **Online diagnosis with 'BlackBox' function**
- Low water consumption on all FLW models



Pump capacities
Bath fluid: Water



FL2503 through FL4006

FLW2503 through FLW4006

Recirculating Coolers

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Cooling cap. kW +20 ±0 -10 -20°C | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|-------------------------------------|---|-----------------------|-------------------------|------------|--|
|------------------|--------------|------------------------|----------------|-------------------------------------|---|-----------------------|-------------------------|------------|--|

Technical features
(see fold-out page)



| | | | | | | | | | |
|-----------|--------|------------|------|------------------|-------------|-----------|--------------------|-------|--------------------------|
| 9 663 025 | FL2503 | -20 ... 40 | ±0.5 | 2.5 1.5 1.2 0.55 | 40 7.3-43.8 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 321.9 | 208-230 / 60 / 12 |
| 9 666 025 | FL2506 | -15 ... 40 | ±0.5 | 2.5 1.0 0.3 -- | 60 7.3-87.6 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 348.3 | 208-230 / 60 / 16 |
| 9 663 040 | FL4003 | -20 ... 40 | ±0.5 | 4.0 2.4 1.5 0.65 | 40 7.3-43.8 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 326.3 | 208-230 / 60 / 10 / 3Ph. |
| 9 666 040 | FL4006 | -20 ... 40 | ±0.5 | 4.0 1.9 0.9 0.05 | 60 7.3-87.6 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 346.1 | 208-230 / 60 / 15 / 3Ph. |

Recirculating Coolers (water-cooled)

| | | | | | | | | | |
|-----------|---------|------------|------|------------------|-------------|-----------|--------------------|-------|--------------------------|
| 9 673 025 | FLW2503 | -20 ... 40 | ±0.5 | 2.7 1.7 1.3 0.55 | 40 7.3-43.8 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 315.3 | 208-230 / 60 / 12 |
| 9 676 025 | FLW2506 | -15 ... 40 | ±0.5 | 2.5 1.0 0.3 -- | 60 7.3-87.6 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 352.7 | 208-230 / 60 / 16 |
| 9 673 040 | FLW4003 | -20 ... 40 | ±0.5 | 4.3 2.5 1.6 0.65 | 40 7.3-43.8 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 315.3 | 208-230 / 60 / 10 / 3Ph. |
| 9 676 040 | FLW4006 | -20 ... 40 | ±0.5 | 4.0 1.9 0.9 0.05 | 60 7.3-87.6 | 19 ... 27 | 23.6 x 29.9 x 45.3 | 297.6 | 208-230 / 60 / 15 / 3Ph. |

Included with each unit: 2 barbed fittings for tubing 3/4" inner dia. on models FL/FLW2503 and FL/FLW4003 (pump connections G 3/4" male) ¹⁾ Other voltages available on request
2 barbed fittings for tubing 1" inner dia. on models FL/FLW2506 and FL/FLW4006 (pump connections G 1 1/4")



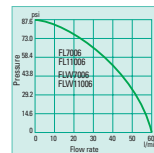
Models FL7006 through FLW11006

Recirculating coolers from this performance category are designed to dissipate process heat from large and demanding external systems.

Further Application Examples

- Electron microscopes
- Lasers
- Mills or kneaders
- Pilot plants
- Miniplants
- Plastic industry
- Drying of gases
- General industries
- Medical diagnostics

Pump capacity
Bath fluid: Water



FL7006 through FLW11006

Recirculating Coolers

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Cooling cap. kW +20 ±0 -10 -20°C | Pump capacity Flow rate/Press. l/min. psi | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V / Hz / A |
|------------------|--------------|------------------------|----------------|-------------------------------------|---|-----------------------|-------------------------|------------|--|
|------------------|--------------|------------------------|----------------|-------------------------------------|---|-----------------------|-------------------------|------------|--|

Technical features
(see fold-out page)



| | | | | | | | | | |
|-----------|---------|------------|------|------------------|-------------|-----------|--------------------|-------|--------------------------|
| 9 666 070 | FL7006 | -20 ... 40 | ±0.5 | 7.0 5.5 3.0 1.7 | 60 7.3-87.6 | 25 ... 35 | 30.7 x 33.5 x 58.3 | 555.6 | 208-230 / 60 / 23 / 3Ph. |
| 9 666 110 | FL11006 | -20 ... 40 | ±0.5 | 11.0 7.5 5.0 3.0 | 60 7.3-87.6 | 25 ... 35 | 30.7 x 33.5 x 58.3 | 546.7 | 208-230 / 60 / 27 / 3Ph. |

Recirculating Coolers (water-cooled)

| | | | | | | | | | |
|-----------|----------|------------|------|------------------|-------------|-----------|--------------------|-------|--------------------------|
| 9 676 070 | FLW7006 | -20 ... 40 | ±0.5 | 7.4 6.0 3.1 1.7 | 60 7.3-87.6 | 25 ... 35 | 30.7 x 33.5 x 58.3 | 485.0 | 208-230 / 60 / 23 / 3Ph. |
| 9 676 110 | FLW11006 | -20 ... 40 | ±0.5 | 11.5 8.0 5.1 3.0 | 60 7.3-87.6 | 25 ... 35 | 30.7 x 33.5 x 58.3 | 551.2 | 208-230 / 60 / 27 / 3Ph. |

Included with each unit: 2 barbed fittings for tubing 1" inner dia. (pump connections G 1 1/4")

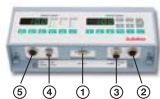
¹⁾ Other voltages available on request

Recirculating Coolers of the FC Series

with 0.6 to 2.5 kW cooling capacity for heating and cooling

- High temperature stability
- Expanded working temperature ranges to +80 °C
- Integrated heater
- Keypad with 2 LED displays
- Adjustable inlet/outlet temperature ratio
- Energy-saving cooling control
- Liquid level indicator: sight glass
- Operation in ambient temperatures up to +40 °C

Digital and analog connections of the FC series:

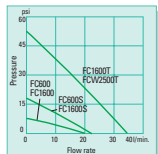


- 1 RS232 interface
- 2 Standby input
- 3 Alarm output

FC1600T, FCW2500T provide additionally:

- 4 External Pt100 sensor
- 5 External programming, temperature recorder

Pump capacities
Bath fluid: Water



FC1600T



FC600S



FCW2500T

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW | | | | | Pump capacity Flow rate/Press. l/min. psi | | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|---------------------|----|---|-----|-------|---|--|-----------------------|-------------------------|------------|--|
| | | | | | 20 | 10 | 5 | -10 | -20°C | | | | | | |

| FC Recirculating Coolers | | Technical features (see fold-out page) | | | | | | | | | | | | | |
|--------------------------|---------|--|----------------|---------------|---------------------|------|-----|------|----|---|------|-----------------------|-------------------------|------------|--|
| Order No. | Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW | | | | | Pump capacity Flow rate/Press. l/min. psi | | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V/Hz/A |
| 9 600 060 | FC600 | -20 ... 80 | ±0.2 | 1.2 | 0.6 | 0.47 | 0.4 | 0.21 | -- | 20 | 7.3 | 6 ... 8 | 13.8 x 21.3 x 19.3 | 105.8 | 208-230/60/7 |
| 9 600 063 | FC600S | -10 ... 80 | ±0.2 | 1.2 | 0.5 | 0.37 | 0.3 | 0.1 | -- | 22 | 17.4 | 6 ... 8 | 13.8 x 21.3 x 19.3 | 114.6 | 208-230/60/10 |
| 9 600 160 | FC1600 | -20 ... 80 | ±0.2 | 1.2 | 1.65 | 1.25 | 1.0 | 0.47 | -- | 20 | 7.3 | 8 ... 11 | 18.1 x 24 x 19.3 | 143.3 | 208-230/60/10 |
| 9 600 163 | FC1600S | -15 ... 80 | ±0.2 | 1.2 | 1.55 | 1.15 | 0.9 | 0.36 | -- | 22 | 17.4 | 8 ... 11 | 18.1 x 24 x 19.3 | 145.5 | 208-230/60/14 |

| with connection for external Pt100 sensor | | Technical features (see fold-out page) | | | | | | | | | | | | | |
|---|---------|--|----------------|---------------|---------------------|------|-----|------|----|---|------|-----------------------|-------------------------|------------|--|
| Order No. | Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW | | | | | Pump capacity Flow rate/Press. l/min. psi | | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V/Hz/A |
| 9 600 166 | FC1600T | -15 ... 80 | ±0.2 | 1.2 | 1.45 | 1.05 | 0.8 | 0.25 | -- | 28 | 50.8 | 8 ... 11 | 18.1 x 24 x 19.3 | 147.7 | 208-230/60/14.5 |

| water-cooled model | | Technical features (see fold-out page) | | | | | | | | | | | | | |
|--------------------|----------|--|----------------|---------------|---------------------|-----|-----|-----|------|---|------|-----------------------|-------------------------|------------|--|
| Order No. | Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW | | | | | Pump capacity Flow rate/Press. l/min. psi | | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ¹⁾ V/Hz/A |
| 9 601 256 | FCW2500T | -25 ... 80 | ±0.2 | 1.2 | 2.5 | 2.0 | 1.8 | 0.8 | 0.25 | 28 | 50.8 | 8 ... 11 | 18.1 x 24 x 19.3 | 163.1 | 208-230/60/12.6 |

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

¹⁾ Other voltages available on request

Recirculating Coolers

2.5 kW to 10 kW of cooling power; up to 5 kW heating power

Top quality and reliability

Maximum reliability during continuous operation in rough environmental conditions is achieved by using components and materials of the highest quality only. All wetted parts are made of stainless steel or high grade plastic.

Benefits

- Convenient keypad operation and bright temperature display (see page 54)
- Industrial grade main switch and emergency cut-off switch
- High cooling and pump capacities
- Highly efficient gasket-free immersing pumps ensuring maintenance-free continuous operation
- Electronically adjustable pump pressure in stages
- Optional heating
- Pressure indicator
- Filling level indicator
- Overload protection for pump motor and compressor
- Filling port (2.8 inches dia.), sealed
- Handles and castors
- IP class according to IEC 60529 : IP21
- Operation in ambient temperatures up to +40 °C!

The modular concept

Customize your recirculating cooler according to YOUR requirements and select from 5 basic models:

- Keypad and control electronics
- Working temperature range, e.g. -20 to +35 °C, or up to +130 °C
- Adjustable pump type / pump capacity
- Integrated heater
- Process integration (e.g. devicenet)
- Micro-filters and DI-filters

Model descriptions:

Designation 'a' = ventilation-air-cooling

Designation 'w' = water-cooled models

Suitable bath fluids:

- Water, water-glycol
- Silicon oils
- 3M-Fluorinert®
- Galden®



'SemiChill' Recirculating Coolers (Order numbers: see pages 54 & 55)

| JULABO Basic model | Working temp. range ¹⁾ °C | Temp. stab. °C | Cooling capacity kW | | | Pump type/pump capacity | Filling volume liters | Dimensions W x L x H in | Weight lbs | Power requirement ²⁾ V / Hz / A (basic model) ³⁾ |
|--------------------|--------------------------------------|----------------|---------------------|---|--------|-------------------------|-----------------------|-------------------------|------------|--|
| | | | +20 | 0 | -10 °C | | | | | |

| | | | | | | | | | | |
|----------|--------------|------|------|-----|-----|-------------|---------|--------------------|-------|--------------------------|
| SC2500a | -20 ... +80 | ±0.1 | 2.5 | 1.5 | 0.9 | see page 54 | 21...33 | 19.3 x 24.4 x 42 | 297.6 | 208-230 / 60 / 10 |
| SC2500w | -20 ... +80 | ±0.1 | 2.5 | 1.5 | 0.9 | | 21...33 | 19.3 x 24.4 x 42 | 297.6 | 208-230 / 60 / 10 |
| SC5000a | -20 ... +130 | ±0.1 | 5.0 | 2.5 | 1.2 | | 43...60 | 23.2 x 26.4 x 44.1 | 337.3 | 208-230 / 60 / 20 / 3Ph. |
| SC5000w | -20 ... +130 | ±0.1 | 5.0 | 2.5 | 1.2 | | 43...60 | 23.2 x 26.4 x 44.1 | 337.3 | 208-230 / 60 / 19 / 3Ph. |
| SC10000w | -20 ... +130 | ±0.1 | 10.0 | 5.0 | 2.5 | | 43...60 | 23.2 x 26.4 x 44.1 | 350.5 | 208-230 / 60 / 19 / 3Ph. |

¹⁾ Different working temperature ranges: see page 54 (standard working temperature range: +5 ... +35 °C)

²⁾ Other voltages available on request

³⁾ Please add the following values: for options pump P3: + 1.5 A, pump P4: +3.0 A for options heater H1: +4.0 A, heater H5: +11.0 A

Customize YOUR unit with the following options:

Keypad and control electronics

'Eco' 'EcoPlus' 'Professional'

Technical features

| | | | |
|---|---|---|---|
| MULTI-DISPLAY (LED) temperature indication | • | • | • |
| VFD COMFORT-DISPLAY with simultaneous indication of 3 values | • | • | • |
| Keypad, splash-proof | • | • | • |
| PID temperature control | • | • | • |
| 3-point calibration | • | • | • |
| Pump capacity adjustable in stages | • | • | • |
| RS232 interface | • | • | • |
| 'Stake' connections for power supply (e.g. for a shut-off solenoid valve) | • | • | • |
| Early warning system for low level, high and low temperature limits | • | • | • |
| High temperature cut-off adjustable via display | • | • | • |
| Low liquid level protection with cut-off function | • | • | • |
| Classification III (DIN 12876-1) | • | • | • |
| Online diagnosis with 'Black Box' function | • | • | • |
| Connector for ext. Pt100 sensor for measuring and controlling the external system | • | • | • |
| Integrated programmer with real time clock for 1x10 program steps | • | • | • |
| Resistivity measurement/status display via LED: adjustable between 1 ... 5 MΩ/cm | • | • | • |
| Resistivity measurement & actual value display (range: 0.5 ... 5 MΩ/cm) | • | • | • |
| Flow measurement and status display (factory-preset limit value) | • | • | • |

| | | | |
|---|--|--|--------|
| Quantitative flow measurement and display on VFD | | | Option |
| Scalable analog interfaces (1 input, 2 outputs), standby input and alarm output | | | Option |
| Devicenet interface | | | Option |
| Ethernet interface | | | Option |
| RS485 interface | | | Option |

See fold-out page for icon feature description

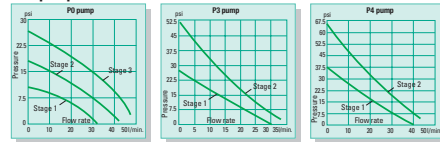
Working temperature range

| Type: | Standard | LowTemp | Low/HighTemp I | Low/HighTemp II |
|-----------------------------------|----------------|-------------|----------------|-----------------|
| Working temperature range: | +5...+35°C | -20...+35°C | -20...+80°C | -20...+130°C |
| SC2500a, SC2500w | In basic model | Option | Option | --- |
| SC5000a, SC5000w, SC10000w | In basic model | Option | Option | Option |

Circulating pumps

| Pump type: | P0 | P3 | P4 |
|------------------------------|----------------------|----------------------|----------------------|
| Flow rate/pressure: | 48 l/min. - 26.1 psi | 33 l/min. - 50.8 psi | 43 l/min. - 62.4 psi |
| SC2500a, SC2500w | In basic model | Option ¹⁾ | --- |
| SC5000a, SC5000w SC10000w | --- | In basic model | Option ¹⁾ |

Pump capacities (Bath fluid: Water)



¹⁾ Reduces cooling capacity by 0.2 kW • Pump connections: NPT 3/4" male

YOUR recirculating cooler can be equipped with one of the available heaters to provide an expanded working temperature range.

Heaters

| Type: | H1 | H5 |
|----------------------------|--------|--------|
| Heating capacity: | 1 kW | 5 kW |
| SC2500a, SC2500w | Option | --- |
| SC5000a, SC5000w, SC10000w | --- | Option |

DI-filter housings and micro-filter housings

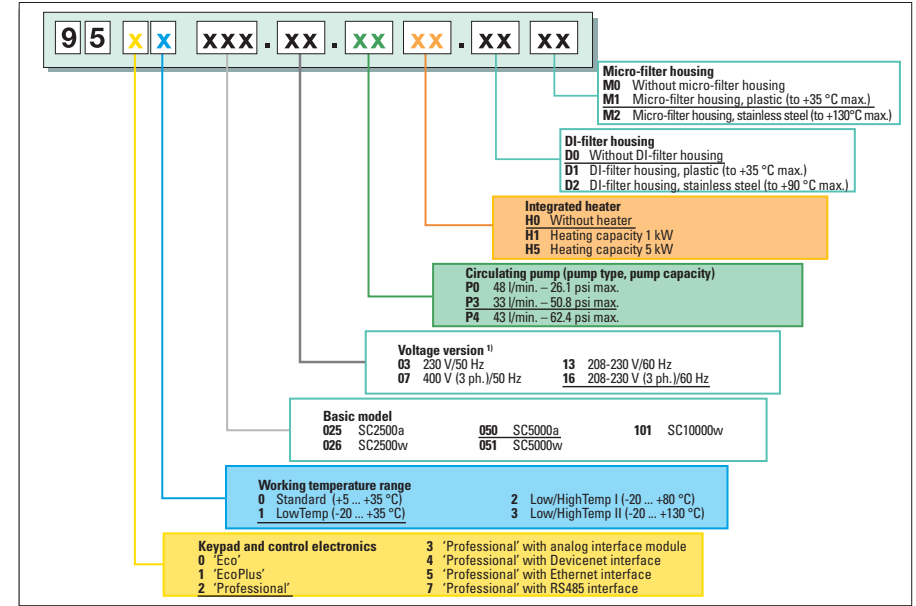
All models can be fitted with filter housings (right side mounting). Please specify when placing an order. Filter housings cannot be retrofitted.

| | | | |
|-----------|---|-----------|--|
| D1 | DI-filter housing, plastic (to +35 °C max.), with cartridge | M1 | Micro-filter housing, plastic (to +35 °C max.), without cartridge |
| D2 | DI-filter housing, stainless steel (to +90 °C max.), with cartridge | M2 | Micro-filter housing, stainless steel (to +130 °C max.), without cartridge |

Order Information: Customize a chiller that suits YOUR needs!

Compose the order number of YOUR recirculating cooler (Example: for model SC5000a):

9 5 2 1 050 16 P3 H0 D0 M1



¹⁾ Voltage versions: SC2500a, SC2500w: 230V/50Hz or 208-230V/60Hz SC5000a, SC5000w, SC10000w: 400V(3ph.)/50Hz or 208-230V(3ph.)/60Hz

'SemiChill' Accessories

| Order No. | Description | Suitable for |
|-----------|---|--|
| 8 920 016 | Micro-filter cartridge 10 micron | Micro-filter housing plastic |
| 8 920 017 | Micro-filter cartridge 25 micron | Micro-filter housing plastic |
| 8 920 018 | Micro-filter cartridge 40 micron | Micro-filter housing plastic |
| 8 920 019 | Micro-filter cartridge 100 micron | Micro-filter housing plastic |
| 8 920 020 | Micro-filter cartridge 250 micron | Micro-filter housing plastic |
| 8 920 036 | Micro-filter cartridge 10 micron | Micro-filter housing stainless steel |
| 8 920 037 | Micro-filter cartridge 25 micron | Micro-filter housing stainless steel |
| 8 920 038 | Micro-filter cartridge 40 micron | Micro-filter housing stainless steel |
| 8 920 039 | Micro-filter cartridge 100 micron | Micro-filter housing stainless steel |
| 8 920 040 | Micro-filter cartridge 250 micron | Micro-filter housing stainless steel |
| 8 920 005 | DI-filter cartridge | DI-filter housing, plastic/stainless steel |
| 8 920 030 | Touch and condensation cover | DI-filter and micro-filter housings |
| 8 920 060 | Air-filter package, washable | SC2500a |
| 8 920 061 | Air-filter package, washable | SC5000a |
| 8 920 050 | Earthquake anchors | SC2500a, SC2500w |
| 8 920 051 | Earthquake anchors | SC5000a, SC5000w, SC10000w |
| 8 920 100 | Drain port, stainless steel, to empty the unit | All models |
| 8 890 036 | 2 Barbed fittings for tubing 1/2" inner dia. to NPT 3/4" female | All models |
| 8 890 037 | 2 Barbed fittings for tubing 3/8" inner dia. to NPT 3/4" female | All models |
| 8 890 038 | 2 Adapters NPT 3/4" female to M16x1 male | All models |
| 8 980 073 | RS232 interface cable, 2.5 m | All models |
| 8 900 110 | USB Interface adapter cable | All models |
| 8 980 030 | PBI Profibus Interface Box | All models |



Options: DI-filter housings and micro-filter housings mounted on the unit



Reinforced tubing
CR® tubing



Tubing insulation
Tube clamps



Twin distributing adapter
Quad distributing adapter



Solenoid valve for
return flow safety device



External Pt100 sensor /
M+R in-line Pt100 sensor

| Order No. | Description | Suitable for |
|--|--|---|
| Tubing / Tubing insulations | | |
| 8 930 008 | 1 m CR® tubing, 8 mm inner dia. (-20 ... +120 °C) | AWC100, F200, FL300 |
| 8 930 010 | 1 m CR® tubing, 10 mm inner dia. (-20 ... +120 °C) | AWC100, F200 |
| 8 930 012 | 1 m CR® tubing, 12 mm inner dia. (-20 ... +120 °C) | FL300 |
| 8 930 308 | 1 m Reinforced tubing, 8 mm inner dia. (-40 ... +120 °C) | FL601/1201/1701 + FC series |
| 8 930 312 | 1 m Reinforced tubing, 12 mm / 1/2" inner dia. (-40 ... +120 °C) | FL601/1201/1701 + FC series |
| 8 930 319 | 1 m Reinforced tubing, 3/4" inner dia. (-40 ... +120 °C) | FL(W)1203/1703/2503/4003 |
| 8 930 325 | 1 m Reinforced tubing, 1" inner dia. (-40 ... +120 °C) | FL(W)2506/4006/7006/11006 |
| 8 930 410 | 1 m Insulation, 14 mm inner dia. | CR® tubing 8 to 10 mm inner dia. |
| 8 930 412 | 1 m Insulation, 18 mm inner dia. | CR® tubing 12 mm ID and Reinforced tubing 8 mm ID |
| 8 930 413 | 1 m Insulation, 23 mm inner dia. | Reinforced tubing 12 mm / 1/2" ID |
| 8 930 419 | 1 m Insulation, 29 mm inner dia. | Reinforced tubing 3/4" ID |
| 8 930 425 | 1 m Insulation, 35 mm inner dia. | Reinforced tubing 1" ID |
| Tube clamps | | |
| 8 970 480 | 2 Tube clamps, size 1 | CR® tubing 8 inner dia. |
| 8 970 481 | 2 Tube clamps, size 2 | CR® tubing 10 and 12 mm ID and Reinforced tubing 8 mm ID |
| 8 970 482 | 2 Tube clamps, size 3 | Reinforced tubing 12 mm / 1/2" ID |
| 8 970 483 | 2 Tube clamps, size 4 | Reinforced tubing 3/4" ID |
| 8 970 484 | 2 Tube clamps, size 5 | Reinforced tubing 1" ID |
| Twin distributing adapters / Quad distributing adapters | | |
| 8 970 470 | Twin distributing adapter with barbed fittings for tubing 8 mm ID | FL + FC series |
| 8 970 472 | Twin distributing adapter with barbed fittings for tubing 10 mm ID | FL + FC series |
| 8 970 471 | Twin distributing adapter with barbed fittings for tubing 12 mm ID | FL + FC series |
| 8 970 476 | Twin distribut. adapter G 3/4" with barbed fittings for tubing 3/4" ID | FL(W)1203/1703/2503/4003 |
| 8 970 477 | Twin distribut. adapter G 1 1/4" with barbed fittings for tubing 1" ID | FL(W)2506/4006/7006/11006 |
| 8 970 474 | 2 Quad distributing adapters, M16x1, with barbed fittings for tubing 8 mm or 12 mm / 1/2" inner dia. | FC series |
| 8 970 520 ¹⁾ | 2 Quad distributing adapters, M16x1, with barbed fittings for tubing 8 mm or 12 mm / 1/2" inner dia. | FL(W)601/1201/1701 |
| 8 970 522 ¹⁾ | 2 Quad distributing adapters, G 3/4" female, with barbed fittings for tubing 3/4" inner dia. | FL(W)1203/1703/2503/4003 |
| 8 970 524 ¹⁾ | 2 Quad distributing adapters, G 1 1/4" female, with barbed fittings for tubing 1" inner dia. | FL(W)2506/4006/7006/11006 |
| Connectors / Stainless steel adapters ¹⁾ Recommendation: Use shut-off valves additionally. | | |
| 8 890 040 | 2 Adapters G 3/4" female to M16x1 male | FL(W)1203/1703/2503/4003 |
| 8 890 041 | 2 Adapters G 1 1/4" female to M16x1 male | FL(W)2506/4006/7006/11006 |
| 8 890 042 | 2 Adapters G 3/4" female to barbed fitting for tubing 1/2" inner dia. | FL(W)1203/1703/2503/4003 |
| 8 890 043 | 2 Adapters G 3/4" female to barbed fitting for tubing 3/4" inner dia. | FL(W)1203/1703/2503/4003 |
| 8 890 044 | 2 Adapters G 1 1/4" female to barbed fitting for tubing 1/2" inner dia. | FL(W)2506/4006/7006/11006 |
| 8 890 045 | 2 Adapters G 1 1/4" female to barbed fitting for tubing 3/4" inner dia. | FL(W)2506/4006/7006/11006 |
| 8 890 046 | 2 Adapters G 1 1/4" female to barbed fitting for tubing 1" inner dia. | FL(W)2506/4006/7006/11006 |
| 8 890 047 | 2 Adapters G 3/4" female to NPT 1/2" male | FL(W)1203/1703/2503/4003 |
| 8 890 048 | 2 Adapters G 3/4" female to NPT 3/4" male | FL(W)1203/1703/2503/4003 |
| 8 890 049 | 2 Adapters G 1 1/4" female to NPT 1/2" male | FL(W)2506/4006/7006/11006 |
| 8 890 050 | 2 Adapters G 1 1/4" female to NPT 3/4" male | FL(W)2506/4006/7006/11006 |
| 8 890 051 | 2 Adapters G 1 1/4" female to NPT 1" male | FL(W)2506/4006/7006/11006 |
| Shut-off valves / Solenoid valve / Earthquake anchors | | |
| 8 970 456 | Shut-off valve for loop circuit, M16x1 | FL300/601/1201,1701, FC series |
| 8 970 454 | Shut-off valve G 3/4" | FL1203/1703/2503/4003 |
| 8 970 458 | Shut-off valve G 1 1/4" | FL(W)2506/4006/7006/11006 |
| 8 980 701 | Solenoid valve set for loop circuit (max. +100 °C), M16x1 | FC series (return flow safety device) |
| 8 920 051 | Earthquake anchors | FL(W)2503/2506/4003/4006 |
| 8 920 052 | Earthquake anchors | FL(W)7006/11006 |
| External Pt100 sensors | | |
| 8 981 003 | External Pt100 sensor, 200 x 6 mm dia., stainless steel | FC1600T, FCW2500T: |
| 8 981 020 | M+R in-line Pt100 sensor, including 2 fittings M16x1 male (for installation in the loop circuit) | external measurement & control |

Bath fluids / Lab automation see pages 31 / 57

Controlling • Programming • Viewing • Recording

JULABO offers YOU the most suitable software for YOUR application. YOU save time, make YOUR work easier – control, optimize, visualize and record temperature and time-dependent processes without any hassle. For routine control tasks of only one JULABO instrument, the FREE 'EasyTemp' is ideal (download at www.julabo.com). For more demanding applications JULABO offers 'EasyTemp Professional' for controlling up to 8 instruments. The connection is carried out inexpensively and simply via digital RS232 interface or USB converter. Ask JULABO!

| JULABO Software Solutions offer: | EasyTEMP | EasyTEMP PROFESSIONAL |
|--|----------|-----------------------|
| Control of one JULABO unit with integrated interface | ● | ● |
| Control of up to 8 JULABO units with integrated interface | | ● |
| Instrument window: | | |
| Recording and display of currently measured values on PC | ● | ● |
| Setpoint programming via PC | ● | ● |
| Status indication | ● | ● |
| Individual control window for each unit | | ● |
| Simultaneous start of units with just one button | | ● |
| Recording of measured values: | | |
| Graphic zoom data function | ● | ● |
| Display of up to 4 curves in one diagram | ● | |
| Display of up to 16 curves in one diagram | | ● |
| Up to 4 definable scales | | ● |
| Curves can be assigned to individual scales | | ● |
| Entry of formulas such as averaging, differences between measured values, etc. | | ● |
| Entry of text comments with display in the diagram | | ● |
| Ramp programming: | | |
| Ramp function of up to 100 steps | ● | |
| Ramp function of up to 1000 steps (individually for each instrument) | | ● |
| Repeat memorized profiles | ● | ● |
| Modifications to running profiles | ● | ● |
| Graphic display of total profiles | | ● |
| Data recording: | | |
| Recording of measured values in ASCII format | ● | ● |
| Recording of measured values in Excel | | ● |
| Saving of further relevant measuring data | | ● |
| Scalable monitoring pattern | | ● |
| Trigger function for recording | | ● |
| Export function of graphs into JPG format | | ● |
| Loading of previously created recordings with print function | | ● |
| Options: | | |
| Control and integration of laboratory instruments of different makes, e.g. laboratory stirrers, magnetic stirrers, analyzing balances, dosing pumps, pH meters, etc. | | on request |
| Drivers for interfaces such as Profibus, Devicenet, Ethernet, RS485 | | on request |
| Z1 CFR 11 conformity | | on request |

| Order No. | Description | Suitable for |
|-----------|---|---------------------------------|
| 8 901 102 | 'EasyTemp' control software (free download at www.julabo.com) | Units with RS232 |
| 8 901 105 | 'EasyTemp Professional' control software, with USB dongle | Units with RS232 |
| 8 980 073 | RS232 interface cable, 2.5 m | Units with RS232 |
| 8 980 075 | RS232 interface cable, 3.0 m | SW22 + SW23 shaking water baths |
| 8 900 110 | USB interface adapter cable | Units with RS232 |
| 8 900 015 | PBM Profibus DP Master | Connection via USB port on PC |
| 8 900 005 | PB-5 Option: integrated Profibus DP | 'HighTech' circulators HL, SL |
| 8 900 002 | PB-2 Option: integrated Profibus DP | Presto®, Magnum 91, Forte HT |
| 8 900 003 | PB-3 Option: integrated Profibus DP | LC6 programmable controller |
| 8 980 030 | PBI Profibus DP Interface Box | Units with RS232 |

Customized solutions

JULABO offers turnkey solutions including custom software and hardware solutions for specific applications. JULABO offers YOU turnkey, dedicated solutions to your automation requirements.

JULABO Water Baths are clearly superior to other water baths. They provide numerous features and significant benefits for YOU and YOUR work:

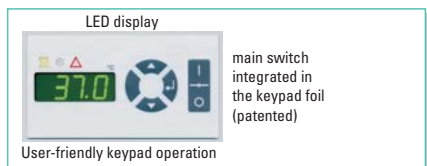
The sloped tank rim keeps the water in the stainless steel bath tank where it belongs. No dripping, no condensation – even when the lid is opened.

Features of TW2

- Space-saving design, suitable for samples and up to 24 test tubes
- For dental applications

TW8, TW12, TW20 provide

- Drain screw
- Handles for easy relocation



Benefits:

- Overall splash-water protection
- Keypad with water-protected main switch
- User-friendly operation, best reproducibility of the set values
- Bright temperature indication (LED) for actual and setpoint values
- Display resolution: 0.1 °C
- Dry-running protection
- Audible warning signal with optical indication for the cut-off function
- Removable bottom plate

Applications

- Routine laboratory applications
- Cell cultivation
- Temperature testing of food and luxury articles
- Temperature control of samples
- Incubations
- Material testing
- Corrosion tests

Lift-up covers are optionally available for all models. Details see page 59.



| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stability °C | Heat. cap. kW | Bath opening/ bath depth W x L / D in | Insert capacity test tube racks 13 mm dia. 17 mm dia. | Filling volume liters | Dimensions W x L x H in w/o / with cover | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|--------------------|---------------|---------------------------------------|---|-----------------------|--|--|
| 9 550 102 | TW2 | 20 ... 99.9 | ±0.2 | 1 | 5.9 x 5.1 / 4.3 | -- | 24 | 1..2 6.7 x 6.3 x 10.2/14.6 | 115/50-60/5 |
| 9 550 108 | TW8 | 20 ... 99.9 | ±0.2 | 1 | 9.1 x 10.6 / 5.5 | 180 | 120 | 3..8 11.4 x 12.6 x 11/17.3 | 115/50-60/8 |
| 9 550 112 | TW12 | 20 ... 99.9 | ±0.2 | 1 | 13.8 x 10.6 / 5.5 | 270 | 180 | 5..12 15.8 x 12.6 x 11/17.3 | 115/50-60/9 |
| 9 550 120 | TW20 | 20 ... 99.9 | ±0.2 | 1 | 19.7 x 11.8 / 7.1 | 360 | 240 | 8..22 22.1 x 13.8 x 12.6/19.3 | 115/50-60/9 |

Technical features
(see fold-out page)



Water Baths

| | | | | | | | | | | |
|-----------|------|-------------|------|---|-------------------|-----|-----|-------|-------------------------|-------------|
| 9 550 102 | TW2 | 20 ... 99.9 | ±0.2 | 1 | 5.9 x 5.1 / 4.3 | -- | 24 | 1..2 | 6.7 x 6.3 x 10.2/14.6 | 115/50-60/5 |
| 9 550 108 | TW8 | 20 ... 99.9 | ±0.2 | 1 | 9.1 x 10.6 / 5.5 | 180 | 120 | 3..8 | 11.4 x 12.6 x 11/17.3 | 115/50-60/8 |
| 9 550 112 | TW12 | 20 ... 99.9 | ±0.2 | 1 | 13.8 x 10.6 / 5.5 | 270 | 180 | 5..12 | 15.8 x 12.6 x 11/17.3 | 115/50-60/9 |
| 9 550 120 | TW20 | 20 ... 99.9 | ±0.2 | 1 | 19.7 x 11.8 / 7.1 | 360 | 240 | 8..22 | 22.1 x 13.8 x 12.6/19.3 | 115/50-60/9 |

¹⁾ For applications at or near ambient temperature: Counter-cooling with tap water and liquid level/cooling set (accessory)
²⁾ Other voltages available on request

Lift-up covers

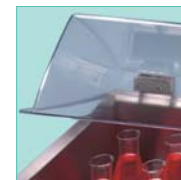
The lift-up Makrolon® or stainless steel covers are recommended for use at working temperatures above +60 °C, particularly to protect samples from contamination.

Liquid level/cooling set

- for continuous water supply
- to maintain a constant liquid level at high temperatures
- for counter-cooling of applications at or near ambient temperature



Liquid level/cooling set



Makrolon® cover



Stainless steel cover



Flat bath covers



Polypropylene® test tube racks / Stainless steel test tube racks

| JULABO Order No. | Description | for model | Remarks |
|------------------|-------------|-----------|---------|
|------------------|-------------|-----------|---------|

Lift-up Makrolon® covers (to +80 °C)

| Dimensions | | | |
|------------|--------------------------|------|--|
| 8 970 289 | 6.7 x 6.3 x 6.3 inches | TW2 | Prevents liquid losses due to evaporation, protects samples from contamination |
| 8 970 286 | 11.4 x 12.6 x 6.3 inches | TW8 | |
| 8 970 287 | 15.7 x 12.6 x 6.3 inches | TW12 | |
| 8 970 288 | 22 x 13.8 x 6.7 inches | TW20 | |

Lift-up stainless steel covers (to +100 °C)

| | | | |
|-----------|-------------------------------|------|--|
| 8 970 259 | Lift-up stainless steel cover | TW2 | Prevents liquid losses due to evaporation, protects samples from contamination |
| 8 970 266 | Lift-up stainless steel cover | TW8 | |
| 8 970 267 | Lift-up stainless steel cover | TW12 | |
| 8 970 268 | Lift-up stainless steel cover | TW20 | |

Flat stainless steel bath covers with sets of rings

| | | | |
|-----------|---------------------------------|------|---|
| 8 970 270 | with 1 opening 7.5 inches dia. | TW8 | Beakers or Erlenmeyer flasks can be placed directly onto the perforated stainless steel bottom plate. |
| 8 970 271 | with 4 openings 3.6 inches dia. | TW8 | |
| 8 970 278 | with 6 openings 3.6 inches dia. | TW12 | |
| 8 970 272 | with 2 openings 7.5 inches dia. | TW20 | |
| 8 970 273 | with 6 openings 6.5 inches dia. | TW20 | |

Cooling installation/continuous water supply

| | | | |
|-----------|---|-----------------|--|
| 8 970 415 | Liquid level/cooling set (see illustration above) | TW8, TW12, TW20 | To maintain a constant liquid level, for counter-cooling |
|-----------|---|-----------------|--|

Test tube racks to +80 °C, Polypropylene® with stainless steel frame

| | | | | | | |
|-----------|-------------------------|---------------|---------------------------------|-----|------|------|
| 8 970 380 | for 60 test tubes | 16/17 mm dia. | Insert capacity test tube racks | TW8 | TW12 | TW20 |
| 8 970 381 | for 90 test tubes | 12/13 mm dia. | | | | |
| 8 970 382 | for 90 microliter tubes | 11/12 mm dia. | | | | |
| 8 970 383 | for 21 test tubes | 30 mm dia. | | | | |
| | | | 2 | 3 | 4 | |

Test tube racks to +100 °C, stainless steel

| | | | | | | | |
|-----------|-------------------------|---------------|---------------------------------|-----|-----|------|------|
| 8 970 330 | for 24 test tubes | 16/17 mm dia. | Insert capacity test tube racks | TW2 | TW8 | TW12 | TW20 |
| 8 970 344 | for 50 test tubes | 16/17 mm dia. | | | | | |
| 8 970 345 | for 90 test tubes | 12/13 mm dia. | | | | | |
| 8 970 346 | for 90 microliter tubes | 11/12 mm dia. | | | | | |
| 8 970 347 | for 21 test tubes | 30 mm dia. | | | | | |
| | | | 1 | 2 | 3 | 4 | |

Additional accessories

| | | |
|-----------|---|----------------------|
| 8 970 331 | Stents lifter | TW2 |
| 8 970 339 | Hygiene insert, stainless steel | |
| 8 970 453 | Drain tap with tube 8 mm inner dia. | |
| 8 970 010 | Hollow balls, Polypropylene®, 20 mm dia. (pack of 1000) | |
| | | TW8, TW12, TW20 |
| | | TW2, TW8, TW12, TW20 |

JULABO Shaking Water Baths provide features that you will always find useful. The sloped tank rim keeps the water in the

stainless steel bath tank where it belongs. No dripping, no condensation - even when the lid is opened.

Benefits:

- Overall splash-water protection
- Keypad for adjustment of setpoint temperature, shaking frequency and early warning functions
- User-friendly operation, best reproducibility

- SW22:** for routine applications
- SW23:** for demanding applications requiring best temperature stability and uniformity achieved by constant water circulation in bath



- MULTI-DISPLAY (LED) for actual value, setpoint, high/low temperature early warning functions and shaking frequency
- Display resolution: 0.1 °C or 1 rpm
- Dry-running protection
- Audible signal for warning and cut-off functions
- Electronic timer (0... 10 operating hours)



- Shaking carriage is removable: No direct contact with the bath fluid, carrier trays can be assembled outside the bath.

All units have handles for easy relocation. Upon removing the drain screw, a cooling coil can be fitted to provide counter-cooling with tap water.

For details on accessories, please refer to page 61.



SW22 with optional lift-up Makrolon® cover and carrier tray (accessories)

Applications

- Biochemical research
- Material testing
- Enzyme and tissue studies
- Homogenization
- Temperature testing of food and luxury articles
- Routine laboratory applications
- Corrosion tests
- Fermentation
- Incubations
- Thawing of blood plasma

| JULABO Order No. | JULABO Model | Working temp. range °C ¹⁾ | Temp. stability °C | Heat. cap. kW | Bath opening/ bath depth W x L / D in | Filling volume liters | Shaking frequency rpm | Shaking stroke in | Dimensions W x L x H in w/o / with cover | Weight lbs | Power requirement ²⁾ V/Hz/A |
|------------------|--------------|--------------------------------------|--------------------|---------------|---------------------------------------|-----------------------|-----------------------|-------------------|--|------------|--|
|------------------|--------------|--------------------------------------|--------------------|---------------|---------------------------------------|-----------------------|-----------------------|-------------------|--|------------|--|

Shaking Water Baths

Technical features (see fold-out page)



| | | | | | | | | | | | |
|-----------|------|-------------|-------|---|-------------------|----------|------------|-----|---------------------------|------|-----------|
| 9 550 322 | SW22 | 20 ... 99.9 | ±0.2 | 1 | 19.7 x 11.8 / 7.1 | 8 ... 20 | 20 ... 200 | 0.6 | 27.6 x 13.8 x 10.2 / 16.9 | 42.8 | 115/60/9 |
| 9 550 323 | SW23 | 20 ... 99.9 | ±0.02 | 1 | 19.7 x 11.8 / 7.1 | 8 ... 20 | 20 ... 200 | 0.6 | 27.6 x 13.8 x 10.2 / 16.9 | 47.2 | 115/60/10 |

¹⁾ For applications at or near ambient temperature: Counter-cooling with tap water and liquid level/cooling set (accessory)
²⁾ Other voltages available on request

- The lift-up covers are recommended for use at working temperatures above +60 °C for both models.
- Large selection of carrier trays for Erlenmeyer flasks and test tubes is available.
- For counter-cooling at or near ambient temperature, use the cooling coil (order no. 8 970 416).
- To maintain a constant liquid level: use the liquid level/cooling set (order no. 8 970 415)

| JULABO Order No. | Description | JULABO Order No. | Description |
|------------------|-------------|------------------|-------------|
|------------------|-------------|------------------|-------------|

Bath covers / Hollow balls

- 8 970 288 Lift-up Makrolon® cover (to +80 °C) – see illustration on page 60 (SW22)
- 8 970 268 Lift-up stainless steel cover (to +100 °C) – see illustration on page 59
- 8 970 010 Hollow balls, Polypropylene®, 20 mm dia. (pack of 1000)

Cooling installation/continuous water supply

- 8 970 415 Liquid level/cooling set (ill. page 59)
- 8 970 416 Cooling coil (fig. 1)

All-purpose spring tray (fig. 2)

- 8 970 630 All-purpose spring tray pre-assembled for 11 Erlenmeyer flasks 250 ml incl. set of springs for Erlenmeyer flasks 25...1000 ml
- 8 970 631 Set of springs consisting of 5 springs 190 mm and 12 springs 135 mm (for tray 8 970 630)

Standard carrier trays (fig. 3)

- | | | | |
|-------------------------|--------|-------------------------|------------|
| 8 970 360 for 45 flasks | 25 ml | 8 970 364 for 11 flasks | 250-300 ml |
| 8 970 361 for 32 flasks | 50 ml | 8 970 365 for 8 flasks | 500 ml |
| 8 970 362 for 18 flasks | 100 ml | 8 970 366 for 5 flasks | 1000 ml |
| 8 970 363 for 15 flasks | 200 ml | | |

Carrier tray and spring clamps (fig. 4)

- 8 970 620 Basic tray for assembling spring clamps on a mix and match basis

Spring clamps

- | | |
|-----------------------------|---------------------------------|
| 8 970 601 for 10 ml flasks | 8 970 606 for 200-250 ml flasks |
| 8 970 602 for 25 ml flasks | 8 970 607 for 300 ml flasks |
| 8 970 603 for 50 ml flasks | 8 970 608 for 500 ml flasks |
| 8 970 604 for 100 ml flasks | 8 970 609 for 1000 ml flasks |

Fig. 4 shows the basic tray assembled with different spring clamps.

Carrier tray with test tube racks (fig. 5)

- 8 970 369 Basic tray for assembling a maximum of 4 test tube racks

Test tube racks

made of Polypropylene® (to +80 °C)

- 8 970 380 for 60 test tubes, 16/17 mm dia.
- 8 970 381 for 90 test tubes, 12/13 mm dia.
- 8 970 382 for 90 microliter tubes, 11/12 mm dia.
- 8 970 383 for 21 test tubes, 30 mm dia.

Test tube racks

made of stainless steel (to +100 °C)

- 8 970 344 for 50 test tubes, 16/17 mm dia.
- 8 970 345 for 90 test tubes, 12/13 mm dia.
- 8 970 346 for 90 microliter tubes, 11/12 mm dia.
- 8 970 347 for 21 test tubes, 30 mm dia.

Fig. 5 shows the basic tray assembled with different test tube racks.

Carrier trays with test tube racks (complete) (to +80 °C)

- 8 960 440 for 240 test tubes, 16/17 mm dia.
- 8 960 441 for 360 test tubes, 12/13 mm dia.
- 8 960 442 for 360 microliter tubes, 30 x 11/12 mm dia.
- 8 960 443 for 84 test tubes, 30 mm dia.

Lab automation

- 8 901 102 'EasyTemp' control software (free download www.julabo.com)
- 8 980 075 RS232 interface cable, 3 m for direct PC connection
- 8 900 110 USB Interface adapter cable

Option

- 8 810 050 Shaking tray positioner (for SW23)

The shaking water bath must be factory-prefitted with the shaking tray positioner. Please specify when placing an order. It cannot be retrofitted.



Cooling coil



All-purpose spring tray



Standard carrier tray



Basic tray with spring clamps



Carrier tray with test tube racks

Temperature Controllers are designed for measuring, controlling and monitoring of any electrically heated equipment in laboratories and pilot plant stations.

They provide connections for:

- 1 or 2 working sensors
- 1 safety sensor
- 1 socket for the external device
- digital and analog interfaces

Benefits:

- Simple to operate
- Splash-proof keypad
- High temperature stability
- Bright MULTI-DISPLAY (LED)
- Display resolution 0.1 °C or 0.01 °C, resp.

- LCD-Display, backlit: offers interactive and user-friendly operation on LC6 and PG6 programmer
- High/low temperature warning functions
- Adjustable high temperature cut-off, visible via MULTI-DISPLAY
- Audible and optical alarms in case of a disturbance



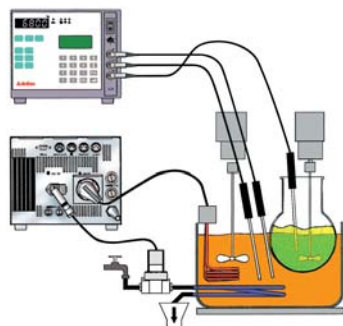
LC4

with 2 LED displays
 1. MULTI-DISPLAY for actual value and adjustment of setpoint, warning and safety values
 2. Constant indication of setpoint



LC6 programmable controller

with 1 LED and 1 LCD display
 • 2 working sensors for different measurement locations (cascade-controller)
 • Analog inputs and outputs for 0...10 V or 0...20 mA/4...20 mA
 • 'Stakei' connection for direct tap water cooling control
 • Integrated programmer for 6 x 60 program steps



Applications

- Precise and reliable temperature control for**
- Heating mantles, heating collars
 - Oil baths in combination with distillation/pilot plants
 - Control for indirect tap water cooling with solenoid valve (see illustration above)

For accessories, please contact JULABO.

| JULABO Order No. | JULABO Model | Adjustable temp. range °C | Temp. stab. in external system °C | LED display / resolution °C | LCD display / resolution °C | Working sensor | Safety sensor | Max. connection watt. kW | Dimensions W x L x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|---------------------------|-----------------------------------|-----------------------------|-----------------------------|----------------|---------------|--------------------------|-------------------------|--|
|------------------|--------------|---------------------------|-----------------------------------|-----------------------------|-----------------------------|----------------|---------------|--------------------------|-------------------------|--|

Temperature Controllers

Technical features (see fold-out page)

| | | | | | | | | | | |
|-----------|-----|------------|---------|---------|----|---------|---------|---|-----------------|--------------|
| 9 700 140 | LC4 | -50...+350 | > ±0.05 | 2 / 0.1 | -- | 1 Pt100 | 1 Pt100 | 1 | 6.7 x 6.7 x 6.3 | 115/50-60/10 |
|-----------|-----|------------|---------|---------|----|---------|---------|---|-----------------|--------------|

Programmable Controller

Technical features (see fold-out page)

| | | | | | | | | | | |
|-----------|-----|-------------|---------|----------|----------|---------|---------|---|-----------------|--------------|
| 9 700 160 | LC6 | -100...+400 | > ±0.03 | 1 / 0.01 | 1 / 0.01 | 2 Pt100 | 1 Pt100 | 1 | 8.3 x 7.1 x 7.1 | 115/50-60/15 |
|-----------|-----|-------------|---------|----------|----------|---------|---------|---|-----------------|--------------|

¹⁾ Other voltages available on request

PG6 programmer, remote controller

This model is suitable for analog and digital control of circulators and recirculating coolers.

The PG6 can also be used as remote controller, particularly for JULABO circulators located in a fume cabinet, where it is quite difficult for the user to get easy access.

Benefits:

- Programming of temperature and time-dependent processes
- 6 x 60 program steps
- RS232 interface



Accessories

- 8 980 090 Digital control cable, 2.5 m
- 8 980 092 Analog control cable, 2.5 m

Applications

- JULABO 'HighTech' heating and refrigerated circulators
- Recirculating coolers 'SemiChill'
- Heating and cooling devices of different makes

| JULABO Order No. | JULABO Model | Adjustable temp. range °C | Adjustment temp./time | LED display / resolution °C | LCD display / resolution °C | Analog outputs Voltage / Current V / mA | Dimensions W x L x H | Power requirement ¹⁾ in V/Hz/A |
|------------------|--------------|---------------------------|-----------------------|-----------------------------|-----------------------------|---|----------------------|---|
|------------------|--------------|---------------------------|-----------------------|-----------------------------|-----------------------------|---|----------------------|---|

Programmer

Technical features (see fold-out page)

| | | | | | | | | |
|-----------|-----|--------------|---------|---------|---------|--------------------------------|-----------------|--------------------------------|
| 9 750 060 | PG6 | -99.9...+400 | digital | 1 / 0.1 | 1 / 0.1 | 0...10 V or 0...20 / 4...20 mA | 8.3 x 7.1 x 7.1 | 115/50-60/1...13 ²⁾ |
|-----------|-----|--------------|---------|---------|---------|--------------------------------|-----------------|--------------------------------|

¹⁾ Other voltages available on request
²⁾ Depending on the connected unit

• Circulators for MOCVD applications

for temperature control of bubblers in the circulator bath

Benefits:

- Ventilation-air-cooling, instead of water-cooling
- Bath openings for one or two bubblers



• Active Cooling Control throughout entire temperature range



• Removable venting grid
 • Front drain accessibility



FS20-MC

FS30-MC

| Model selection: | Usable bath depth: |
|--------------------|--------------------|
| FS20-MC / FW20-MC: | 7.1 inches |
| FS30-MC / FW30-MC: | 9.1 inches |

| JULABO Order No. | JULABO Model | Working temp. range °C | Temp. stab. °C | Heat. cap. kW | Cooling capacity kW (Bath fluid: Ethanol) 20 0 -20°C | Pump capacity Flow rate/Pressure l/min. psi | Bath opening/ bath depth W x L / D in | Fill. vol. liters | Dimensions W x D x H in | Power requirement ¹⁾ V/Hz/A |
|------------------|--------------|------------------------|----------------|---------------|--|---|---------------------------------------|-------------------|-------------------------|--|
|------------------|--------------|------------------------|----------------|---------------|--|---|---------------------------------------|-------------------|-------------------------|--|

Refrigerated/ Heating Circulators

Technical features (see fold-out page)

| | | | | | | | | | | |
|-----------|---------|-------------|-------|---|----------------|-----------|-----------------|----------|--------------------|-----------|
| 9 150 622 | FS20-MC | -25 ... +80 | ±0.02 | 1 | 0.26 0.2 0.06 | 11-16 6.5 | 4.3 x 4.3 / 7.9 | 5 ... 7 | 9.1 x 16.5 x 26 | 115/60/13 |
| 9 150 636 | FS30-MC | -30 ... +80 | ±0.02 | 1 | 0.46 0.34 0.15 | 11-16 6.5 | 8.7 x 5.5 / 9.8 | 12... 15 | 12.2 x 16.5 x 29.5 | 115/60/14 |

water-cooled models

| | | | | | | | | | | |
|-----------|---------|-------------|-------|---|----------------|-----------|-----------------|----------|--------------------|-----------|
| 9 150 623 | FW20-MC | -25 ... +80 | ±0.02 | 1 | 0.26 0.2 0.06 | 11-16 6.5 | 4.3 x 4.3 / 7.9 | 5 ... 7 | 9.1 x 16.5 x 26 | 115/60/13 |
| 9 150 635 | FW30-MC | -30 ... +80 | ±0.02 | 1 | 0.46 0.34 0.15 | 11-16 6.5 | 8.7 x 5.5 / 9.8 | 12... 15 | 12.2 x 16.5 x 29.5 | 115/60/14 |

¹⁾ Other voltages available on request

... the Answers

What is working temperature range?

Working temperature range is the range within the operating temperature range which can be reached by the circulator itself and without external cooling, based on an ambient temperature of +20 °C.

What is operating temperature range?

Operating temperature range is the temperature range limited by the control electronics. E.g. working temperature range of heating circulators can be extended by auxiliary means down to the maximum of the lower operating temperature range.

What is temperature stability?

Temperature stability is the maximum temperature difference at one specific measuring point in the circulator bath.

What is temperature uniformity?

Temperature uniformity is the maximum temperature difference at different measuring points in the circulator bath. This is especially important for calibration tasks (pages 38-40). In JULABO circulators temperature uniformity differs only slightly from temperature stability. Visco baths and Calibration baths offer the best temperature uniformity.

What advantages are featured by JULABO displays?

JULABO LED displays are visible at large distances and from every angle. MULTI-DISPLAY (LED) refers to the possibility of not only displaying actual and setpoint values, but also values for high / low temperature warning and high temperature cut-off.

Additionally the MULTI-DISPLAY (LED) enables the indication of the desired pump stage in circulators with electronically adjustable pumps and the display of the shaking frequency in shaking water baths.

JULABO high end products feature the VFD COMFORT-DISPLAY.

This display aims at providing even more illuminating power, clearness and brilliance as well as an even easier operator assistance.

It features the unique simultaneous indication of three temperature values: Internal actual temperature, setpoint temperature and external actual temperature are permanently displayed. Furthermore the selected pump stage is visible at all times on the integrated illuminated pump stage display.

Which JULABO units feature interactive operator assistance?

JULABO circulators of the 'HighTech' Series, the highly dynamic temperature systems 'Presto' and 'Forte HT', as well as LC6 programmable controller feature additionally a 4-line backlit and interactive LCD DIALOG-DISPLAY for user-friendly operation. As well as actual and setpoint values, it is possible to indicate, for example, the control mode (internal/external), heating or cooling capacity, as well as external setpoint values.

What is the difference between PID and ICC temperature control?

JULABO PID1, PID2 and PID3 controllers have fixed control parameters (Kp, Tn, Tv). These can be changed manually in PID2 and PID3 controllers in order to get an improved temperature stability especially in external operating mode.

ICC (Intelligent Cascade Control) currently represents the world's most advanced and absolutely unique temperature control system. ICC features perfect temperature control through automatic and self-optimizing adjustment of PID control parameters according to the application.

ICC temperature control is featured in JULABO circulators of the 'HighTech' series, highly dynamic temperature control systems and the LC6 programmable controller.

What benefits do the TCF Temperature Control Features offer?

a) Band limit:

When working in external control mode this function allows the user to limit the difference between internal and external temperature to freely selectable values. Advantage: Protection of the temperature controlled equipment through careful temperature application, protection of e.g. glass reactors from thermal shock.

b) Dynamics:

Option to choose between aperiodic and normal PID behavior when using internal control mode:

Aperiodic (default value): Perfect, but takes slightly longer to reach the setpoint without overshoots.

Normal: Reaches the setpoint fast, but with small overshoots.

The same applies to refrigerated circulators (undershoots).

c) Limit settings:

The limits 'IntMax' and 'IntMin' are applicable when operating in external control mode. Fixed temperature limits (maximum and minimum values) can be set for the internal bath temperature. These limits cannot be exceeded by the controller.

d) Co-speed factor:

This parameter influences the time for reaching the setpoint temperature when working in external control mode. Increasing the co-speed factor reduces the time for reaching the setpoint, but the possibility of overshoots increases.

What tasks are done by JULABO pumps?

JULABO uses immersion pumps which are designed to work free from mechanical and thermal wear over extended time periods. The main task, beside the internal circulation of the bath fluid, is to constantly supply objects or systems with bath fluid in a closed or open loop. The units of the 'Economy' and 'TopTech' series, as well as JULABO recirculating coolers, feature pressure pumps of different capacities for closed external systems (loop circuits).

The models MC, ME, 'Presto', Magnum 91 and 'Semichill' feature electronically adjustable pump capacities in stages.

All circulators of the 'HighTech' series feature pressure and suction pumps which can also be adjusted electronically in stages. These pump systems can achieve remarkable pressure, suction and flow rate capacities in closed or open external systems.

When working with connected external glass equipment (autoclaves, reactors) the advantage is that by adjusting maximum pressure, damage to the glass vessel can be avoided.

What has to be considered when using RS232 interfaces?

It is important to use a null-modem cable to enable communication between the PC and the JULABO unit. RS232 interface cable and USB interface adapter cable are available as accessories.

Which refrigerants are used by JULABO?

For many years JULABO refrigerating systems have been filled exclusively with CFC-free refrigerants.

What is the meaning of 'ACC' Active Cooling Control?

The 'ACC' range is the working temperature range in which the refrigeration system remains active as long as refrigeration is desired or required. All JULABO units feature working temperature ranges which correspond to the 'ACC' ranges. Thus the refrigeration system can also be used at high temperatures (e.g. +200 °C) for fast cool-down.

What does proportional cooling control mean?

Refrigerated units without proportional cooling have refrigeration systems which are either switched on or off. This means they are either working with 100 % or 0 % cooling power. Systems with proportional cooling have a special electronic valve which can automatically control cooling capacity between 0 % and 100 %. This allows for accurate control of required cooling power at any temperature and at the same time saves energy.

What advantages are featured by JULABO early warning systems (patented)?

The reason for an timely cut-off caused by the low liquid level protection is a lack of bath fluid. Usually processes involving temperature application should not be interrupted in order to avoid major damages (e.g. when incubating in the circulator bath or when applying temperature control externally to a reactor).

The early warning system for low liquid level indicates through an intermittent signal tone that bath fluid has to be refilled.

Furthermore an undesired change of the set actual value, e.g. through an exothermic reaction, can be detected and indicated acoustically. For this purpose limit settings, e.g. 2 °C above and below the actual temperature are set via the display. When there is a warning counter-active measures can be taken.

Why can temperature alarm indications be set to automated cut-off?

This is required for special applications, but can be switched back to the normal warning function at any time.

Changing to cut-off is especially popular in low temperature ranges in order to use this function as a low temperature cut-off with permanent signal tone.

Which norms and standards do JULABO units comply with?

Of course all JULABO units conform with the requirements of the CE label guidelines, and comply with safety requirements. The following harmonized norms and standards are applied: EN 61010, EN 61326, WEEE/RoHS.

What does the classification according to DIN 12876-1 indicated on the type label mean?

Terms and classifications are specified in DIN 12876 and provide information on the application.

JULABO units belong to the following classification:

Class I: (JULABO abbreviation 'S1')

Units of this class feature a fixed high temperature or dry-running protection. The units are only suitable for operation with non-flammable bath fluids.

Class III: (JULABO abbreviation 'S3')

Units of this class feature adjustable high temperature cut-off and additional low liquid level protection. The units are suitable for operation with flammable bath fluids.

What does JULABO offer beyond DIN?

- High temperature cut-off is adjustable in all circulators. It is indicated on a display (MULTI-DISPLAY LED / VFD COMFORT-DISPLAY) and can be accessed at any time.
- If the set high temperature value or an impermissible low liquid level is detected an optical indication appears and an audible signal sounds permanently.
- All JULABO units include a constant monitoring of the difference between safety and working temperature sensor which cuts-off the unit if the difference between these two sensors exceeds 25 K. The cut-off is also effected in case one of the two sensors is defective and has to be replaced. The safety sensor has an additional function as a dry-running protection.
- Furthermore a plausibility control of both sensors through software is always active.

What are permissible ambient conditions for JULABO units?

All JULABO units can be operated failure-free at ambient temperatures between +5 and +40 °C (or +35 °C for ultra-low units with two-stage cascaded technology). Optimal ambient conditions are ambient temperature of +20 °C and approximately 50 % relative humidity.

Which mains voltages and frequencies are permissible?

Information on mains voltages and net frequencies required for safe operation can be found on the type label of each unit.

What is the warranty time given by JULABO?

JULABO USA, Inc. warrants that the products manufactured by JULABO are free from defects in material or workmanship for a period not to exceed two (2) years or ten thousand (10,000) hours of operation, whichever comes first, from the date the product is shipped.

What has to be taken into account when connecting an external system?

1. Tubing between the circulator and the external system has to be kept as short as possible and has to be secured to prevent displacement.
2. Tubing, connections and external system have to be well insulated.
3. Use of a suitable JULABO bath fluid.
4. The exchange of energy between the circulator and the external system has to be optimized (e.g. by avoiding strictures in the tubing).
5. When using an external temperature sensor it has to be well integrated into the system.

What advantages does metal tubing offer?

Flexible JULABO metal tubing can be connected with the circulator and the external system thus avoiding displacement. The integrated insulation prevents loss of performance.

Which bath fluids should be used?

For working temperature ranges up to +80 °C JULABO recommends the use of de-ionized water. Distilled water tends to absorb composites from components, thus causing corrosion.

JULABO THERMAL bath fluids offer extended temperature ranges. They have the advantage of much lower specific heat capacities. When selecting bath fluids special attention has to be paid to the flash point and fire point (page 31 and 45).

Especially when it comes to low temperatures the permissible viscosity, as stated in the operating manuals, must not be exceeded.

Alcohols, e.g. ethanol, only have a limited range of applications due to their extremely low fire point.

Are cool-down and heat-up times shorter when using JULABO THERMAL bath fluids instead of water and alcohol?

The required cooling/heating capacity in Watts or Kilowatts is less when using silicon oils (THERMAL). Therefore heat-up and cool-down times are shorter. The reason is that THERMAL bath fluids have lower specific heat capacities than water and alcohol.

How do you calculate the required cooling or heating capacity?

The following formula can be used for a time-dependent calculation:

$$P = (m \cdot c \cdot dT) / t$$

P = required cooling/heating capacity in kW

m = mass of material in kg

c = specific heat capacity (water = 4.2 / Ethanol = 2.5 / silicon oil = 1.8)

dT = required temperature difference in °C

t = desired cool-down / heat-up time in seconds

One has to take into consideration that the total mass (m) is the sum of the volumes of different sources: e.g. the volume of the circulator, in the tubing, in the reactor's jacket, in the reactor.

The simple calculation of required cooling/heating capacity as seen above does not take into account differences in weight of the bath fluids or other factors reducing performance.

Loss of performance is caused e.g. by: tubing (length, insulation), jacketed baths/reactors (material, thickness, surface), high ambient temperatures, open applications (surface). To allocate sufficient cooling / heating capacity a safety factor of 20-30 % should be integrated into the calculation.

What about the JULABO online remote diagnosis with 'black box' function?

The new circulators, and recirculating coolers with at least 2.5 kW cooling capacity (both with RS232 interface), feature a special function to support the enduser. During operation a black box which is integrated in the unit works unnoticed and invisible in the background recording all relevant data from the last 30 minutes. In event of a problem this data can be downloaded via software from the circulator to a PC and sent to JULABO by e-mail. Based on this data fast and efficient support can be provided. The software 'EasyBlack Box' is available as a free download from www.julabo.com.



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