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Julabo

When Temperature Matters

The 2006 Program



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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.



Every member of the JULABO team stands behind our product line.

JULABO was established in 1967, and built its reputation upon innovative products and market leading support and service. JULABO USA is proud to continue that tradition manufacturing locally to enable us to offer delivery from stock of over 90 % of products as well as a comprehensive team of application engineers and specialists to ensure that your application runs smoothly and without interruption.



SMD assembly station



Serial refrigeration production



Automated final control

CE
IEC 61010
EN 61010
EN 61326
DIN 12876

JULABO instruments meet national and international standards. They are basically maintenance-free and suitable for unsupervised continuous operation.

Please turn page!

Icon feature description of technical benefits

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 'PPC', resolution 0.1 °C

VFD[1] 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, resp.

Illuminated display for selected pump stage 'PPC' and filling volume 'Presto' + 'Forte HT' (pages 36-45)

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, additional warning and safety functions for high and low temperatures

Keypad 3 like keypad 2, additional menu functions for pump stage 'PPC', calibration 'ATC^3', band limit 'TCF', program, etc.

PID temperature control: temperature stability ±0.02...±0.03 °C

PID temperature control with drift compensation: temperature stability ±0.01...±0.02 °C

PID cascade temperature control, temperature stability ±0.01 °C internally, <±0.1 °C externally

Intelligent **C**ascade **C**ontrol, self-optimizing, for optimal results, temperature stability ±0.005 °C int., <±0.05 °C ext.

Temperature **C**ontrol **F**eatures for band limit, limit setting, co-speed factor, control dynamics

Absolute **T**emperature **C**alibration 1-point calibration

Absolute **T**emperature **C**alibration 3-point calibration

Pump **P**ressure **C**ontrol Electronically adjustable pump capacity in stages

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

Online communication with interface connection

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

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

- for low fluid 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 for 1 x 10 program steps

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

'Stakei' 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 **C**ooling **C**ontrol: Cooling available throughout the entire temperature range

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

Adjustable high temperature cut-off or dry-running protection

High temperature cut-off adjustable via display

Classification (DIN 12876-1) with self-protecting cut-off functions and signal

S1 High temperature cut-off/ dry running protection for non flammable bath fluids (NFL)

S3 High temperature cut-off and low liquid level protection for flammable bath fluids (FL)

[1] **VFD:** Vacuum Fluorescence Display

Technical Feature Reference Page

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Always first – Decades of innovation

As early as the 1970's **JULABO is the first** to incorporate

- **fully electronic temperature control** for laboratory circulators and baths, JULABO leads the market by replacing mercury thermometer based thermo-regulation.





The eighties: **JULABO is first** to offer additional benefits based upon analog technology:

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





In the nineties, the transition from analog to digital technology is being successfully completed. JULABO products get a new design. Operation by keypad setting and reproducibility are significantly improved. Digital interfaces allow for direct connection of PCs for automation and documentation of processes.
The beginning of the new millenium is characterized by the introduction of

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







The perfect solution for every requirement and every budget!

The NEW line, originally introduced in the fall of 2004 and further expanded this year, features three main product categories: **'Economy', 'TopTech' and 'HighTech'.** The clean and elegant design offers a host of new features building upon JULABO's reputation as the leaders in innovation and ease of use. For example, the new patented warning functions allow you even more confidence and security in your experimentation.



NEW developments such as the innovative calibration baths (A) and the 'SemiChill' range (B) for demanding chiller application further expand the comprehensive range. The Immersion Coolers have also been developed with the latest digital technology and offer market leading price/performance ratio.

A



B



Please note the icon feature description for the technical highlights on each specific page throughout the catalog.



Global reliability and always active!

Whether you are in the US, Central America or in Europe – JULABO and its network of partners and subsidiaries are close by. The highly trained staff and partners take pride in offering market leading support in order to provide the best solutions for YOUR applications.

See for yourself the benefits of the JULABO product portfolio. For temperature control, cooling and automation tasks – contact JULABO.

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Julabo

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Julabo Circulators and Temperature Systems

The new line of JULABO systems includes user-friendly design and the latest state-of-the-art technology incorporated to give YOU the highest performance standards in the industry, as well as extended safety and warning functions.
JULABO is proud to introduce the 2006 line to YOU.

High Dynamic Temperature Control Systems of the 'Presto' series and High Temperature Circulators of the 'Forte HT' series are the **top of liquid temperature control technology**. They are suitable for **highly demanding** external temperature applications **without the necessity of changing the bath fluids**.

JULABO sets bright standards
JULABO circulators and temperature systems always offer large and easy-to-read displays (LED) no matter what viewing angle or distance from the unit you are observing. The **VFD COMFORT-DISPLAY** – included in the highly sophisticated circulators – offers an even brighter, clearer and simple to read display. **One unique feature is the display function of three temperature values simultaneously** as well as the illuminated display for the adjustable pump capacity 'PPC'! The top-of-the-line HL and SL models also provide a backlit, interactive **LCD Dialog-Display.**

Integrated and easy operation
The key arrangement is very similar throughout the whole circulator series. YOU will find the systems simple to operate using the splash-proof and easy-to-clean keypads.

Professional, dynamic control electronics
The very latest technology allowing for four differing control styles – from 'PID1' to 'ICC' (self-optimizing).

External measurement and control
With the ME model, JULABO for the first time offers a model within the 'TopTech' series capable of highly precise control functions even in an externally connected system – similar to the models of the 'HighTech' series.

Electronically adjustable pump motor
Implemented into the MC, ME models, 'HighTech' series and High Dynamic Temperature Control Systems.

Adjustment of the desired pump capacity
The pump control electronics allow for
- Significantly increased pump capacities.
- Electronically adjustable pump capacity ('PPC') via keypad in four stages.
- Adjustment of pump capacity for various viscosity levels.
- Increase of pump capacity especially for large external systems, low flow rates due to small diameters or external systems located at distance.

Optional HSP booster pump or HST booster heater for ultra-low refrigerated circulators
For control of large external systems (reactors), the heating and pump capacities can optionally be increased (see page 33).

JULABO early warning systems (patented)
- If the liquid level in the bath tank falls below a certain level – e.g. due to evaporation – an optical and audible alarm is triggered with a signal tone that sounds intermittently. This allows to refill the bath tank in time, before the process is unnecessarily interrupted.
- Changes of the actual temperature – caused by e.g. exothermic reactions – will be detected using the parameters and limits YOU determine. If an automated cut-off with a signal tone that sounds continuously is desired for such case, it can also be programmed using the keypad.

Integrated features and safety functions for YOUR benefit
- Standby is displayed and self-test is performed automatically
- Monitoring of sensors and sensor temperature differentials
- Online diagnosis (trouble-shooting e.g. via phone)
- Overload protection for pump motor and refrigerated unit

Cooling and heating from –95 °C to +200 °C (see also page 20)
JULABO refrigerated and ultra-low refrigerated circulators are becoming more and more popular and provide unique features:
- Full exploitation of cooling capacity, rapid cooling – even at high temperatures. Heated bath cover plates prevent ice formation at low temperatures.
- Removable venting grid for hassle-free cleaning of the condenser and access to an integrated front drain.
- Handles for bench top units or castors for the powerful ultra-low units make relocation easy.
- More lab space: Absence of ventilation grids on sides allows units to be placed next to each other.

FREE control software
'EasyTemp' is downloadable from www.julabo.com free of charge and can be utilized as control software for all circulators and high dynamic temperature control systems that provide interfaces for **lab automation.**
Optional analog connections are available for the 'HighTech' series. Further options like Devicenet, Ethernet, USB and Profibus DP for lab automation can also be offered. Ask JULABO!

Please find further JULABO product groups (like e.g. recirculating coolers or units for special applications) **starting on page 46**.

Selection criteria – Choose the appropriate JULABO circulator for YOUR application

Circulators and Temperature Systems	Catalog pages:	8 and 9	10 and 11	12	13 to 15	16 and 17	18 and 19	20 to 26	27	28 to 30	31 to 35	36 to 39	40 to 43	44 and 45
Heating Immersion / Bridge Mounted Circulators		●												
Open Heating Bath Circulators			●											
Visco Baths				●										
Calibration Baths					●									
Heating Circulators with Open Bath						●								
Heating Circulators							●							
Refrigerated/Heating Circulators								●						
Cryo-Compact Circulators									●					
Ultra-Low Refrigerated Circulators										●				
Accessories, Applications, Bath Fluids											●			
'Presto' High Dynamic Temperature Control Systems												●		
'Forte HT' High Temperature Circulators													●	
Performance Data, Bath Fluids, Accessories														●
Working temperature ranges														
Heating Circulators	+20 to +60 °C		●	●		●								
	+20 to +100 °C	●	●	●		●								
	+20 to +150 °C	●		●		●								
	+20 to +200 °C	●					●							
	+20 to +300 °C	●			●		●							
Refrigerated Circulators	-20 / -30 to +100 °C							●						
	-20 / -35 to +150 °C							●						
	-20 / -28 to +200 °C							●						
	-30 / -35 to +200 °C				●			●	●					
	-40 / -50 to +200 °C							●						
Ultra-Low Refrigerated Circulators	-60 / -95 to +100 °C									●				
	-60 / -91 to +180 °C									●				
'Presto'	-40 / - 85 to +250 °C											●		
'Forte HT'	+40 / +70 to +400 °C												●	
Effective cooling capacities														
Cooling capacity at +20 °C working temperature	0.15 to 0.26 kW							●						
	0.38 to 0.5 kW							●	●	●				
	0.68 to 0.96 kW							●		●				
	1.5 to 5.5 kW									●		●		
Pump capacities														
Pressure pumps (flow rate, pressure)	10 l/min - 1.7 psi max.	●	●			●		●						
	15 l/min - 5.1 psi max.	●	●			●		●						
	11-16 l/min - 6.5 psi max.	●		●	●		●	●		●				
	14-18 l/min - 17.4 psi max.												●	
	24-33 l/min - 23.2 psi max.											●		
Pressure and suction pumps	22 l/min - 4.9 psi / 3.2 psi max.								●					
	22-26 l/min - 10.2 psi / 5.8 psi max.	●			●		●	●		●				

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Julabo

The tradition of innovation continues. Always a step ahead!

The 'Economy' Series

-35 °C to +150 °C



ED + EH Circulators

- **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:

S1 — Classification I (DIN 12876-1) with adjustable high temperature cut-off

EH circulator:

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 Refrigerated unit

The 'TopTech' Series

-88 °C to +200 °C



MB + MC Circulators

- **The product group with the broadest range of applications**

MULTI-DISPLAY (LED), resolution 0.1 °C

Keypad 3 with menu functions PID2, ATC3 and PPC (MC model)

PID temperature control

Absolute **T**emperature **C**alibration

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:

S1 — Classification I (DIN 12876-1)

MC circulator:

PPC — **P**ump **P**ressure **C**ontrol

S3 — Classification III (DIN 12876-1)



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



ME Circulator

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

VFD[1] COMFORT-DISPLAY, resolution 0.1 °C

Illuminated display for pump stages 1 to 4

Keypad 3 with menu functions PID3, ATC3, PPC

PID cascade temperature control

Absolute **T**emperature **C**alibration

PPC — **P**ump **P**ressure **C**ontrol

Pt100 — External sensor connection

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 Refrigerated unit/ solenoid valve



Unique technical features designed to inspire YOU!

Julabo

The 'HighTech' Series

-95 °C to +300 °C



HE + SE Circulators

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

VFD[1] COMFORT-DISPLAY, resolution 0.01 °C

Illuminated display for pump stages 1 to 4

Keypad 3 with menu functions ICC, TCF, ATC3, PPC

ICC — Intelligent Cascade Control

TCF — Temperature Control Features

ATC3 — Absolute Temperature Calibration

PPC — Pump Pressure Control

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)



HL + SL Circulators

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

VFD[1] 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, PPC

ICC — Intelligent Cascade Control

TCF — Temperature Control Features

ATC3 — Absolute Temperature Calibration

PPC — Pump Pressure Control

Pt100 — External sensor connection

RS232 RS485 — 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

S3 — Classification III (DIN 12876-1)

The 'HighTech' series (rear view):



with connections for
① External Pt100 sensor
② RS232 / RS485 interface
③ Refrigerated 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

[1] **VFD:** Vacuum Fluorescence Display

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Julabo Heating Immersion Circulators

JULABO Heating Immersion Circulators form the basis for the program of the 'Economy' and 'TopTech' series featuring 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



ED EH

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 a RS232 interface.



MB MC



External Pt100 sensor (accessory)

ME

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
- **'PPC' 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

for all models (see page 31):

- Pump set for external temperature applications
- Installation cooling coil

Bridge Mounted Circulator Julabo

The 'HighTech' Series

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

- 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

Additional features

- Working temperature to +300 °C
- VFD COMFORT-DISPLAY for the SIMULTANEOUS display 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
- Integrated programmer (1 x 10 program steps)

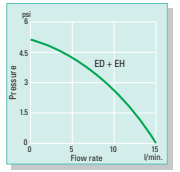
The powerful pressure and suction pump (22-26 l/min – 16 psi max.) allows an optimum bath circulation and connection of external systems requiring temperature application.



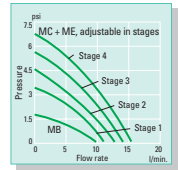
SE-Z

Pump capacity of heating immersion circulators

Bath fluid: Water



Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temp. stab. °C	Heat. cap. kW [2]	Pump capacity Flow rate l/min.	Pressure psi	Suction psi	Cooling coil	Usable immersion depth in	Dimensions W x L x H in	Weight lbs
Heating Immersion Circulators – The 'Economy' Series –								Technical features (see icon feature page)			
9 115 000	ED	20 ... 100	±0.03	1 / 2	15	5.1	--	Option	3.2 – 5.7	5.1 x 5.9 x 13	7.3
9 117 000	EH	20 ... 150	±0.03	1 / 2	15	5.1	--	Option	3.2 – 5.7	5.1 x 5.9 x 13	7.3
Heating Immersion Circulators – The 'TopTech' Series –											
9 140 000	MB	20 ... 100	±0.02	1 / 2	10	1.7	--	Option	3.2 – 5.7	5.1 x 5.9 x 13	7.3
9 150 000	MC	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	--	Option	3.2 – 5.7	5.1 x 5.9 x 13	8.8
9 160 000	ME	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	--	Option	3.2 – 5.7	5.1 x 5.9 x 13	8.8
Bridge Mounted Circulator											
9 250 218	SE-Z	20 ... 300	±0.01	-- / 3	22-26	5.8-10.2	2.9-5.8	integrated	4.7-7.5	12.6 x 6.7 x 13	17.6

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

[2] ED, EH: At voltage 115V/60Hz / 230V/50Hz
MB, MC, ME, SE-Z: At voltage 115V/60Hz / 230V/50-60Hz

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

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

Open Heating Bath Circulators
with transparent bath tank

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

Available are:
- 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

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



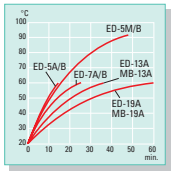
ED-5A/B ED-5M/B ED-7A/B

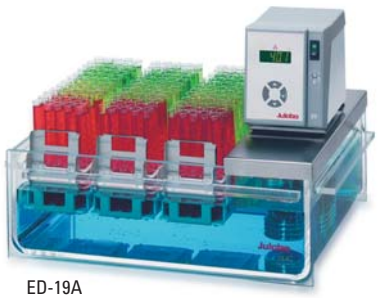
Accessories (see page 31)
- Test tube racks
- Immersion-height adjustable platforms
- Cooling coils

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

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

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





ED-19A



MB-13A

JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temp. stab. °C	Heat. cap. kW [2]	Pump capacity Flow rate / Pressure l/min.	psi	Cooling coil	Bath opening/ bath depth W x L / D in	Bath cover	Filling volume liters	Dimensions W x L x H in	Weight lbs
Open Heating Bath Circulators – The 'Economy' Series –												
9 115 315	ED-5A/B	20 ... 60	±0.03	1 / 2	15	5.1	--	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.7
9 115 317	ED-7A/B	20 ... 60	±0.03	1 / 2	15	5.1	--	4.7 x 13.4 / 5.9	--	7	5.5 x 19.7 x 13.8	12.3
9 115 515	ED-5M/B	20 ... 100	±0.03	1 / 2	15	5.1	--	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.4
9 115 313	ED-13A	20 ... 60	±0.03	1 / 2	15	5.1	Option	7.1 x 11.8 / 5.9	--	13	16.1 x 13 x 14.2	16.5
9 115 319	ED-19A	20 ... 60	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 5.9	--	19	21.7 x 13 x 14.2	18.7
9 115 513	ED-13M	20 ... 100	±0.03	1 / 2	15	5.1	Option	7.1 x 11.8 / 5.9	--	13	16.1 x 13 x 14.6	16.5
9 115 519	ED-19M	20 ... 100	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 5.9	--	19	21.7 x 13 x 14.6	18.7
Open Heating Bath Circulators – The 'TopTech' Series –												
9 140 313	MB-13A	20 ... 60	±0.02	1 / 2	10	1.7	Option	7.1 x 11.8 / 5.9	--	13	16.1 x 13 x 14.2	16.5
9 140 319	MB-19A	20 ... 60	±0.02	1 / 2	10	1.7	Option	14.2 x 11.8 / 5.9	--	19	21.7 x 13 x 14.2	18.7

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

[2] ED combinations: At voltage 115V/60Hz / 230V/50Hz
MB combinations: At voltage 115V/60Hz / 230V/50-60Hz

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



MB-13

Accessories (see pages 31 and 32)
- Lift-up and flat bath covers
- Test tube racks
- Cooling coil
- Immersion-height adjustable platforms

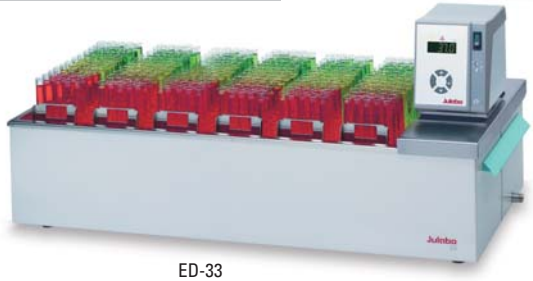


ED-19

Applications
for the circulators on pages 10 & 11

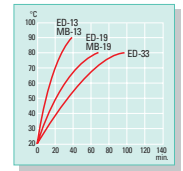
Preparation of samples
- for serology and
- clinical chemistry

Temp. applications
- Analytics
- Material testing



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 [2]	Pump capacity Flow rate/Pressure l/min.	psi	Cooling coil	Bath opening/ bath depth W x L / D in	Bath cover	Filling volume liters	Dimensions W x L x H in	Weight lbs
Open Heating Bath Circulators – The 'Economy' Series –												
9 115 413	ED-13	20 ... 100	±0.03	1 / 2	15	5.1	Option	7.1 x 11.8 / 5.9	Option	13	15.4 x 13 x 14.6	17.6
9 115 419	ED-19	20 ... 100	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 5.9	Option	19	22.4 x 13 x 14.6	24.2
9 115 427	ED-27	20 ... 100	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 7.9	Option	27	22.4 x 13 x 16.5	28.7
9 115 433	ED-33	20 ... 100	±0.03	1 / 2	15	5.1	Option	26.4 x 11.8 / 5.9	Option	33	35.8 x 13 x 15	44
Open Heating Bath Circulators – The 'TopTech' Series –												
9 140 413	MB-13	20 ... 100	±0.02	1 / 2	10	1.7	Option	7.1 x 11.8 / 5.9	Option	13	15.4 x 13 x 14.6	17.6
9 140 417	MB-17	20 ... 100	±0.02	1 / 2	10	1.7	Option	7.1 x 11.8 / 7.9	Option	17	15.4 x 13 x 16.5	22
9 140 419	MB-19	20 ... 100	±0.02	1 / 2	10	1.7	Option	14.2 x 11.8 / 5.9	Option	19	22.4 x 13 x 14.6	24.2

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

[2] ED combinations: At voltage 115V/60Hz / 230V/50Hz
MB combinations: At voltage 115V/60Hz / 230V/50-60Hz

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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 having an insulated bath mantle and two transparent windows of 7.3 x 9.6 inches made of high quality multiple-layer insulation glass.

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



ME-31A



ME-16G

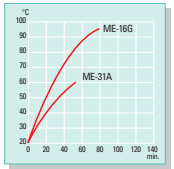


ME-18V

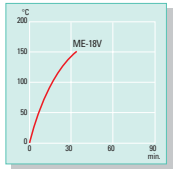
Applications

- 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

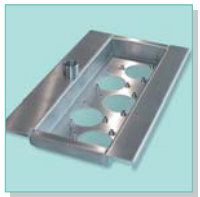


Heat-up times (230 V)
Bath fluid: Thermal H



For more viscometers! Available as option:

Cover with 4 round openings 20 inches dia. for ME-18V (order no. 8 970 294)



Cover with 5 round openings 20 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 [2]	Pump capacity Flow rate/ l/min.	Pressure psi	Cooling coil	Bath opening/ number/ bath depth in	For x visco-meters	Filling volume liters	Dimensions W x L x H in	Weight lbs
Visco Baths												
Technical features				PID 3	ATC³	PPC	Pt100	RS232	1 x 10			S3
9 160 331	ME-31A	20 ... 60	±0.01	1 / 2	11-16	3.3-6.5	Integrated	3.5x3.5/3x/14.6	3	31	19.7 x 7.9 x 22	24.2
9 160 616	ME-16G	20 ... 100	±0.01	1 / 2	11-16	3.3-6.5	Integrated	3x3 /2x/12.2	2	16	dia. 11.4 x 18.9	19.8
9 160 518	ME-18V	20 ... 150	±0.01	1 / 2	11-16	3.3-6.5	Integrated	3.5x3.5/2x/14.6	2	18	14.2 x 9.4 x 21.3	37.4

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

[2] At voltage 115V/60Hz / 230V/50-60Hz

Highly precise Heating/Refrigerated Circulators

for working temperatures from -30 °C to +200 °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 following values are achieved while a constant liquid level is maintained:

- Highest temperature stability to ±0.005 °C
- Temperature uniformity better than ±0.01 °C

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 (e. g. –20 °C, 0 °C, +50 °C) can be stored and recalled any time.

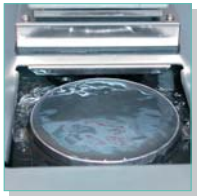
Simultaneous indication of 3 temperature values!

Using the high precision reference thermometer (page 15) 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



- Temperature chamber with uniform overflow



- Removable circulator with temperature chamber



FK30-ME



FK31-ME

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stability/ Temp. uniformity °C / °C	Heat. cap. kW [1]	Cooling cap. kW (Bath fluid: ethanol) 20	0	-20°C	Pump capacity Flow rate/ l/min.	Pressure psi	Bath opening/ Usable depth in	Filling vol. liters	Dimensions W x L x H in	Weight lbs
Calibration Baths with integrated refrigerated unit													
Technical features (see icon feature page)				PID 3	ATC³	PPC	Pt100	RS232	1 x 10				S3
9 160 627	FK30-ME	-30 ... +200	±0.005 / <±0.01	1 / 2	0.46	0.34	0.15	11-16	3.3-6.5	dia. 4.7 / 6.7	14	12.2 x 16.5 x 29.9	96.8
9 160 628	FK31-ME	-30 ... +200	±0.005 / <±0.01	1 / 2	0.46	0.34	0.15	11-16	3.3-6.5	dia. 4.7 / 12.2	24	12.2 x 16.5 x 34.6	110

[1] At voltage 115V/60Hz / 230V/50Hz

Calibration Baths for working temperatures to +300 °C – see page 14

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Highly precise
for working temperatures to +300 °C

These instruments feature the same benefits as the calibration baths on page 13.

For measurements from close to ambient temperature up to +50 °C it is recommended to connect a recirculating cooler to the integrated cooling coil.

Extension of working temperature range:

9 610 050 Recirculating cooler FE500
for working temperatures from
+10 °C to +50 °C

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.

Applications
Calibration of temperature sensors, measuring devices and thermometers, that needs to be carried out in regular intervals according to national and international standards.



SE-8K SE-14K

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stability/ Temp. uniformity °C / °C	Heat. cap. kW [1]	Pump capacity Flow rate l/min.	Pump capacity Pressure psi	Bath opening/ Usable depth in	Filling vol. liters	Dimensions W x L x H in	Weight lbs
Calibration Baths										
Technical features (see icon feature page)				ICC	ATC³	PPC	Pt100	RS232		S3
9 250 508	**SE-8K**	+50 ... +300	±0.005 / <±0.01	3	22-26	5.8-10.2	dia. 4.7 / 6.7	8	8.3 x 16.5 x 18.1	35.2
9 250 514	**SE-14K**	+50 ... +300	±0.005 / <±0.01	3	22-26	5.8-10.2	dia. 4.7 / 12.2	14	8.3 x 16.5 x 23.6	44.0

[1] At voltage 230V/50-60Hz

Accessories
The following Viton® sleeves are optionally available for all 4 models:

Order no.	for sensor	Order no.	for sensor
8 930 602	2 mm dia.	**8 930 605**	5 mm dia.
8 930 603	3 mm dia.	**8 930 606**	6 mm dia.
8 930 604	4 mm dia.	**8 930 608**	8 mm dia.

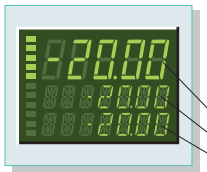
9 610 050 Recirculating cooler FE500
for models SE-8K and SE-14K

8 981 002 High precision reference sensor (page 15)

Outstanding and new! Only JULABO offers:

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 (1) can be set via keypad to display the reference temperature!

① Reference temperature
② Setpoint temperature
③ Actual temperature

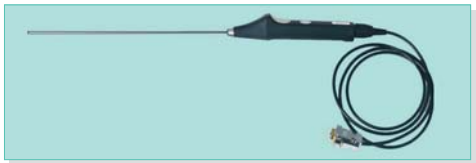
Save the extra costs of purchasing a highly accurate digital thermometer.

Precision Reference Sensor

JULABO Order No.	Description
8 981 002	**Precision reference sensor, stainl. steel**

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

Precision Pt100 reference sensor with integrated measuring electronics and RS232 connection
for direct use with all JULABO calibration baths.



Calibration Certificates

When purchasing a JULABO calibration bath YOU decide which certicates 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

NEW

Example: DKD calibration certificate



Example: ISO calibration certificate



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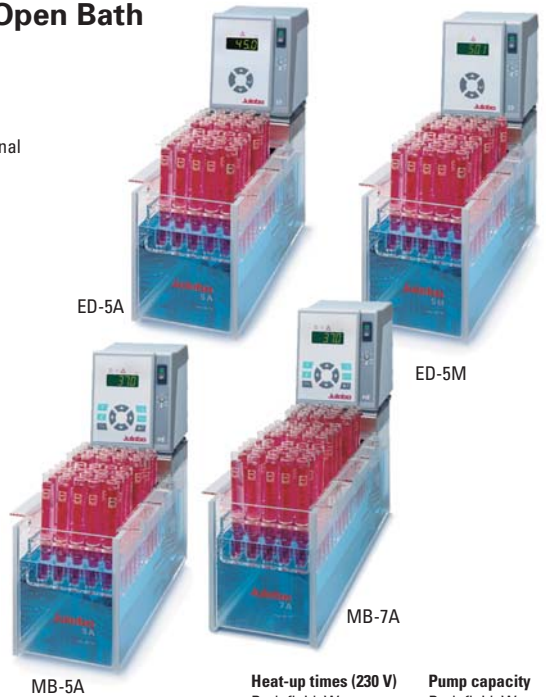
Heating Circulators with Open Bath
with transparent bath tank

These units are designed for

- Temperature applications in the circulator bath
- as well as 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**

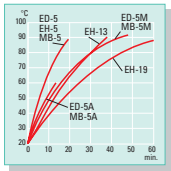
Accessories

- Large selection of test tube racks (see page 31)

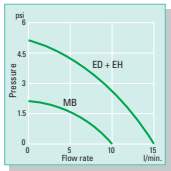
Applications
for circulators on pages 16 & 17

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

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



Pump capacity
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temp. stab. °C	Heat. cap. kW [2]	Pump capacity Flow rate/pressure l/min. psi		Cooling coil	Bath opening/ bath depth W x L / D in	Bath cover	Filling volume liters	Dimensions W x L x H in	Weight lbs
Heating Circulators with Open Bath – The 'Economy' Series –												
9 115 305	ED-5A	20 ... 60	±0.03	1 / 2	15	5.1	Integr.	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.7
9 115 505	ED-5M	20 ... 100	±0.03	1 / 2	15	5.1	Integr.	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.4
Heating Circulators with Open Bath – The 'TopTech' Series –												
9 140 305	MB-5A	20 ... 60	±0.02	1 / 2	10	1.7	Integr.	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.7
9 140 307	MB-7A	20 ... 60	±0.02	1 / 2	10	1.7	Integr.	4.7 x 13.4 / 5.9	--	7	5.5 x 19.7 x 13.8	12.3
9 140 505	MB-5M	20 ... 100	±0.02	1 / 2	10	1.7	Integr.	4.7 x 9.4 / 5.9	--	5	5.5 x 15.7 x 13.8	11.4

Technical features (see icon feature page): 999 · PID 1 · S1 (Economy) / PID 2 · ATC³ · RS232 · 120 · S1 (TopTech)

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

[2] ED combinations: At voltage 115V/60Hz / 230V/50Hz
MB combinations: At voltage 115V/60Hz / 230V/50-60Hz

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

NEW The 'EH' Series

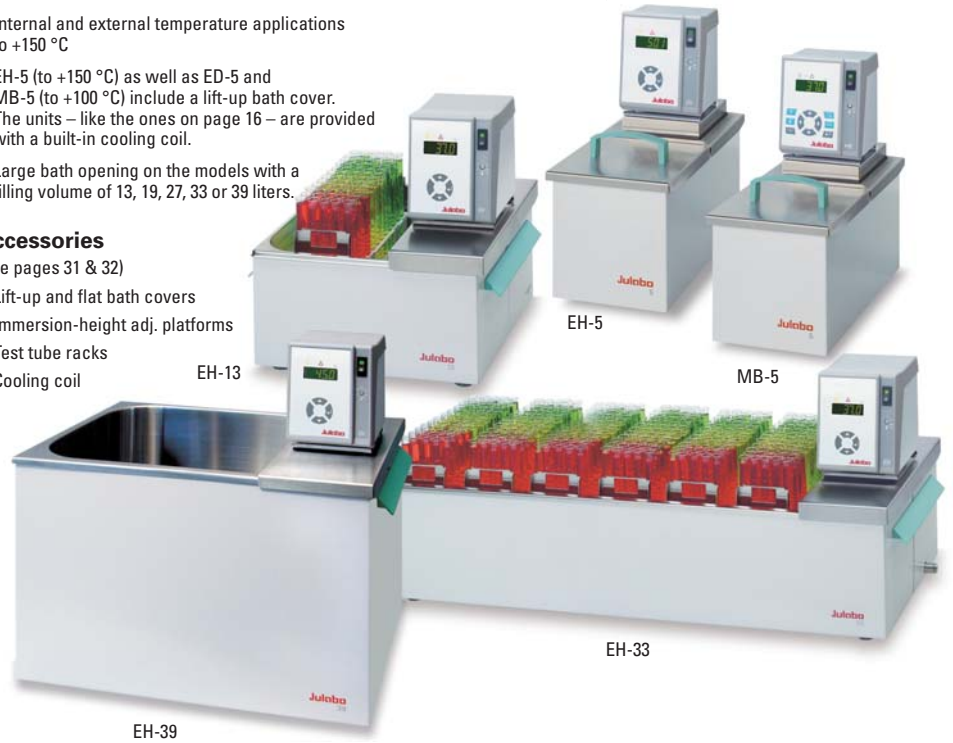
Julabo

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 16 – are provided with 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 [2]	Pump capacity Flow rate/pressure l/min. psi		Cooling coil	Bath opening/ bath depth WxL/D in	Bath cover	Filling volume liters	Dimensions W x L x H in	Weight lbs
Heating Circulators with Open Bath – The 'Economy' Series –												
9 115 405	ED-5	20 ... 100	±0.03	1 / 2	15	5.1	Integr.	5.9 x 5.9 / 5.9	Integr.	4.5	6.7 x 13 x 14.2	15.4
9 117 405	EH-5	20 ... 150	±0.03	1 / 2	15	5.1	Integr.	5.9 x 5.9 / 5.9	Integr.	4.5	6.7 x 13 x 14.2	15.4
9 117 413	EH-13	20 ... 150	±0.03	1 / 2	15	5.1	Option	7.1 x 11.8 / 5.9	Option	13	15.4 x 13 x 14.6	17.6
9 117 419	EH-19	20 ... 150	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 5.9	Option	19	22.4 x 13 x 14.6	24.2
9 117 427	EH-27	20 ... 150	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 7.9	Option	27	22.4 x 13 x 16.5	28.6
9 117 433	EH-33	20 ... 150	±0.03	1 / 2	15	5.1	Option	26.4 x 11.8 / 5.9	Option	33	35.8 x 13 x 15	44.0
9 117 439	EH-39	20 ... 150	±0.03	1 / 2	15	5.1	Option	14.2 x 11.8 / 11.8	Option	39	21.3 x 13.4 x 20.5	41.8
Heating Circulators with Open Bath – The 'TopTech' Series –												
9 140 405	MB-5	20 ... 100	±0.02	1 / 2	10	1.7	Integr.	5.9 x 5.9 / 5.9	Integr.	4.5	6.7 x 13 x 14.2	15.4

Technical features (see icon feature page): 999 · PID 1 · S3 (EH) / 999 · PID 2 · ATC³ · RS232 · 120 · S1 (MB-5)

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

[2] ED, EH combinations: At voltage 115V/60Hz / 230V/50Hz
MB combination: At voltage 115V/60Hz / 230V/50-60Hz

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

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

- External temperature control application to closed systems
- Simultaneous operation in the circulator bath
- Electronically adjustable pump capacity 'PPC'
- 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 installation such as early detection system in case of fluid losses or if the setpoint temperature is exceeded
- RS232 interface

There are 4 '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 & 35 for details concerning applications, peripherals, accessories)



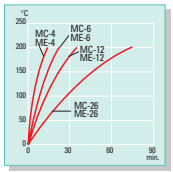
Accessories (see pages 32 & 33)

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

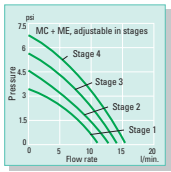
Applications
(Circulators on pages 16 to 19)

External temperature control applications for
- Refractometers
- Polarimeters
- Photometers
- Rotary viscometers

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



Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temp. stab. °C	Heat. cap. kW [2]	Pump capacity Flow rate/pressure 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
Technical features (see icon feature page)											
9 150 504	MC-4	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	5.1 x 5.9 / 5.9	4.5	8.3 x 16.5 x 15	21.1
9 150 506	MC-6	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	5.1 x 5.9 / 7.9	6	8.3 x 16.9 x 16.5	27.5
9 150 512	MC-12	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	8.7 x 5.9 / 7.9	12	11.8 x 16.9 x 17.7	28.6
9 150 526	MC-26	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	8.7 x 11.8 / 7.9	26	14.2 x 24 x 17.7	57.2

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

9 160 504	ME-4	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	5.1 x 5.9 / 5.9	4.5	8.3 x 16.5 x 15	21.1
9 160 506	ME-6	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	5.1 x 5.9 / 7.9	6	8.3 x 16.9 x 16.5	27.5
9 160 512	ME-12	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	8.7 x 5.9 / 7.9	12	11.8 x 16.9 x 17.7	28.6
9 160 526	ME-26	20 ... 200	±0.01	1 / 2	11-16	3.3-6.5	Integrated	8.7 x 11.8 / 7.9	26	14.2 x 24 x 17.7	57.2

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

[2] At voltage 115V/60Hz / 230V/50-60Hz

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

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

- 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 'PPC'
- Adjustment of 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 – bus 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)

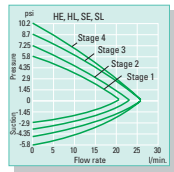
- Electronic module
- External Pt100 sensor
- Bath lid with special cooling coil
- Solenoid valve

Applications

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

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

Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temp. stab. °C	Heat. cap. kW [2]	Pump capacity Flow rate l/min.	Pressure psi	Suction psi	Bath opening/ Bath depth W x L / D in	Filling volume liters	Dimensions W x L x H in	Weight lbs
9 210 504	HE-4	20 ... 250	±0.01	1 / 2	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 15.7	24.2
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	29.7
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	30.8
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	14.2 x 24 x 18.5	59.4

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

9 310 504	HL-4	20 ... 250	±0.01	1 / 2	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 15.7	24.2
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	29.7
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	30.8
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	14.2 x 24 x 18.5	59.4

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

[2] At voltage 115V/60Hz / 230V/50-60Hz

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

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Refrigerated circulators and ultra-low refrigerated circulators

Heat-up and cool-down as rapidly as possible. Avoid temperature overshoots and undershoots when reaching your setpoint while at the same time maintaining it with the greatest possible accuracy. THESE ARE THE DEMANDS of today's temperature applications, which are constantly becoming more and more complex. THIS IS WHAT JULABO offers across the board with sophisticated control electronics based on the latest microprocessor technology. Combined with single or dual-stage refrigeration systems disturbances are quickly and automatically compensated. The high dynamic temperature control systems from the 'Presto' series offer levels of dynamic control of processes not previously available.

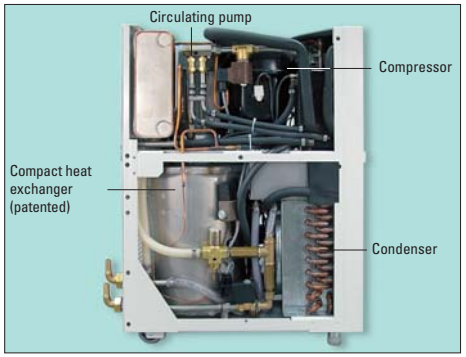
The systems with integrated refrigeration are suitable for the widest temperature applications. For applications with exotherms around ambient the rapid response cooling is particularly suited.

Additional benefits

- Active Cooling Control:
  Cooling available throughout the entire temperature range
- All models feature additional control electronics which automatically turns the refrigeration unit off when no cooling is required (except F12 and ED models)
- The powerful 'FP' models dose the necessary cooling via a valve control system
- All refrigerated units remain fully functional even at elevated ambient temperature conditions up to +40 °C
- Heated top cover plates prevent ice build-up and condensation at low temperatures

'Presto'
High Dynamic Temperature Control Systems

These top-of-the-line instruments are equipped with the latest temperature control technology for external temperature applications from –85...+250 °C. They allow for operation without the necessity of changing the clear bath fluid JULABO Thermal HL, due to the hydraulically sealed design concept.



For every application – the right choice

JULABO has the widest possible range – from entry level standard models of the 'Economy' Series all the way to powerful ultra-low refrigerated circulators.
'Presto' on pages 36 through 39.

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

JULABO Model designations

F = **F**rigus, **F**roid, **F**rio (stands for cooling)

FP = **P**roportional cooling control,
energy-saving especially at high performance levels

FPW = **W**ater-cooled, powerful models
Benefit: Virtually no heat generation into ambient air

For cooling of 'FPW' models a cooling water system (industrial water) is recommended.

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

Construction of JULABO refrigeration systems

The image illustrates the compact design of the high dynamic temperature control system 'Presto' LH45 (page 38) which combines powerful refrigeration technology and intelligent control electronics at its best.
Cooling components in JULABO refrigerated and ultra-low refrigerated circulators are located in the lower area, air flow is typically from the front and directs discharged air to the rear. JULABO's refrigerated units do not have side vents allowing for:

- Space saving – multiple systems can be located closely next to each other
- No negative impact of air circulation or heat radiation to the left or right of the unit

All JULABO refrigerated units, dynamic temperature control systems and recirculating coolers (pages 51 to 53) feature removable venting grids. Inevitable dust accumulation can easily be removed from the condenser.

The drain port for emptying the bath is easily accessible on the front once the grid is removed.

Product group	Page
The 'Economy' Series	21 – 22
The 'TopTech' Series	23 – 24
The 'HighTech' Series	25 – 26
Cryo-Compact Circulators	27
Ultra-Low Refrigerated Circulators	28 – 30
'Presto' High Dynamic Temperature Control Systems	36 – 39

The 'Economy' Series
for working temperatures from -30 °C to +100 °C

- Temperature control applications to 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 port easily accessible on the front

- No side ventilation slots
- Compact design

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


F12-ED


F25-ED

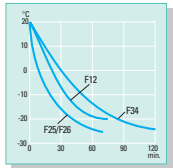
Applications
for the models on pages 21 & 22

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

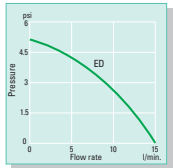

F26-ED


F34-ED

Cool-down times
Bath fluid: Ethanol



Pump capacity
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20°C	Pump capacity Flow rate/pressure l/min.	psi	Bath opening/ bath depth WxL/D in	Filling volume liters	Dimensions W x L x H in	Weight lbs
Refrigerated/Heating Circulators													
9 115 612	F12-ED	-20 ... 100	±0.03	1 / 2	0.20	0.12	0.02	15	5.1	5.9 x 6.3 / 5.1	4.5	7.9 x 14.2 x 22	48.4
9 115 625	F25-ED	-28 ... 100	±0.03	1 / 2	0.35	0.25	0.06	15	5.1	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 24	66.0
9 115 626	F26-ED	-28 ... 100	±0.03	1 / 2	0.26	0.20	0.06	15	5.1	4.7 x 5.5 / 5.5	4.5	16.5 x 16.5 x 16.5	66.0
9 115 634	F34-ED	-30 ... 100	±0.03	1 / 2	0.45	0.32	0.14	15	5.1	9.4 x 11.8 / 5.9	20	15 x 22.8 x 24.4	90.2

Technical features (see icon feature page): 999 | | PID 1 | | S1

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

[1] At voltage 115V/60Hz / 230V/50Hz
F12/F25-ED: At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz

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The 'Economy' Series

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

Benefits of the NEW 'EH' model combinations:

- Extended working temperature ranges
- Suitable for use with flammable bath fluids
- Classification III according to DIN 12876-1
- Large model selection, particularly with F32-EH

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.



F38-EH



F34-EH

NEW

The 'EH' Series



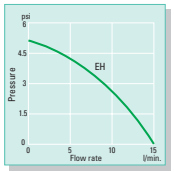
F12-EH

F25-EH



F32-EH

Pump capacity
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	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	Filling volume liters	Dimensions W x L x H in	Weight lbs
Refrigerated/Heating Circulators										Technical features (see icon feature page)			
9 117 612	F12-EH	-20 ... 100	±0.03	1 / 2	0.20	0.12	0.02	15	5.1	5.9 x 6.3 / 5.1	4.5	7.9 x 14.2 x 22	48.4
9 117 625	F25-EH	-28 ... 150	±0.03	1 / 2	0.35	0.25	0.06	15	5.1	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 24	66.0
9 117 626	F26-EH	-28 ... 150	±0.03	1 / 2	0.26	0.20	0.06	15	5.1	4.7 x 5.5 / 5.5	4.5	16.5 x 16.5 x 16.5	66.0
9 117 632	F32-EH	-35 ... 150	±0.03	1 / 2	0.45	0.39	0.15	15	5.1	7.1 x 4.7 / 5.9	8	12.2 x 16.5 x 25.2	79.2
9 117 634	F34-EH	-30 ... 150	±0.03	1 / 2	0.45	0.32	0.14	15	5.1	9.4 x 11.8 / 5.9	20	15 x 22.8 x 24.4	90.2
9 117 638	F38-EH	-35 ... 80	±0.05	1 / 2	0.92	0.66	0.32	15	5.1	13.8 x 16.1 / 10.6	45	17.3 x 25.2 x 33.9	158.4

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

[1] At voltage 115V/60Hz / 230V/50Hz
F12/F25-EH: At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz

The 'TopTech' Series

for working temperatures from -28 °C to +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

early detection system with audible signal

in case of fluid losses or if the setpoint temperature is exceeded.

All models with RS232 interface.

Please note the technical highlights of the three different heads MB, MC and ME.



F12-MB



F25-MC

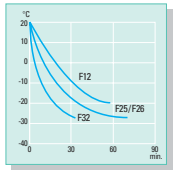


F25-ME

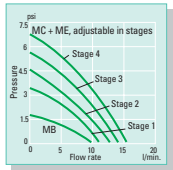


F26-ME

Cool-down times (P.22+23)
Bath fluid: Ethanol



Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	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	Filling volume liters	Dimensions W x L x H in	Weight lbs
Refrigerated/Heating Circulators										Technical features (see icon feature page)			
9 140 612	F12-MB	-20 ... 100	±0.02	1 / 2	0.20	0.12	0.02	10	1.7	5.9 x 6.3 / 5.1	4.5	7.9 x 14.2 x 22	48.4
9 140 625	F25-MB	-28 ... 100	±0.02	1 / 2	0.35	0.25	0.06	10	1.7	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 24	66.0
9 140 626	F26-MB	-28 ... 100	±0.02	1 / 2	0.26	0.2	0.06	10	1.7	4.7 x 5.5 / 5.5	4.5	16.5 x 16.5 x 16.5	66.0
Technical features (see icon feature page)													
9 150 612	F12-MC	-20 ... 100	±0.02	1 / 2	0.20	0.12	0.02	11-16	3.3-6.5	5.9 x 6.3 / 5.1	4.5	7.9 x 14.2 x 22	50.6
9 150 625	F25-MC	-28 ... 200	±0.02	1 / 2	0.35	0.25	0.06	11-16	3.3-6.5	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 24	68.2
Technical features: The red framed icons signify the differences to the 'MC' model													
9 160 625	F25-ME	-28 ... 200	±0.01	1 / 2	0.35	0.25	0.06	11-16	3.3-6.5	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 24	68.2
9 160 626	F26-ME	-28 ... 200	±0.01	1 / 2	0.26	0.2	0.06	11-16	3.3-6.5	4.7 x 5.5 / 5.5	4.5	16.5 x 16.5 x 16.5	68.2

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

[1] At voltage 115V/60Hz / 230V/50Hz
F12/F25 combinations: At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz

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The 'TopTech' Series

for working temperatures from -50 °C to +200 °C

The major benefit of these circulators is

- increased cooling performance

and the FP40 and FP50 models additionally provide

- energy-saving proportional cooling control

Further technical features of all JULABO refrigerated circulators are:

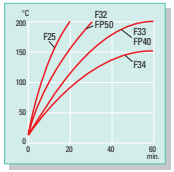
- Active Cooling Control throughout the entire temperature range
- Removable venting grid: Hassle-free cleaning of the condenser
- Drain port easily accessible on the front

Features of the 'ME' model combinations:

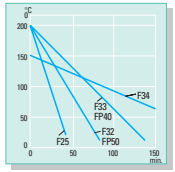
- SIMULTANEOUS display of 3 temperature values
- External measurement and control with ext. Pt100 sensor
- Temperature and time-dependent processes with integrated programmer (1 x 10 steps)



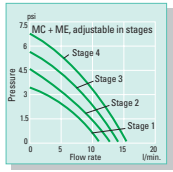
Heat-up times (230 V) (P. 24-26)
Bath fluid: Thermal H



Cool-down times (P. 24-26)
Bath fluid: Thermal H



Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-30	-40°C	Pump capacity Flow rate / pressure l/min.	psi	Bath opening/ bath depth WxL/D in	Filling vol. liters	Dimensions W x L x H in	Weight lbs
Technical features (see icon feature page)															
9 150 632	F32-MC	-35 ... 200	±0.02	1 / 2	0.45	0.39	0.15	0.05	--	11-16	3.3-6.5	7.1 x 4.7 / 5.9	8	12.2 x 16.5 x 25.2	81.4
9 150 633	F33-MC	-30 ... 200	±0.02	1 / 2	0.5	0.32	0.12	0.03	--	11-16	3.3-6.5	9.1 x 5.5 / 7.9	16	14.2 x 18.1 x 27.2	96.8
9 150 634	F34-MC	-30 ... 150	±0.02	1 / 2	0.45	0.32	0.14	0.03	--	11-16	3.3-6.5	9.4 x 11.8 / 5.9	20	15 x 22.8 x 24.4	92.4
9 150 640	FP40-MC	-40 ... 200	±0.02	– / 2	0.68	0.5	0.32	0.17	0.04	11-16	3.3-6.5	9.1 x 5.5 / 7.9	16	14.6 x 18.1 x 27.2	105.6
9 150 650	FP50-MC	-50 ... 200	±0.02	– / 2	0.9	0.8	0.5	0.32	0.16	11-16	3.3-6.5	7.1 x 4.7 / 5.9	8	16.5 x 19.3 x 27.6	121.0

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

9 160 632	F32-ME	-35 ... 200	±0.01	1 / 2	0.45	0.39	0.15	0.05	--	11-16	3.3-6.5	7.1 x 4.7 / 5.9	8	12.2 x 16.5 x 25.2	81.4
9 160 633	F33-ME	-30 ... 200	±0.01	1 / 2	0.5	0.32	0.12	0.03	--	11-16	3.3-6.5	9.1 x 5.5 / 7.9	16	14.2 x 18.1 x 27.2	96.8
9 160 634	F34-ME	-30 ... 150	±0.01	1 / 2	0.45	0.32	0.14	0.03	--	11-16	3.3-6.5	9.4 x 11.8 / 5.9	20	15 x 22.8 x 24.4	92.4
9 160 640	FP40-ME	-40 ... 200	±0.01	– / 2	0.68	0.5	0.32	0.17	0.04	11-16	3.3-6.5	9.1 x 5.5 / 7.9	16	14.6 x 18.1 x 27.2	105.6
9 160 650	FP50-ME	-50 ... 200	±0.01	– / 2	0.9	0.8	0.5	0.32	0.16	11-16	3.3-6.5	7.1 x 4.7 / 5.9	8	16.5 x 19.3 x 27.6	121.0

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

[1] At voltage 115V/60Hz / 230V/50Hz
FP40, FP50 combinations: At voltage 230V/60Hz or 230V/50Hz

The 'HighTech' Series

for working temperatures from -50 °C to +200 °C

Benefits of the 'HE' refrigerated circulators of the 'HighTech' series:

- Highest precision and display resolution
- VFD COMFORT-DISPLAY for SIMULTANEOUS display of 3 temperature values
- 'ICC' self-optimizing control electronics
- Professional PC connection – bus capability
- Integrated programmer (1 x 10 steps) with real time clock
- Powerful pressure and suction pump with electronically adjustable pump capacity 'PPC'
- Adjustment of pump capacity for varying viscosity levels of bath fluids

There are 7 'HE' model combinations with differing effective cooling capacities, bath openings, bath depths and filling volumes.

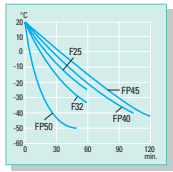
The 'HL' combinations offer increased functionality and are suitable for even more applications (see page 26).

Accessory: Electronic module (see page 32)

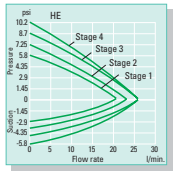




Cool-down times (P. 24-26)
Bath fluid: Ethanol



Pump capacities
Bath fluid: Water



Cool-down times with Thermal H as the bath fluid – see page 24!

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-30	-40°C	Pump capacity Flow rate l/min.	Press. psi	Suct. psi	Bath opening/ bath depth WxL/D in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
Technical features: The red framed icons signify the differences to the 'ME' model																
9 210 625	F25-HE	-28 ... 200	±0.01	1 / 2	0.35	0.25	0.06	--	--	22-26	5.8-10.2	2.9-5.8	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 25.2	70.4
9 210 632	F32-HE	-35 ... 200	±0.01	1 / 2	0.45	0.39	0.15	0.05	--	22-26	5.8-10.2	2.9-5.8	7.1 x 4.7 / 5.9	8	12.2 x 16.5 x 26	83.6
9 210 633	F33-HE	-30 ... 200	±0.01	1 / 2	0.50	0.32	0.12	0.03	--	22-26	5.8-10.2	2.9-5.8	9.1 x 5.5 / 7.9	16	14.2 x 18.1 x 28	99.0
9 210 634	F34-HE	-30 ... 150	±0.01	1 / 2	0.45	0.32	0.14	0.03	--	22-26	5.8-10.2	2.9-5.8	9.4 x 11.8 / 5.9	20	15 x 22.8 x 25.2	96.8
9 210 640	FP40-HE	-40 ... 200	±0.01	– / 2	0.68	0.50	0.32	0.17	0.04	22-26	5.8-10.2	2.9-5.8	9.1 x 5.5 / 7.9	16	14.6 x 18.1 x 28	107.8
9 210 645	FP45-HE	-42 ... 200	±0.01	– / 2	0.85	0.70	0.42	0.28	0.08	22-26	5.8-10.2	2.9-5.8	9.1 x 10.2 / 7.9	26	15 x 22.8 x 27.2	116.6
9 210 650	FP50-HE	-50 ... 200	±0.01	– / 2	0.90	0.80	0.50	0.32	0.16	22-26	5.8-10.2	2.9-5.8	7.1 x 4.7 / 5.9	8	16.5 x 19.3 x 28.3	125.4

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

[1] F25-HE: At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz
F32/F33/F34-HE: At voltage 115V/60Hz / 230V/50Hz
FP40/FP45/FP50-HE: At voltage 230V/60Hz or 230V/50Hz

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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



FP40-HL



FP50-HL

Accessories

- Electronic module (see page 32)
- External Pt100 sensor

Applications
for the models on pages 25 & 26

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



F25-HL



F32-HL

For heat-up/cool-down diagrams and pump curves please see pages 24 & 25

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-30	-40°C	Pump capacity Flow rate l/min.	Press. psi	Suct. psi	Bath opening/ bath depth WxL/D in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
9 310 625	F25-HL	-28 ... 200	±0.01	1 / 2	0.35	0.25	0.06	--	--	22-26	5.8-10.2	2.9-5.8	4.7 x 5.5 / 5.5	4.5	9.1 x 16.5 x 25.2	70.4
9 310 632	F32-HL	-35 ... 200	±0.01	1 / 2	0.45	0.39	0.15	0.05	--	22-26	5.8-10.2	2.9-5.8	7.1 x 4.7 / 5.9	8	12.2 x 16.5 x 26	83.6
9 310 633	F33-HL	-30 ... 200	±0.01	1 / 2	0.50	0.32	0.12	0.03	--	22-26	5.8-10.2	2.9-5.8	9.1 x 5.5 / 7.9	16	14.2 x 18.1 x 28	99.0
9 310 634	F34-HL	-30 ... 150	±0.01	1 / 2	0.45	0.32	0.14	0.03	--	22-26	5.8-10.2	2.9-5.8	9.4 x 11.8 / 5.9	20	15 x 22.8 x 25.2	96.8
9 310 640	FP40-HL	-40 ... 200	±0.01	– / 2	0.68	0.50	0.32	0.17	0.04	22-26	5.8-10.2	2.9-5.8	9.1 x 5.5 / 7.9	16	14.6 x 18.1 x 28	107.8
9 310 645	FP45-HL	-42 ... 200	±0.01	– / 2	0.85	0.70	0.42	0.28	0.08	22-26	5.8-10.2	2.9-5.8	9.1 x 10.2 / 7.9	26	15 x 22.8 x 27.2	116.6
9 310 650	FP50-HL	-50 ... 200	±0.01	– / 2	0.90	0.80	0.50	0.32	0.16	22-26	5.8-10.2	2.9-5.8	7.1 x 4.7 / 5.9	8	16.5 x 19.3 x 28.3	125.4

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

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

[1] F25-HL: At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz
F32/F33/F34-HL: At voltage 115V/60Hz / 230V/50Hz
FP40/FP45/FP50-HL: At voltage 230V/60Hz or 230V/50Hz

Cryo-Compact Circulators

for working temperatures from -30 °C to +200 °C

Space saving design:
Width 9.8 in | for
Length 18.9 in | both
Height 15.7 in | models

Features of F30-C and F31-C

- More space on the lab bench, especially in a fume cabinet
- Active Cooling Control throughout the entire temperature range
- Measurement and control directly in the external system with external Pt100 sensor
- RS232 / RS485 interface
- Rapid heating and cooling

F31-C additionally provides

- Analog connections for external programming input and 2 outputs for temperature recorder, standby input and alarm output



F30-C

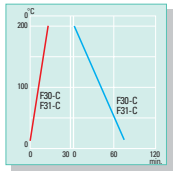


F31-C

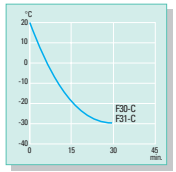
Applications

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

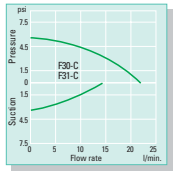
Heat-up (230 V) / Cool-down times
Bath fluid: Thermal H



Cool-down times
Bath fluid: Ethanol



Pump capacities
Bath fluid: Water





Rear view:
F31-C with analog outputs and inputs for external programming, standby and alarm

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-30°C	Pump capacity Flow rate l/min.	Press. psi	Suct. psi	Bath opening/ bath depth WxL/D in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
9 400 830	F30-C	-30 ... 200	±0.01	1 / 2	0.38	0.28	0.06	0.02	22	4.9	3.2	6.7 x 2.8 / 5.9	3.8	9.8 x 18.9 x 15.7	70.4
9 400 831	F31-C	-30 ... 200	±0.01	1 / 2	0.38	0.28	0.06	0.02	22	4.9	3.2	6.7 x 2.8 / 5.9	3.8	9.8 x 18.9 x 15.7	70.4

Cryo-Compact Circulators — **Technical features** (see icon feature page)

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

[1] At voltage 115V/60Hz / 230V/50Hz or 230V/60Hz

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The 'TopTech' Series / The 'HighTech' Series

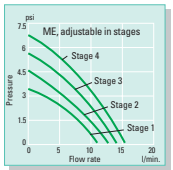
for working temperatures from -95 °C to +100 °C

These units contain 2 compressors using cascade-technology, filled with different refrigerants. This ensures that ultralow working temperatures are achieved. The units are designed for continuous operation. Additional features are:

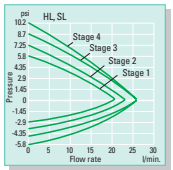
- ACC • Active Cooling Control throughout the entire temperature range
- • Removable venting grid: Hassle-free cleaning of the condenser
- • Drain port easily accessible on the front



Pump capacities
Bath fluid: Water



Pump capacities
Bath fluid: Water



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

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Pump capacity	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-40	-60	-80°C	Bath opening/ filling port cm bath depth/in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
Technical features				PID 3	ATC³	PPC	Pt100	RS232	1 x 10						S3
9 160 688	FP88-ME	-88 ... 100	±0.02	1.3	see diagram	1.1	0.96	0.92	0.73	0.59	0.15	5.1 x 5.9 / 6.3	8	21.7 x 24 x 35.4	261.8
						ICC	TCF	ATC³	PPC	Pt100	RS232 RS485	6 x 60			S3
9 310 688	FP88-HL	-88 ... 100	±0.02	1.3	see diagram	1.1	0.96	0.92	0.73	0.59	0.15	5.1 x 5.9 / 6.3	8	21.7 x 23.6 x 36.2	266.2
9 350 795 N	F95-SL	-95 ... 0	±0.05	3		--	2.0	1.9	1.65	1.2	0.36	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	442.2
9 350 796 N	FW95-SL[1]	-95 ... 0	±0.05	3		--	2.0	1.9	1.65	1.2	0.36	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	435.6

[1] FW95-SL is water-cooled.
Cooling water connection G 3/4" male with barbed fittings for tubing 3/4" inner dia.
Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

Voltage: Available in 230V/60Hz or 230V/50Hz
F95-SL, FW95-SL: Available in 230V(3 Ph.)/60Hz or 400V(3 Ph.)/50Hz

The 'HighTech' Series

Ultimate models, mainly for external temperature applications

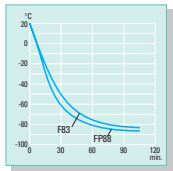
- High performance data
- Upgradeable
- Insulating filling port
- Heated bath cover plate
- Prevent ice formation
- Energy-saving performance

Accessories
- Electronic module (see page 32)
- External Pt100 sensor

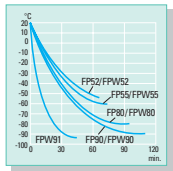
Applications
- Jacketed reaction vessels
- Autoclaves, miniplant installations
- Kilo labs
- Process development



Cool-down times (P. 28)
Bath fluid: Ethanol



Cool-down times
Bath fluid: Ethanol



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Pump capacity	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-40	-60	-80°C	Filling port dia. / bath depth/in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
Ultra-Low Refrigerated Circulators						ICC	TCF	ATC³	PPC	Pt100	RS232 RS485	6 x 60			S3
9 350 752N	FP52-SL	-60 ... 100	±0.05	3	see diagram page 28	3.0	2.8	1.6	0.65	0.1	--	dia. 2.8 / 8.7	24	23.2 x 29.9 x 45.7	343.2
9 350 753N	FPW52-SL	-60 ... 100	±0.05	3		3.0	2.8	1.6	0.65	0.1	--	dia. 2.8 / 8.7	24	23.2 x 29.9 x 45.7	336.6
9 350 755N	FP55-SL	-55 ... 100	±0.05	3		5.2	4.1	2.2	0.7	0.13	--	dia. 2.8 / 9.1	27	33.5 x 29.9 x 45.7	400.4
9 350 756N	FPW55-SL	-60 ... 100	±0.05	3		5.5	4.1	2.2	1.0	0.13	--	dia. 2.8 / 9.1	27	23.2 x 29.9 x 45.7	358.6
9 350 780N	FP80-SL	-80 ... 100	±0.05	3		1.2	1.2	1.1	0.82	0.5	0.14	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	349.8
9 350 781N	FPW80-SL	-80 ... 100	±0.05	3		1.2	1.2	1.1	0.82	0.5	0.14	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	343.2
9 350 790N	FP90-SL	-90 ... 100	±0.05	3		1.8	1.7	1.6	1.35	0.75	0.15	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	420.2
9 350 791N	FPW90-SL	-90 ... 100	±0.05	3		1.8	1.7	1.6	1.35	0.75	0.15	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	413.6
9 350 793N	FPW91-SL	-91 ... 100	±0.2	3		5.2	4.7	4.0	3.5	2.3	0.8	dia. 2.8 / 7.9	22	33.5 x 29.9 x 45.7	651.2

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 G 3/4" male with barbed fittings for tubing 3/4" inner dia.

Voltage: Available in 230V(3ph.)/60Hz or 400V(3ph.)/50Hz



Upgradeable: Increased heater and pump capacities
- HST booster heater (6 kW) providing 9 kW total (order no. 8 810 012)
- Electronic module (order no. 8 900 100) required for control of the HST booster heater
- HSP booster pump 43.5 psi– 30 l/min. max. (reduces cooling capacity by 0.4 kW) (order no. 8 810 015) see page 33



Option:
Bath opening 11 x 9.1 inches instead of filling port on request!

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The 'HighTech' Series

with extended working temperature ranges to +150 °C / +180 °C

Applications such as process development require extended working temperature ranges, e.g. for control of reactors.

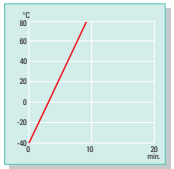
The following powerful units are additionally equipped with special insulating material. Benefits:

- Prevents ice formation on the heated bath cover plate
- Reduced heat generation at high temperatures

In addition, the features mentioned on page 29 apply.

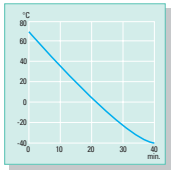


Upgradeable:



Rapid heating
with the HST booster heater, e.g. for the models FP52, FP90, FPW90 and FPW91-SL
Bath fluid: JULABO Thermal H5S

Rapid and powerful:



Cool-down
with the bath fluid JULABO Thermal H5S in the FPW90-SL: from 70 °C to -40 °C within 40 minutes

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Pump capacity	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-40	-60	-80°C	Filling port dia. / bath depth in	Fill. vol. liters	Dimensions W x L x H in	Weight lbs
Ultra-Low Refrigerated Circulators															
9 350 752N150	FP52-SL	-60 ... 150	±0.05	3		3.0	2.8	1.6	0.65	0.1	--	dia. 2.8 / 8.7	24	23.2 x 29.9 x 45.7	343.2
9 350 753N150	FPW52-SL	-60 ... 150	±0.05	3		3.0	2.8	1.6	0.65	0.1	--	dia. 2.8 / 8.7	24	23.2 x 29.9 x 45.7	336.6
9 350 755N150	FP55-SL	-55 ... 150	±0.05	3	see	5.2	4.1	2.2	0.7	0.13	--	dia. 2.8 / 9.1	27	33.5 x 29.9 x 45.7	400.4
9 350 756N150	FPW55-SL	-60 ... 150	±0.05	3	diagram	5.5	4.1	2.2	1.0	0.13	--	dia. 2.8 / 9.1	27	23.2 x 29.9 x 45.7	358.6
9 350 790N150	FP90-SL	-90 ... 150	±0.05	3	page 28	1.8	1.7	1.6	1.35	0.75	0.15	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	420.2
9 350 791N150	FPW90-SL	-90 ... 150	±0.05	3		1.8	1.7	1.6	1.35	0.75	0.15	dia. 2.8 / 7.9	22	23.2 x 29.9 x 45.7	413.6
9 350 793N180	FPW91-SL	-91 ... 180	±0.2	3		5.2	4.7	4.0	3.5	2.3	0.8	dia. 2.8 / 7.9	22	33.5 x 29.9 x 45.7	651.2

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 G 3/4" male with barbed fittings for tubing 3/4" inner dia.

Voltage: Available in 230V(3ph.)/60Hz or 400V(3ph.)/50Hz

Order No.	Description	Suitable for
Heating Immersion Circulators (pages 8 and 9)	for combination with any bath tank. For attachment either use a bath clamp or for round glass bath tanks employ a stand rod (order no. 8 970 020).	
8 970 020	Stand rod (for attachment to a laboratory stand)	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	ED, EH, MB, MC, ME
	External Pt100 sensors	ME



Pump set, with the bath attachment clamp removed

Large selection of bath tanks

Stainless steel bath tanks to +150 °C		Inner / Outer 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 19 / 7.1	
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	ED, EH, MB, MC, ME
9 902 419	Bath tank 19	19.7 x 11.8 / 5.9	22 x 13 / 7.1	
9 902 427	Bath tank 27	19.7 x 11.8 / 7.9	22 x 13 / 9.1	ED, EH, MC, ME
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		**Inner / Outer dimensions**		
9 900 305	Bath tank 5A	15.4 x 4.7 / 5.9	16.1 x 5.9 / 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		**Inner / Outer dimensions**		
9 900 505	Bath tank 5M	15.4 x 4.7 / 5.9	16.1 x 5.9 / 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



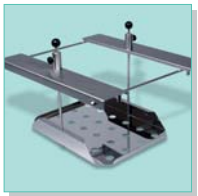
Stainless steel bath tanks

Open Heating Bath, Heating, Refrigerated/Heating Circulators (pages 10 to 30)

JULABO offers the perfect accessory for the unit YOU selected:

Test tube racks / Immersion-height adjustable platforms / Castor platform / Installation cooling coil / Water bath protective media

Test tube racks		Immers. 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.	to 1.2 in	Bath tanks: 5A / 5M 7A
8 960 003	046 for 30 test tubes, 50 x 12/13 mm dia.	60 °C 1.8 in	Max. qty.: 2 3
8 960 010	062 for 20 test tubes, 160 x 17 mm dia.	3.9 in	
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 Poly- 3.1 in	Bath tanks: 13/13A/13M/17 19/19A/19M/27 33
8 970 306	for 90 tubes, 12/13 mm dia.	propylene® to 80 °C 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 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.	steel to 150 °C 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 3.1 in	Bath tank: 5 and F12, F25, F26
8 970 321	for 38 tubes, 12/13 mm dia.	steel to 150 °C 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
Water bath protective media 'Aqua-Stabil'			
8 940 006	6 bottles, 100 ml each		To prevent contamination/formation of algae in open heating bath / heating circulators
8 940 012	12 bottles, 100 ml each		



Polypropylene® test tube rack with stainless steel frame

Immersion-height adjustable platform



Water bath protective media

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Lift-up bath cover


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


Electronic module


Metal tubing
(flexible)


Insulated filling nozzle
with condensation trap

Order No.	Description	Suitable for
Bath covers		
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
External Pt100 sensors		
8 981 003	200 x 6 mm dia., stainless steel, 1.5 m cable	ME, HE, HL, SE, SL
8 981 005	200 x 6 mm dia., glass, 1.5 m cable	
8 981 006	20 x 2 mm dia., stainless steel, 1.5 m cable	
8 981 010	300 x 6 mm dia., stainless steel, 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	
8 981 020	M + R in-line Pt100 sensor (including 2 fittings M16x1 male)	
8 981 103	3.5 m Extension cable for Pt100 sensor	
8 890 030	TCCB Thermo-Couple Converter Box	

Interfaces

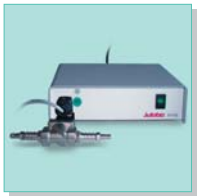
In addition to the digital interfaces, an electronic module with analog connections can be retrofitted to all circulators of the 'HighTech' series. This module provides one input and two outputs for external programming, flow sensor or temperature recorder. Inputs/outputs are scalable (current or voltage).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

8 900 100	**Electronic module with analog connections**	HE, HL, SE, SL

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
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
8 930 108	1 m Viton® tubing, 8 mm inner dia. (-50 ... +200 °C)	MC, ME, HE, HL, SE, SL,
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,
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, 8 mm dia.	Tubing 8 mm inner dia.
8 970 481	2 Tube clamps, 10 to 12 mm dia.	Tubing 10 or 12 mm inner dia.
Metal tubing, triple insulated, -100 ... +350 °C (2 fittings M16x1 female)		
8 930 209	0.5 m Metal tubing	HE, HL, SE, SL
8 930 210	1 m Metal tubing	
8 930 211	1.5 m Metal tubing	
8 930 214	3 m Metal tubing	
Metal tubing, insulated, -50 ... +200 °C (2 fittings M16x1 female)		
8 930 220	0.5 m Metal tubing	HE, HL, SE, SL
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
8 970 702	Condensation trap with bath lid	F83, FP88
8 970 705	Insulated filling nozzle with condensation trap	FP(W)52, FP(W)55, FP(W)80, FP(W)90, FPW91, F95, FW95

Order No.	Description	Qty.	Suitable for working temp. range °C	Flash point °C	Fire point °C	Color
Bath fluids						
8 940 124	Thermal G	10 l	-30 ... + 80	--	--	light yellow
8 940 125	Thermal G	5 l	-30 ... + 80	--	--	light yellow
8 940 100	Thermal M	10 l	+40 ... +170	>+280	>+305	clear
8 940 101	Thermal M	5 l	+40 ... +170	>+280	>+305	clear
8 940 102	Thermal H	10 l	+20 ... +250	>+270	>+360	light brown
8 940 103	Thermal H	5 l	+20 ... +250	>+270	>+360	light brown
8 940 104	Thermal HY	10 l	-80 ... + 55	> +75	> +80	clear
8 940 105	Thermal HY	5 l	-80 ... + 55	> +75	> +80	clear
8 940 106	Thermal H5S	10 l	-50 ... +105	>+110	>+130	light brown
8 940 107	Thermal H5S	5 l	-50 ... +105	>+110	>+130	light brown
8 940 114	Thermal H10S	10 l	-20 ... +180	>+175	>+210	light brown
8 940 115	Thermal H10S	5 l	-20 ... +180	>+175	>+210	light brown
8 940 108	Thermal H20S	10 l	0 ... +220	>+230	>+270	light brown
8 940 109	Thermal H20S	5 l	0 ... +220	>+230	>+270	light brown
8 940 116	Thermal H250	10 l	+60 ... +200	>+225	>+250	clear
8 940 117	Thermal H250	5 l	+60 ... +200	>+225	>+250	clear


Bath fluid


MVS controller,
solenoid valve

Order No.	Description	Suitable for
Automated tap water cooling: 'Dosed' tap water cooling or compensation of exothermic reactions (pages 34, 35).		
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
8 810 010	**HST booster heater 4 kW**	SL-12, FP40-HL, FP45-HL
8 810 012	**HST booster heater 6 kW**	FP52, FPW52, FP55, FPW55
8 810 015	**HSP booster pump 30 l/min. - 43.5 psi max.**	FP80, FPW80, FP90, FPW90, FPW91
Connectors / Valves / Adapters, etc.		
8 970 410	D + S level-adapter (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
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, F30-C, F31-C
8 970 450	Drain tap (max. +200 °C)	Bath tanks 4, 6, 12, 26, F30-C, F31-C
8 970 470	T-connection with barbed fittings	Tubing 8 mm inner dia.
8 970 472	T-connection with barbed fittings	Tubing 10 mm inner dia.
8 970 471	T-connection 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
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
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
8 970 492	1 Collar nut M10x1 male	ED, EH, MB, MC, ME
8 970 442	2 Elbow fittings 90°, M16x1 female/male	
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	HE, HL, SE, SL
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	


Bath lid with
special cooling coil



1 - HST booster heater
2 - HSP booster pump


D+S level-adapter

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Software / Lab automation

Order No.	Description	Suitable for
8 901 102	'EasyTemp' control software (free download www.julabo.com)	MB, MC, ME, HE, HL, SE, SL
8 901 105	'EasyTemp Professional' control software, incl. USB dongle	MB, MC, ME, HE, HL, SE, SL
8 980 073	RS232 interface cable, 2.5 m	MB, MC, ME, HE, HL, SE, SL
8 900 110	USB Interface adapter cable	Units with RS232 + 8 980 073
8 900 015	PBM Profibus DP Master	Connection via USB port on PC
8 900 005	PB-5 Option: integrated Profibus DP	HL, SL
8 980 030	PBI Profibus DP Interface Box	MB, MC, ME, HE, SE

FREE of charge

For MORE information concerning lab automation and software solutions, please refer to pages 48, 49.

Economic tap water consumption



ME circulator

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 for use with the models MB, MC, ME, HE and SE, we recommend the following:

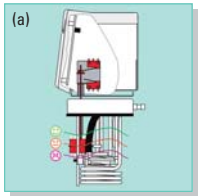
9 790 000 MVS solenoid valve controller
8 980 700 Solenoid valve for tap water cooling

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.

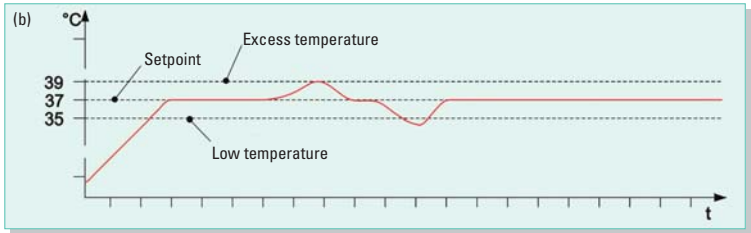
JULABO Early warning systems (patented)



JULABO Early warning systems with float and micro switches (patented)

When the liquid level in the bath tank falls below a certain level (a) (e.g. due to evaporation or leakage in the system) or the actual temperature changes significantly (b), optical and audible alarms are triggered with a signal tone that sounds intermittently. This allows the user to take preventive measures before the process becomes unnecessarily interrupted.

When the alarm is triggered for:
a) Refill the bath tank
b) Eliminate the cause for the failure (e. g. caused by exothermic reaction)



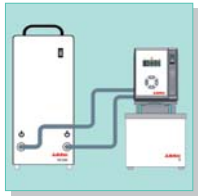
JULABO Early warning system for high and low temperature (patented), programmable to automated 'cut-off' (thus also usable as low temperature cut-off).

Flow-through cooler and immersion coolers

are employed for counter-cooling in combination with heating circulators. This allows for subambient 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.



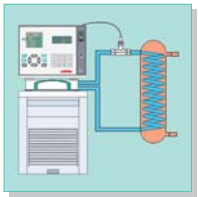
FD200 flow-through cooler and circulator



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

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.



M+R in-line Pt100 sensor

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 use with the models ME, HE and SE are additionally required:

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



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

External temperature application to large or various other objects

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 1.1 bar is recommended. The capacity 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 and separated from the bath fluid. Remove the trapped ice from time to time in order to maintain full performance.



Condensation trap immersed in the filling port

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Presto – the 'power generation'

JULABO offers a sophisticated range of High Dynamic Temperature Control Systems: the 'Presto' series.

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

- ***Presto*** is suitable for positive and negative temperature ranges, for example from -40 to +250 °C or from -85 to +170 °C – without the necessity of changing 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 for exothermic and endothermic reactions quickly and with exceptional performance.
- ***Presto*** is hydraulically sealed to prevent unpleasant steams and odors.
- ***Presto*** does not allow absorption of air humidity into the bath fluid. This prevents the formation of ice crystals and the subsequent difficulties.

The *Presto* icon feature description:

VFD[1] COMFORT-DISPLAY Simultaneous display of: actual value, setpoint and actual external value plus high temperature cut-off value, resolution 0.01 °C

LCD DIALOG-DISPLAY backlit, offers interactive and user-friendly operation in easy-to-read text with 4 lines x 16 digits

Illuminated display for selected pump stage 'PPC' and filling volume

Keypad 2 for setpoint adjustments, warning and safety functions

ICC Intelligent **C**ascade **C**ontrol, self-optimizing temperature control for optimal results, temperature stability ±0.01 °C ...±0.05 °C externally

TCF **T**emperature **C**ontrol **F**eatures for band limit, limit setting, co-speed factor, control dynamics

ATC **A**bsolute **T**emperature **C**alibration 1-point calibration

PPC **P**ump **P**ressure **C**ontrol Electronically adjustable pump capacity in stages

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

[1] **VFD:** Vacuum Fluorescence Display

RS232 RS485 Interface – Online communication for highest demands, upgradeable with Profibus DP

6 x 60 Programmer with real time clock and convenient keypad for 6 x 60 program steps

Maintain cooling performance!
- Removable venting grid: Hassle-free cleaning of the condenser
- Drain port easily accessible from the front

ACC **A**ctive **C**ooling **C**ontrol: Cooling available throughout the entire temperature range to +250 °C

Proportional cooling control: Energy-saving performance with reduced heat generation

JULABO early warning systems (patented) for high/low temperature limits

High temperature cut-off adjustable via display

S3 Classification III (DIN 12876-1) with self-protecting cut-off functions and signal tone (high temperature cut-off and low liquid level protection)

Additional *Presto* benefits:

- Two splash-proof keypads
- Small footprint
  - LH40, LH45, LH46 and LH85 can be placed under the lab bench
  - LH47 and LH50: tower versions with small footprint
- LH45, LH46 and LH85: Combination of air and water cooling, i.e. automatic changeover at high ambient temperature conditions or interruption of water-cooling
- Handles and castors allow easy relocation
- Time-saving filling process for the entire system with permanent air purge
- Automatic de-gas mode
- Small filling volume conserves bath fluid and enhances instrument performance
- Reservoir with cooling device and integrated high temperature cut-off
- Integrated warning, safety and supervision functions via 9 sensors
- Optional expansion vessels (accessories)

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.)

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 (optional accessory)

Remote device 'RD'

- Backlit, 4-line LCD-DISPLAY for user-friendly operation
- Splash-proof keypad for 2 storable setpoints, 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
- All set values can be easily reproduced

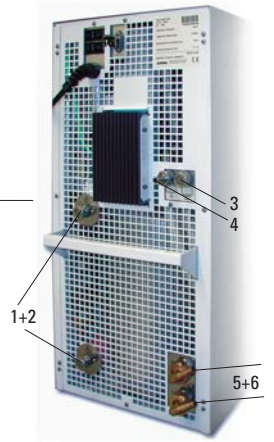


Keypad, splash-proof

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

Rear view:

1+2 Pump connections M16x1 male
3 Expansion vessel connection M16x1 male
4 Overflow connector
5+6 Cooling water connections G3/4" with barbed fittings for tubing 10 mm inner dia.



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Presto offers 6 models

Applications

- Jacketed reactors, autoclaves, e.g. for polymerization, polycondensation
- Combinatorial chemistry, reaction blocks, organic synthesis
- Reaction calorimeters
- Distillation, pilot plants
- Calibration
- Semiconductor industry
- External open systems (except LH40)

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.

Small footprints = more space in your lab



LH40
LH45

Can be placed under the bench!



LH46
LH85

Small footprint, high capacity!



LH47
LH50

Technical specifications with icon feature description (refer to page 36)

	LH40	LH45
Working temperature range °C	-40…+250	-40…+250
Temperature stability (external) °C	±0.01…±0.05	±0.01…±0.05
Temperature display / resolution °C	VFD + LCD / ±0.01	VFD + LCD / ±0.01
Display for pump pressure and filling volume on	VFD	VFD
Heating capacity kW	1.8	1.8
Cooling capacity [1] °C	+200 | +20 -20 -40	+200 | +20 -20 -40
Bath fluid: Thermal | Ethanol kW	1.5 | 1.0 0.4 0.05	1.5 | 1.2 0.5 0.1
Cooling of compressor	air	air / water
Pump capacity: min./max. flow rate - pressure l/min. - psi	24 – 33 / 11.6 – 23.2	24 – 33 / 11.6 – 23.2
Filling volume liters	2.5	2.5
Dimensions: W x L x H inches	11.8 x 19.3 x 25.2	11.8 x 19.3 x 25.2
Weight lbs	156.2	169.4
IP class according to IEC 529	IP31	IP31
Permissible ambient temperature °C	+5…+40	+5…+40
Power requirement V/Hz	230/60 or 230 /50	230/60 or 230/50
Total power consumption kW	2.4	2.4
JULABO Order No.	**9 410 140**	**9 410 145**

[1] Cooling capacity measured at pump stage 1 = 24 l/min. – 11.6 psi

[2] 32A CEE power supply line necessary for LH47 and LH50

	LH46	LH85	LH47	LH50
	-45…+250	-85…+250	-45…+250	-50…+250
	±0.01…±0.05	±0.01…±0.05	±0.01…±0.05	±0.01…±0.1
	VFD + LCD / ±0.01	VFD + LCD / ±0.01	VFD + LCD / ±0.01	VFD + LCD / ±0.01
	VFD	VFD	VFD	VFD
	1.8	1.8	1.8	6.0
	+200 | +20 -20 -40	+200 | +20 -20 -40 -60 -80	+200 | +20 -20 -40	+200 | +20 -20 -40
	2.5 | 2.1 0.9 0.1	1.5 | 1.0 0.9 0.7 0.5 0.1	2.5 | 3.0 1.3 0.3	5.5 | 7.0 2.8 0.9
	air / water	air / water	air	water
	24 – 33 / 11.6 – 23.2	24 – 33 / 11.6 – 23.2	24 –33 / 11.6 – 23.2	24 –35 / 11.6 – 31.9
	2.5	2.5	2.5	10
	19.7 x 23.2 x 25.2	19.7 x 23.2 x 25.2	15.7 x 21.7 x 50	15.7 x 21.7 x 50
	211.2	286	330	374
	IP31	IP31	IP31	IP31
	+5…+40	+5…+40	+5…+40	+5…+40
	230/60 or 230/50	230/60 or 230/50	230 (3 Ph.)/60 or 400 (3 Ph.)/50	230 (3 Ph.)/60 or 400 (3 Ph.)/50
	2.8	3.7	5.6 [2]	9.0 [2]
	9 410 146	**9 410 185**	**9 410 147**	**9 410 150**

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

Performance data curves: see page 44

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Forte HT – The 'High Temperature generation'

The ***Forte HT*** series offers similar features to the ***Presto.*** The units have a compact, closed design and are perfectly suitable for wide working temperature ranges up to +400 °C.

Optionally, the C.U. cooling unit and tap water connection ensure operation at temperatures from +40 °C and provide rapid cool-down times throughout the entire temperature range.

- ***Forte HT*** can be used for working temperatures to +400 °C without the necessity of changing the bath fluid.
- ***Forte HT*** avoids oxidation and ensures prolonged lifetime of the bath fluid.
- ***Forte HT*** is hydraulically sealed to prevent unpleasant steams and odors.
- ***Forte HT*** with the separate control unit can be easily integrated into other installations.

The *Forte HT* icon feature description:

MULTI-DISPLAY (LED) for actual value, up to 3 setpoints, high and low temperature warning functions, high temperature cut-off, resolution 0.01 °C

LCD DIALOG-DISPLAY backlit, offers interactive and user-friendly operation in easy-to-read text with 4 lines x 16 digits

Illuminated display for filling volume

Keypad 2 for setpoint adjustments, warning and safety functions

ICC Intelligent **C**ascade **C**ontrol, self-optimizing temperature control for optimal results, temperature stability ±0.01 °C ...±0.1 °C externally

TCF **T**emperature **C**ontrol **F**eatures for band limit, limit setting, co-speed factor, control dynamics

ATC **A**bsolute **T**emperature **C**alibration 1-point calibration

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

RS232 RS485 Interface – Online communication for highest demands, upgradeable with Profibus DP

6 x 60 Programmer with real time clock and convenient keypad for 6 x 60 program steps

JULABO early warning systems (patented) for high/low temperature limits

High temperature cut-off adjustable via display

S3 Classification III (DIN 12876-1) with self-protecting cut-off functions and signal tone (high temperature cut-off and low liquid level protection)

Additional *Forte HT* benefits:

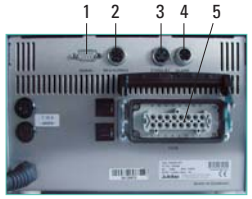
- Separate control unit, electronical components are not in contact with the 'warm zone'
- Control of exothermic reactions using the C.U. cooling unit and tap water even at high temperatures
- High pump capacity reducible via adapter
- Small footprint
- Small filling volume
- Time-saving filling process for the entire system with permanent air purge
- Expansion vessel (included as standard accessory) is used for filling process and serves as additional reservoir
- Automatic de-gas mode
- Cooling zone for tap water
- Integrated warning, safety and supervision functions via 7 sensors

Forte HT High Temperature Circulators can be upgraded to temperature control systems with dynamic characteristics in combination with the C.U. cooling unit and tap water.

This allows for:
- Automatic control of exothermic reactions, even at high working temperatures.
- Rapid cooling with up to 15 kW cooling capacity.



Separate control unit
with MULTI-DISPLAY (LED), LCD DIALOG-DISPLAY, illuminated display and keypad



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

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High Temperature Circulators

- Tough, easy implementation in installations
- External temperature application to external closed systems (loop circuits)
- Rapid cooling
- Cooling zone for tap water connection at high temperatures for continuous operation



Separate control unit HT30 circulator

Applications
for the models on pages 42 & 43

- Jacketed reactors
- Autoclaves
- Pilot plants
- High temperature distillation
- Semiconductor industry

Technical specifications with icon feature description (refer to page 40)

		HT30-M1	HT60-M3
Working temperature range	°C	70…400	70…400
Temperature stability (external)	°C	±0.01…±0.1	±0.01…±0.1
Temperature display / resolution	°C	LED + LCD / ±0.01	LED + LCD / ±0.01
Display for liquid level (filling volume) on		illuminated display	illuminated display
Heating capacity	kW	3	6
Pump capacity: Min./max. flow rate - pressure	l/min. - psi	14 – 18 / 11.6 – 17.4	14 – 18 / 11.6 – 17.4
Filling volume	liters	2	2
Dimensions:			
Circulator system W x L x H	inches	9.1 x 9.1 x 22.8	9.1 x 9.1 x 22.8
Separate control unit W x L x H	inches	9.8 x 9.8 x 7.1	9.8 x 9.8 x 7.1
Weight (including control unit)	lbs	59.4	63.8
IP class according to IEC 529		IP31	IP31
Permissible ambient temperature	°C	+5…+40	+5…+40
Power requirement	V/Hz	230/50 or 230/60	208 (3 Ph.)/60
Total power consumption	kW	3.7	6.45
JULABO Order No.		**9 800 031**	**9 800 063**

Included with each unit: 8 970 802 Adapter for pressure reduction; 8 970 435 Handle; 8 970 050 Stand rod attachment, turnable; 8 970 801 Expansion vessel

High Temperature Circulators with C.U. cooling unit

- Dynamic control characteristics, similar to the 'Presto'
- Automatic control of exothermic reactions
- Temperature application from +40 °C
- Rapid cooling with tap water



Separate control unit HT60 circulator with C.U. cooling unit

		HT30-M1-C.U.	HT60-M3-C.U.
Working temperature range	°C	40…400	40…400
Temperature stability (external)	°C	±0.01…±0.1	±0.01…±0.1
Temperature display / resolution	°C	LED + LCD / ±0.01	LED + LCD / ±0.01
Display for liquid level (filling volume) on		illuminated display	illuminated display
Heating capacity	kW	3	6
Cooling capacity (with tap water cooling at 20 °C)	kW	15 max.	15 max.
Pump capacity: Min./max. flow rate - pressure.	l/min. - psi	14 – 18 / 11.6 – 17.4	14 – 18 / 11.6 – 17.4
Filling volume	liters	2	2
Dimensions:			
Circulator system W x L x H	inches	16.9 x 9.1 x 22.8	16.9 x 9.1 x 22.8
Separate control unit W x L x H	inches	9.8 x 9.8 x 7.1	9.8 x 9.8 x 7.1
Weight (including control unit)	lbs	77	81.4
IP class according to IEC 529		IP31	IP31
Permissible ambient temperature	°C	+5…+40	+5…+40
Power requirement	V/Hz	230/60 or 230/50	208 (3 Ph.)/60
Total power consumption	kW	3.75	6.5
JULABO Order No.		**9 800 035**	**9 800 066**

The connection cable between control unit and HT circulator is 2 m long.
5 m Extension cable = order no. 8 980 125

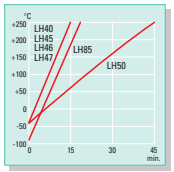
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The ultimate in temperature technology

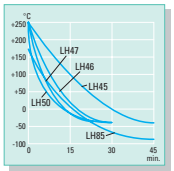
Presto reaches the preselected temperature within the shortest period of time!

Forte HT features similar advantages in respect to rapid heating and cooling.

Heat-up times
Bath fluid: Thermal HL

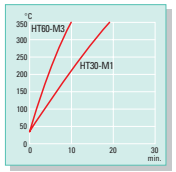


Cool-down times
Bath fluid: Thermal HL

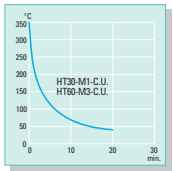


Heat-up and cool-down times measured without external system.

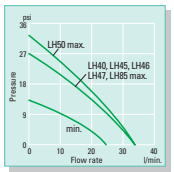
Heat-up times
Bath fluid: Thermal H350



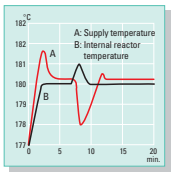
Cool-down times
Bath fluid: Thermal H350



Presto
Pump capacities
Bath fluid: Thermal HL

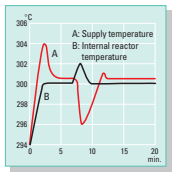


Presto LH45
with 2 liter reactor

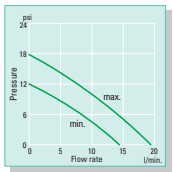


Curves on the left and right: Automatic control of an exothermic reaction

Forte HT
with 5 liter autoclave



Forte HT
Pump capacities
Bath fluid: Thermal H350



Accessories

Bath fluids

Order No.	Description	Quantity	Suitable for working temp. ranges Presto	Suitable for working temp. ranges Forte HT	Flash point	Fire point	Color
8 940 106	Thermal H5S,	10 l	-40…+250 °C	--	>+110 °C	>+130 °C	light brown
8 940 107	Thermal H5S,	5 l	-40…+250 °C	--			
8 940 108	Thermal H20S,	10 l	--	+20…+250 °C	>+230 °C	>+270 °C	light brown
8 940 109	Thermal H20S,	5 l	--	+20…+250 °C			
8 940 116	Thermal H250,	10 l	--	+80…+250 °C	>+225 °C	>+250 °C	clear
8 940 117	Thermal H250,	5 l	--	+80…+250 °C			
8 940 110	Thermal H350,	10 l	--	+50…+350 °C	>+200 °C	>+230 °C	light brown
8 940 111	Thermal H350,	5 l	--	+50…+350 °C			
8 940 122	Thermal HL45,	10 l	-45…+250 °C	--	>+121 °C	>+162 °C	clear
8 940 123	Thermal HL45,	5 l	-45…+250 °C	--			
8 940 120	Thermal HL80,	10 l	-91…+170 °C	--	>+63 °C	>+112 °C	clear
8 940 121	Thermal HL80,	5 l	-91…+170 °C	--			



Bath fluid

The temperature ranges mentioned above only apply to Presto and Forte HT!
For details on bath fluids for circulators, please refer to page 33.

External Pt100 sensors

Order No.	Description	Suitable for
8 981 003	200 x 6 mm dia., stainless steel, 1.5 m cable	Presto + Forte HT
8 981 005	200 x 6 mm dia., glass, 1.5 m cable	
8 981 006	20 x 2 mm dia., stainless steel, 1.5 m cable	
8 981 010	300 x 6 mm dia., stainless steel, 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	
8 981 020	M + R in-line Pt100 sensor (including 2 fittings M16x1 male)	
8 981 103	3.5 m Extension cable for Pt100 sensor	
8 890 030	TCCB Thermo-Couple Converter Box	



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

Order No.	Description	Suitable for
Viton® tubing / Tubing insulation / Tube clamps		
8 930 108	1 m Viton® tubing, 8 mm inner dia. (-50 ... +200 °C)	Presto + Forte HT
8 930 112	1 m Viton® tubing, 12 mm inner dia. (-50 ... +200 °C)	
8 930 410	1 m Insulation for tubing 8 mm or 10 mm inner dia.	Viton® tubing Temperature range -50 ... +100 °C
8 930 412	1 m Insulation for tubing 12 mm inner dia.	
8 970 480	2 Tube clamps, 8 mm dia.	Tubing 8 mm inner dia.
8 970 481	2 Tube clamps, 10 to 12 mm dia.	Tubing 10 or 12 mm inner dia.
Metal tubing, triple insulated, -100 ... +350 °C (2 fittings M16x1 female)		
8 930 209	0.5 m Metal tubing	Presto + Forte HT
8 930 210	1 m Metal tubing	
8 930 211	1.5 m Metal tubing	
8 930 214	3 m Metal tubing	
Metal tubing, insulated, -50 ... +200 °C (2 fittings M16x1 female)		
8 930 220	0.5 m Metal tubing	Presto + Forte HT
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
8 970 750	Icing protection sleeve for pump connectors	Presto
Software / Lab automation		
8 901 102	'EasyTemp' control software (free download www.julabo.com)	Presto + Forte HT
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	
Additional accessories		
8 910 041	Castor platform	Presto LH40, 45, 46, 85
8 970 830	Expansion vessel 2 liters	Presto LH40, 45, 46, 85
8 970 831	Expansion vessel 5 liters	Presto LH47, LH50
8 980 127	5 m Extension cable 5 m for remote device RD	Presto
9 790 100	C.U. cooling unit	Forte HT
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.	
Connectors / Valves / Adapters, etc.		
8 970 457	Shut-off valve for loop circuit (max. +250 °C), M16x1	Presto + Forte HT
8 970 490	2 Collar nuts M16x1 female	
8 890 004	2 Adapters M16x1 female to NPT 1/4" male	Presto + Forte HT
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	



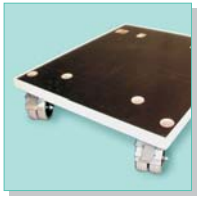
Viton® tubing



Metal tubing, triple insulated

EasyTEMP
FREE of charge

EasyTEMP PROFESSIONAL



Castor platform



Expansion vessel for ***Presto*** (rear view)

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Julabo Temperature Controllers

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

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

They provide connections for:
- 1 or 2 working sensors
- 1 safety sensor
- 1 Schuko socket for the external device
- digital and analog interfaces

- 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



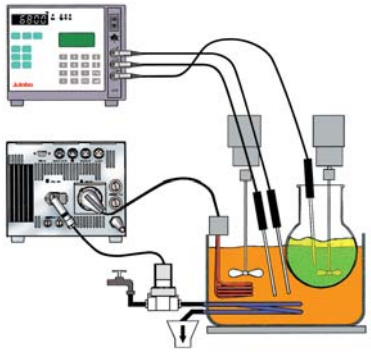
LC4-F

with separate operating elements for working and safety circuits and 4 LED displays for
- Actual value and adjustment of setpoint and warning values (MULTI-DISPLAY)
- Constant indication of setpoint
- Constant indication of actual safety value and adjustment of safety setpoint
- Constant indication of safety setpoint
- Analog inputs and outputs



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)

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 [1]	Dimensions W x L x H in	Weight lbs
Temperature Controllers			Technical features (see icon feature page)							
9 700 140	LC4	-50...+350	> ± 0.05	2 / 0.1	--	1 Pt100	1 Pt100	1 / 2	6.7 x 6.7 x 6.3	6.6
Low profile design (4 x LEDs)										
9 700 142	LC4-F	-50...+350	> ± 0.03	4 / 0.1	--	1 Pt100	1 Pt100	1 / 2	9.8 x 7.9 x 3.9	6.6
Programmable Controller										
9 700 160	LC6	-100...+400	> ± 0.03	1 / 0.01	1 / 0.01	2 Pt100	1 Pt100	1 / 3	8.3 x 7.1 x 7.1	8.8

[1] At voltage 115V/50-60Hz / 230V/50-60Hz

Programmable Controller, Programmer Julabo

Accessories

Order No.	Description	Suitable for
Pt100 sensors with high quality Lemosa plug		
8 981 003	200 x 6 mm dia., stainless steel, 1.5 m cable	LC4, LC4-F, LC6
8 981 005	200 x 6 mm dia., glass, 1.5 m cable	
8 981 006	20 x 2 mm dia., stainless steel, 1.5 m cable	
8 981 010	300 x 6 mm dia., stainless steel, 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	
8 981 103	3.5 m Extension cable for Pt100 sensor	
8 890 030	TCCB Thermo-Couple Converter Box	
9 790 000	MVS solenoid valve controller for tap water cooling	LC4, LC4-F
8 980 700	Solenoid valve for tap water cooling	LC4, LC4-F, LC6
Additional accessories		
8 970 020	Stand rod, 200 x 12 mm	LC4
8 970 021	Stand rod system, 200 x 12 mm	LC6
8 980 142	Y-adapter cable for connecting 1 dual Pt100 sensor to 2 Lemosa sockets (conforming to NAMUR)	
Software / Lab automation		
8 901 102	'EasyTemp' control software (free download www.julabo.com)	LC4, LC4-F, LC6
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	
8 900 003	PB-3 Option: integrated Profibus DP	LC6
8 980 030	PBI Profibus DP Interface Box	LC4, LC4-F

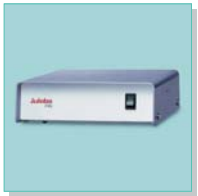
For MORE information on lab automation and software solutions, please see pages 48, 49.



Pt100 sensors



LC4-F, MVS controller, solenoid valve



PBI Profibus DP Interface Box

PG6 programmer, remote controller

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

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

Additionally, the PG6 can 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.



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	Total power consumption W	Dimensions W x L x H in	Weight lbs
					Technical features (see icon feature page)				
9 750 060	PG6	-99.9...+400	digital	1 / 0.1	1 / 0.1	0...10 V or 0...20/4...20 mA	100	8.3 x 7.1 x 7.1	8.8

Voltage: Available in 115V/50-60Hz or 230V/50-60Hz

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Controlling, programming, viewing, recording

JULABO provides YOU the software specifically tailored for YOUR appication. No matter how demanding YOUR application may be, the following software solutions help to:

- Make YOUR work easy
- Save precious time
- Optimize processes
- Record processes (digital lab book)

'EasyTemp' and 'EasyTemp Professional'

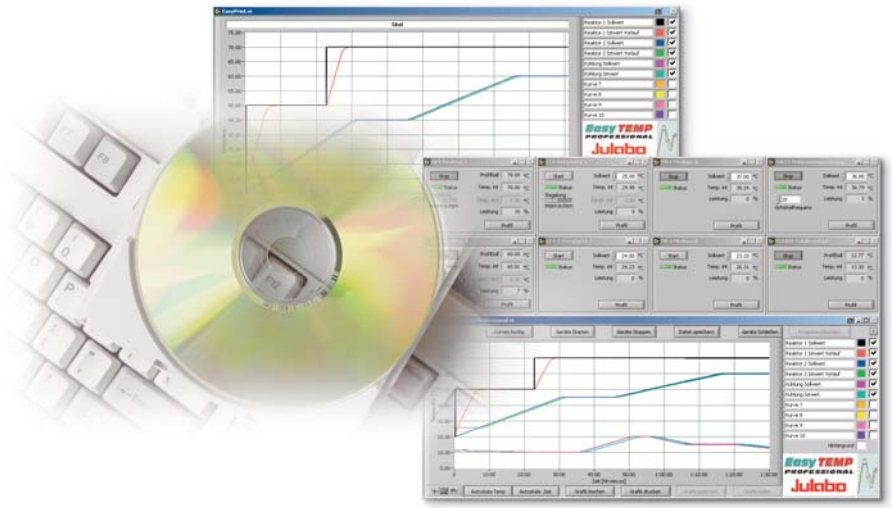
The JULABO software solutions enable YOU to control, display and record temperature and time-dependent processes without any hassle.
For relatively simple control tasks of only one JULABO instrument, the FREE 'EasyTemp' is ideal. For more complex tasks JULABO offers 'EasyTempProfessional' for controlling 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 **Free download** at www.julabo.com or request a CD-ROM version (order no. 8 901 102)	EasyTEMP PROFESSIONAL MORE functions MORE convenience MORE units
Control of one JULABO unit with integrated RS232 interface	●	●
Control of up to 8 JULABO units with integrated RS232 interface		●
Display of temperature values on PC	●	●
Setpoint adjustment via PC	●	●
Display of the effective heating/cooling capacities	●	●
Graphic zoom data function	●	●
Repeat memorized profiles	●	●
Record measured values	●	●
Status indication	●	●
Recorded data is exportable in ASCII format (e.g. for use in MS Excel®)	●	●
Report and memory function of all relevant data		●
Ramp programming with up to 100 steps	●	
Comprehensive ramp programming with up to 1000 steps per profile		●
Programming and recording of individual profiles for each unit		●
Graphic reproduction of important values		●
Graphic display of total profiles		●
Individual control window for each unit		●
Modifications to running temperature profiles		●
Export function of graphs into JPG format		●
Scalable monitoring pattern		●
Start / stop function of individual or any integrated units		●
21 CFR 11 conformity		on request
Integration and control of up to 8 laboratory instruments of different makes, e.g. laboratory stirrers, magnetic stirrers, analyzing balances, dosing pumps, PH measuring devices, etc.		on request
Drivers for interfaces such as Devicenet, Profibus, Ethernet and RS485		on request

Order No.	Description	Suitable for
8 901 102	'EasyTemp' control software (free download www.julabo.com)	all units with RS232
8 901 105	'EasyTemp Professional' control software, incl. USB dongle	all units with RS232

Accessories

Order No.	Description	Suitable for
8 980 073	RS232 interface cable, 2.5 m	'TopTech' series, 'HighTech' series, Presto, Forte HT, recirculating coolers with RS232, controllers LC4, LC4-F, LC6 programmable controller
8 980 075	RS232 interface cable, 3.0 m	SW shaking water baths
8 900 110	USB Interface adapter cable	Units with RS232 + 8 980 073 or 8 980 075, resp.
8 900 015	PBM Profibus DP Master	Connection via USB port on PC
8 900 005	PB-5 Option: integrated Profibus DP	HL, SL circulators
8 900 002	PB-2 Option: integratedProfibus DP	Presto + Forte HT
8 900 003	PB-3 Option: integratedProfibus DP	LC6 programmable controller
8 980 030	PBI Profibus DP Interface Box	all units with RS232



Customized solutions

JULABO sets up customized programs and device drivers as well as necessary control hardware for specific requirements.
JULABO is able to provide efficient lab automation for every user - even for specific laboratory instruments, exceptional functional requirements and interfaces such as Devicenet, Profibus DP, Ethernet and RS485.

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Julabo Recirculating Coolers

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:

- 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 subambient temperatures, if required down to -20 °C
- Rapid amortization period
- Suitable for heating and cooling applications (page 53)

AWC100 Air-to-Water Recirculating Cooler:

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



AWC100

F200 + F240

- Small footprint with implemented refrigerated unit
- Dissipates process heat of max. 240 W
- Drain screw for emptying



F200 F240

Applications

- Cooling of Peltier elements, particularly for analyzers, rheometers

Applications

- Electrophoresis chambers
- Rotary evaporators
- 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 20	15	10	5 °C	Pressure pump capacity l/min.	psi	Filling volume liters	Dimensions W x L x H in	Weight lbs
Air-to-Water Recirculating Cooler											
9 630 100	AWC100	+20... +40	Stage 0: 400	320	220	120	2.9	2.9	0.85	8.1 x 14.2 x 12.4	24.2
			Stage 1: 550	440	300	180					

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stability °C	Cooling capacity Watts 20	10	5	-10°C	Pressure pump capacity max. l/min.	psi	Filling volume liters	Dimensions W x L x H in	Weight lbs
Recirculating Coolers												
9 620 020	F200	+5 ... +40	±3	200	180	130	--	8	1.7	3.0	7.5 x 13.8 x 16.1	41.8
9 620 024	F240	-10 ... +40	±1	240	180	150	50	15	7.3	3.0	8.3 x 17.7 x 15.7	46.2

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.
F240: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

Voltage: Available in 115V/60Hz or 230V/50Hz

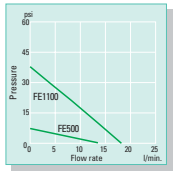
Recirculating Coolers of the FE Series
with 0.5 to 1.8 kW cooling capacity

- Rapid, powerful
- High efficiency
- Simple operation
- Splash-proof keypad / LED display
- Adjustable pump capacity
- Liquid level indicator: sight glass
- Small filling volume
- Freezing and dry-running protection
- High/low temperature early warning system
- Audible and optical alarm indication
- Low profile design allowing the unit to be placed under the lab bench
- Handles and castor make relocation easy
- Removable venting grid
- Front drain



FE500 FE1100

Pump capacities
Bath fluid: Water



Accessories

(see page 54)

Applications

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

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stability °C	Cooling capacity kW 20	10	5	-10°C	Pressure pump capacity max. l/min.	psi	Pressure gauge psi	Dimensions W x L x H in	Weight lbs
FE Recirculating Coolers												
9 610 050	FE500	-20 ... +40	±0.5	0.5	0.48	0.45	0.12	14	7.3	--	13.8 x 17.7 x 22.4	83.6
9 610 110	FE1100	+5 ... +40	±0.5	1.1	0.95	0.65	--	18	7.3 ... 36.3	0 ... 60	16.1 x 25.6 x 22	143.0

Technical features (see icon feature page)

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

Voltage: FE500, FE1100 available in 115V/60Hz or 230V/50Hz

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Recirculating Coolers of the FE Series

with 2.8 to 6 kW cooling capacity

These powerful models include the features specified on page 51 and provide high cooling capacities.



FE2800T

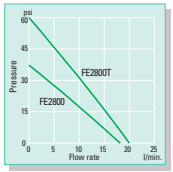
Applications

- Electrophoresis chambers
- AAS (Atomic Absorption Spectroscopy)
- NMR (Nuclear Magnetic Resonance)
- Pilot plants
- Electron, scanning microscopes

Accessories

(see page 54)

Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stability °C	Cooling capacity kW 20	10	5 °C	Pressure pump capacity max. l/min.	psi	Pressure gauge psi	Dimensions W x L x H in	Weight lbs
FE Recirculating Coolers											
9 610 280	FE2800	+5 ... +40	±1.0	2.8	1.85	1.4	18	7.3 ... 36.3	0 ... 60	21.3 x 29.1 x 24.8	176.0
9 610 286	FE2800T	+5 ... +40	±1.0	2.75	1.80	1.35	20	7.3 ... 58.0	0 ... 86	21.3 x 29.1 x 24.8	180.4

Technical features (see icon feature page)

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

Voltage: FE2800, FE2800T available in 230V/60Hz or 230V/50Hz

Recirculating Coolers of the FC Series

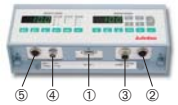
with 0.6 to 2.5 kW cooling capacity for heating and cooling

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



FCW2500T

Digital and analog connections of the FC series:



① RS232 interface
② Standby input
③ Alarm output

FC1200T, FC1600T, FCW2500T provide additionally:

④ External Pt100 sensor
⑤ External programming, temperature recorder

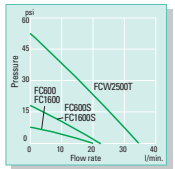


FC600S



FC1600T

Pump capacities
Bath fluid: Water



JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Cooling capacity kW 20	10	5	-10	-20°C	Presssure pump capacity max. l/min.	psi	Pressure gauge bar	Filling volume liters	Dimensions W x L x H in	Weight lbs
FC Recirculating Coolers															
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	94.6
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	96.8
9 600 160	FC1600	-20 ... 80	±0.2	1.2	1.65	1.25	1.0	0.47	--	20	7.3	0 ... 2.5	8 ... 11	18.1 x 24 x 19.3	143.0
9 600 163	FC1600S	-15 ... 80	±0.2	1.2	1.55	1.15	0.9	0.36	--	22	17.4	0 ... 2.5	8 ... 11	18.1 x 24 x 19.3	145.2
with connection for external Pt100 sensor															
9 600 166	FC1600T	-15 ... 80	±0.2	1.2	1.45	1.05	0.8	0.25	--	28	50.8	0 ... 4.0	8 ... 11	18.1 x 24 x 19.3	147.4
water-cooled model															
9 601 256	FCW2500T	-25 ... 80	±0.2	1.2	2.5	2.0	1.8	0.8	0.25	28	50.8	0 ... 4.0	8 ... 11	18.1 x 24 x 19.3	162.8

Technical features (see icon feature page)

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

Voltage: Available in 230V/60Hz or 230V/50Hz

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T-connection /
Quad distributing adapter



Solenoid valve for
return flow safety device



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

JULABO Order No.	Description	Suitable for
Tubing		
8 930 308	2 m Textile-reinforced tubing 8 mm inner dia.	Recirculating coolers
8 930 312	2 m Textile-reinforced tubing 12 mm inner dia.	
Tubing insulation		
8 930 410	1 m Insulation for tubing 8 or 10 mm inner dia.	Cooling at -20 °C to +10 °C
8 930 412	1 m Insulation for tubing 12 mm inner dia.	
Metal tubing, insulated (2 fittings M16x1 female)		
8 930 220	0.5 m Metal tubing	Recirculating coolers
8 930 221	1 m Metal tubing	
8 930 222	1.5 m Metal tubing	
8 930 223	3 m Metal tubing	
T-connections / Quad distributing adapters / Shut-off valve / Solenoid valve		
8 970 470	T-connection with barbed fittings for tubing 8 mm inner dia.	Cooling of two systems
8 970 471	T-connection with barbed fittings for tubing 12 mm inner dia.	
8 970 474	2 Quad distributing adapters, M16x1 with barbed fittings for tubing 8 mm or 12 mm inner dia.	FC series
8 970 475	2 Quad distributing adapters, M16x1 with barbed fittings for tubing 8 mm or 12 mm inner dia.	FE series
8 970 456	Shut-off valve for loop circuit, M16x1	Manual return flow safety device
8 980 701	Solenoid valve set for loop circuit (max. +100 °C), M16x1	Electrical return flow safety device for FC series
External Pt100 sensors		
8 981 003	External Pt100 sensor, 200 x 6 mm dia., stainless steel	FC1200T, FC1600T, FCW2500T: external measurement and control
8 981 020	M+R in-line Pt100 sensor (including 2 fittings M16x1 male) (for installation in the loop circuit)	

Cooling capacity calculation

– Example: Cooling of 2 rotary evaporators –

Required cooling capacity and amortization period are calculated as follows:

Cooling water input: 15 °C
Cooling water output: 17 °C
Water flow rate: 6 liters per minute

Formula for calculating the required cooling capacity

P = ΔT x c x m/t

ΔT = Temperature difference = 2 °C
c = Specific heat capacity (for water) = 4.18 kJ/kg*K
m/t = Water flow rate = 0.1 l/sec

Required cooling capacity: 836 W

Recommended unit: **FE1100 recirculating cooler**



Jubi will help solve all of your application questions!

Call 1-800-4-Julabo or visit www.julabo.com!

Recirculating Coolers

for industrial applications and the most demanding applications in the semiconductor industry

The 'SemiChill' Recirculating Coolers are specifically engineered for rugged industrial applications. Furthermore 'SemiChill' units fulfill the highest standards required by the semiconductor industry.

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.

The modular concept:
YOU customize your recirculating cooler according to YOUR requirements and budgetary needs and are able to select from 5 basic models, multiple options and accessory parts.

Flexibility – it is YOUR own choice
- 5 basic models with 2.5 kW, 5 kW or 10 kW cooling capacity
- Air and water-cooled models available
- Temperature range from –20...+130 °C
- Heating capacity up to 5 kW
- Powerful pumps
- 3 different control electronics – from 'Eco' to 'Professional' – and even integration via e.g. Devicenet
- Micro-filters and DI-Filters
- Wide accessory range for process integration

Special benefits
- Space saving tower concept
- Integrated handles and castors
- Industrial grade mains power switch and emergency cut-off
- Liquid level indicator
- Front filling port (sealed)
- Pressure gauge
- Electronically adjustable pump pressure in stages via menu
- Recommended bath fluids: water, water/glycol mixture, silicon oils, 3M Fluorinert®, Galden®
- Low noise level

Applications

See page 51 and additionally:
- Etching tools
- Stainless steel chucks
- PVD
- Sputtering
- Wet benches
- Probers



SC2500a



SC5000a

SemiChill (basic models)

JULABO Basic model	Working temp. range °C	Temp. stab. °C	Control electronics	Cooling capacity kW +20	0	-10°C	Cooling system for refrig. unit	Pump type (page 56)	Filling port dia. in	Filling volume liters	Dimensions W x L x H in	Weight lbs
SC2500a	+5 ... +35	±0.1	Eco	2.5	1.5	0.9	air	P0	2.8	21...33	19.3 x 24.4 x 41.3	297.0
SC2500w	+5 ... +35	±0.1		2.5	1.5	0.9	water	P0	2.8	21...33	19.3 x 24.4 x 41.3	297.0
SC5000a	+5 ... +35	±0.1		5.0	2.5	1.2	air	P3	2.8	43...60	23.2 x 26.4 x 44.1	336.6
SC5000w	+5 ... +35	±0.1		5.0	2.5	1.2	water	P3	2.8	43...60	23.2 x 26.4 x 44.1	336.6
SC10000w	+5 ... +35	±0.1		10.0	5.0	2.5	water	P3	2.8	43...60	23.2 x 26.4 x 44.1	341.0

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Model selection and options:

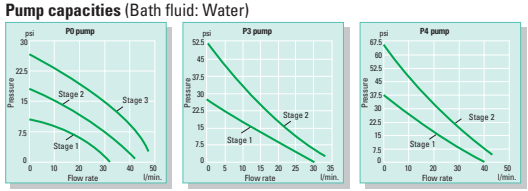
With the modular concept, YOU can customize YOUR SemiChiller according to YOUR specific requirements regarding capacity data and control electronics.

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

Heater: Heating capacity	H0 without heater	H1 1 kW	H5 5 kW
SC2500a, SC2500w	In basic model	Option	---
SC5000a, SC5000w, SC10000w	In basic model	---	Option

Pump type: Pump capacity:	P0 48 l/min.-26.1 psi	P3 33 l/min.-50.8 psi	P4 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 the cooling capacity by 0.2 kW · Pump connections: 3/4" NPT male

Control electronics:
The basic models include the ‘Eco’ electronics

‘Eco’



Technical features (see icon feature page)



‘EcoPlus’



Technical features (see icon feature page)



+ Resistivity measurement and status display via LED: adjustable from 1 ... 5 MΩ/cm
+ Flow measurement and status display via LED: factory-preset limit value

‘Professional’



Technical features (see icon feature page)



+ Resistivity measurement and actual value display via VFD in the range from 0.5 ... 5 MΩ/cm
+ Flow measurement and status display via VFD: factory-preset limit value

Additional options available for the ‘Professional’ control electronics on request:

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

DI and Micro-Filters

All ‘SemiChill’ models can be fitted with DI-filters and/or micro-filters (right side mounting). Please specify when placing an order. Filters cannot be retrofitted.

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

Accessories

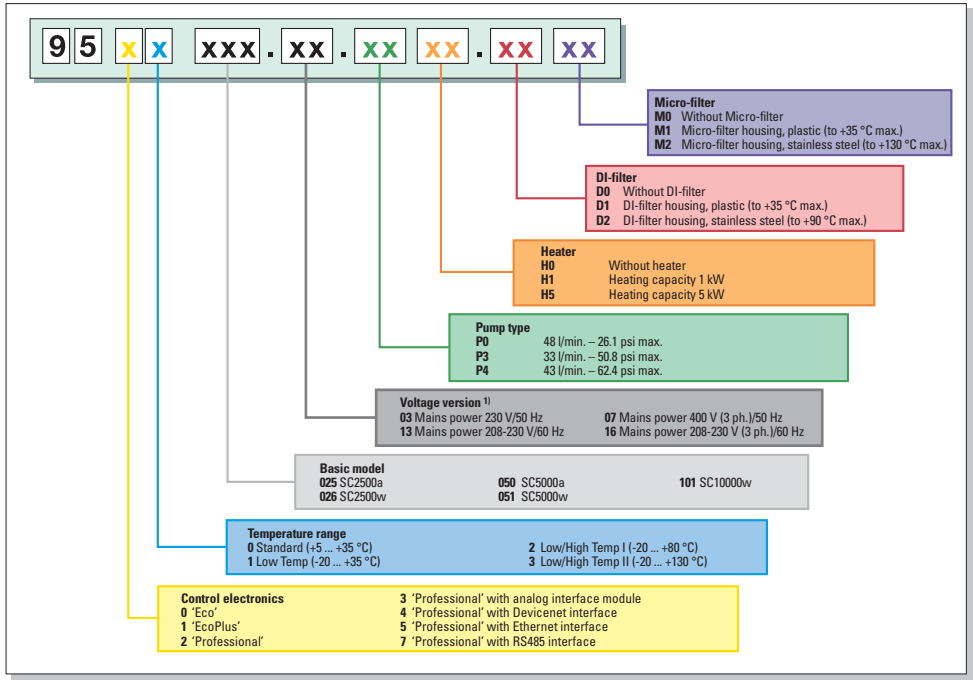
Order No.	Description	Suitable for
8 920 005	DI-filter insert	DI-filter housings
8 920 016	Micro-filter cartridge 10 micron	Micro-filter housing plastic
8 920 017	Micro-filter cartridge 25 micron	Micro-filter housing plastic
8 920 018	Micro-filter cartridge 40 micron	Micro-filter housing plastic
8 920 019	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 stainl.steel
8 920 037	Micro-filter cartridge 25 micron	Micro-filter housing stainl.steel
8 920 038	Micro-filter cartridge 40 micron	Micro-filter housing stainl.steel
8 920 039	Micro-filter cartridge 100 micron	Micro-filter housing stainl.steel
8 920 040	Micro-filter cartridge 250 micron	Micro-filter housing stainl.steel
8 920 030	Touch and condensation cover	DI- and micro-filters
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	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 5/8" 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 (in comb. with 8 980 073)
8 980 030	PBI Profibus Interface Box	All models





DI and micro-filters for left side or right side mounting

Order Information: All options at a glance! Find out the order no. key-code for YOUR SemiChiller:



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

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Julabo Immersion / Flow-Through Coolers

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 Coolers
with temperature control and display

FT402 and FT902 provide a keypad and water-protected mains switches (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 example, for cooling a 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	Cooling capacity kW +20	+10	-20	-40	-80°C	Immersion probe / flexible probe (L x dia.) in	Connection tube (L) in	Dimensions W x L x H in	Weight lbs
Immersion Cooler												
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	39.6
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	52.8
9 650 890	**FT900**	-90...30	--	0.27	0.27	0.24	0.2	0.07	25.6 x 0.6 flexible	63	15 x 21.7 x 23.6	110.0
9 650 842	**FT402**	-40...30	±0.5	0.45	0.36	0.14	0.03	--	4.7 x 2	47.2	7.9 x 11.8 x 16.9	52.8
9 650 892	**FT902**	-90...30	±1	0.27	0.27	0.24	0.2	0.07	25.6 x 0.6 flexible	63	15 x 21.7 x 23.6	110.0
Flow-Through Cooler												
9 655 825	**FD200**	10...30	--	0.22	0.18	--	--	--	--	--	7.1 x 10.6 x 15.4	35.2

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)

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.

Voltage: All models available in 115V/60Hz or 230V/50Hz

Water Baths

Julabo

JULABO Water Baths differ from 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

Special benefits:

- Overall splash-water protection
- Keypad with water-protected mains 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



User-friendly keypad operation

Applications

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

Makrolon® covers are optionally available for all models.
For details please refer to page 60.

NEW TW2 Model



JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temperature stability °C	Heat. cap. kW [2]	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	Weight lbs
Water Baths										
9 550 102	**TW2**	20 ... 99.9	±0.2	1 / 1	5.9 x 5.1 / 4.3	--	24	1...2	6.7 x 6.3 x 10.2 / 14.6	7.7
9 550 108	**TW8**	20 ... 99.9	±0.2	1 / 2	9.1 x 10.6 / 5.5	180	120	3...8	11.4 x 12.6 x 11 / 17.3	17.8
9 550 112	**TW12**	20 ... 99.9	±0.2	1 / 2	13.8 x 10.6 / 5.5	270	180	5...12	15.7 x 12.6 x 11 / 17.3	21.6
9 550 120	**TW20**	20 ... 99.9	±0.2	1 / 2	19.7 x 11.8 / 7.1	360	240	8...22	22 x 13.8 x 12.6 / 19.3	31.2

Technical features (see icon feature page) — PID 1, S1

[1] For applications at or near ambient temperature: Counter-cooling with tap water and liquid level/cooling set (accessory)
[2] At voltage 115V/50-60Hz / 230V/50-60Hz

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Water Baths – Accessories

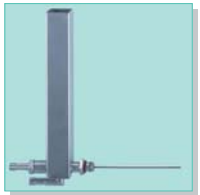
The lift-up Makrolon® cover is recommended for use at working temperatures above +60 °C for all models.

TW8, TW12, TW20:

- Flat bath covers are also available
- For counter-cooling of applications at or near ambient temperature to ensure continuous water supply: Liquid/level cooling set (illustration on the right)
- Test tube racks made of Polypropylene® or stainless steel
- The water bath protective media 'AquaStabil' is particularly recommended for long-term testing

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



Flat bath covers



Polypropylene® test tube racks



Stainless steel test tube racks

JULABO Order No.	Description	for model	Remarks
Lift-up Makrolon® covers			
	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	
Flat stainless steel bath covers with sets of rings			
8 970 270	with 1 opening 190 mm dia.	TW8	Beakers or Erlenmeyer flasks can be placed directly onto the perforated stainless steel bottom plate.
8 970 271	with 4 openings 92 mm dia.	TW8	
8 970 278	with 6 openings 92 mm dia.	TW12	
8 970 272	with 2 openings 190 mm dia.	TW20	
8 970 273	with 6 openings 115 mm 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®			
8 970 380	for 60 test tubes 16/17 mm dia.	TW8, TW12, TW20	Insert capacity test tube racks: TW8: 2, TW12: 3, TW20: 4
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 to +100 °C, stainless steel			
8 970 330	for 24 test tubes 16/17 mm dia.	TW2	Insert capacity test tube racks: TW2: 1, TW8: 2, TW12: 3, TW20: 4
8 970 344	for 50 test tubes 16/17 mm dia.	TW8, TW12, TW20	
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.		
Water bath protective media 'Aqua-Stabil'			
8 940 006	6 bottles, 100 ml each		To prevent contamination and formation of algae
8 940 012	12 bottles, 100 ml each		

Shaking Water Baths

JULABO Shaking Water Baths provide all the features that you will ever need. 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.

Special 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 bath circulation

MULTI-DISPLAY (LED)



Mains switch integrated in the keypad foil (patented)

Buttons for timer and shaking frequency

Cursor/Edit keys

Function keys

Applications

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

- MULTI-DISPLAY (LED) for actual value, setpoint, high/low temperature early warning functions and shaking frequency
- Display resolution: 0.1 °C or 1 rpm (at 20 ... 200 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 a handle for easy relocation.

After 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 62).



SW23

SW22 with lift-up Makrolon® cover (accessory)

JULABO Order No.	JULABO Model	Working temp. range °C [1]	Temperature stability °C	Heat. cap. kW [2]	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
Shaking Water Baths										
9 550 322	SW22	20 ... 99.9	±0.2	1 / 2	19.7 x 11.8 / 7.1	8 ... 20	20 ... 200	0.6	27.6 x 13.8 x 10.2/16.9	42.7
9 550 323	SW23	20 ... 99.9	±0.02	1 / 2	19.7 x 11.8 / 7.1	8 ... 20	20 ... 200	0.6	27.6 x 13.8 x 10.2/16.9	47.1

Technical features (see icon feature page): PID 1, RS232, S1

[1] For applications at or near ambient temperature: Counter-cooling with tap water and liquid level/cooling set (accessory)
[2] At voltage 115V/60Hz / 230V/50-60Hz

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Julabo Shaking Water Baths – Accessories

- The lift-up Makrolon® cover is 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)



Cooling coil



All-purpose spring tray



Carrier tray (completed)



Basic tray with spring clamps



Carrier tray with test tube racks

JULABO Order No.	Description

JULABO Order No.	Description

Bath cover

8 970 288	**Lift-up Makrolon® cover**

Cooling installation/continuous water supply

8 970 415	**Liquid level/cooling set** (ill. page 60)
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**

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

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 for assembling test tube racks

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
(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

Special Products

Rheometer Circulators

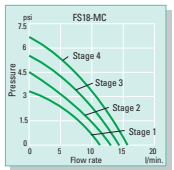
Special benefits of these refrigerated/heating circulators are:

- Small bath volume
- Rapid heating and cooling
- Precise temperature control of the connected rheometer


FS18-MC

FS18-MC provides a pressure pump that can be adapted to YOUR requirements.

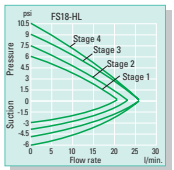
Pump capacities
Bath fluid: Water



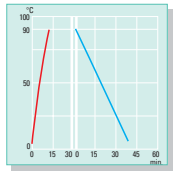

FS18-HL

FS18-HL provides a strong pressure and suction pump as well an external Pt100 sensor connection.

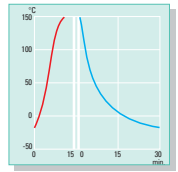
Pump capacities
Bath fluid: Water



Heat-up/Cool-down times of FS18-MC + FS18-HL
Bath fluid: Water



with JULABO Thermal H10S



Applications

- Temperature control applications to rheometers with fast ramping
- External control with Pt100 sensor (FS18-HL)

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW [1]	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-30°C	Pump capacity	Filling opening W x L /in	Filling volume liters	Dimensions W x L x H in	Weight lbs
Technical features (see icon feature page)													
9 150 618	FS18-MC	-35 ... 150	±0.02	1 / 2	0.46	0.34	0.15	0.05	see diagram	7.1 x 4.7	2.5	12.2 x 16.5 x 25.2	81.4
9 310 618	FS18-HL	-35 ... 150	±0.01	1 / 2	0.46	0.34	0.15	0.05	see diagram	7.1 x 4.7	2.5	12.2 x 16.5 x 26	83.6

Included with FS18-MC: 2 each barbed fittings for tubing 8 and 10 mm inner dia. (pump connections M10x1 female)
Included with FS18-HL: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)

[1] At voltage 115V/60Hz / 230V/50Hz

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High Dynamic Temperature Control System

For large scale applications with high demands

- Extremely wide temperature ranges without changing fluids
- Closed system avoids oxidation and ensures prolonged lifetime of the bath fluid
- Rapid heat-up and cool-down times throughout the entire temperature range
- Compensates exothermic and endothermic reactions quickly and with exceptional performance
- Cooling of compressor: water-cooled



Magnum91

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Cooling capacity kW +200	+20	-50	-60	-70	-80°C	Pump capacity Flow rate / Pressure l/min. psi	Dimensions W x L x H in	Weight lbs
9 410 191	Magnum91	-91 ... +250	±0.05...±0.2	6	4.0	5.0	4.0	2.5	1.5	0.7	24-35 11.6-31.9	28 x 35 x 65	924

Cooling water connection G 3/4" male with barbed fittings for tubing 10 mm inner dia.
Voltage: Available in 230V(3 Ph.)/60Hz or 400V(3 Ph.)/50Hz

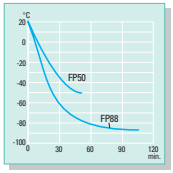
Refrigerated/Ultra-Low Refrigerated Circulators

with high power pressure pump

For temperature control of systems requiring high pump capacities and high flow rates

- Energy-saving proportional cooling control with reduced heat generation
- Active Cooling Control throughout the entire temperature range
- Removable venting grid
- Front drain accessibility

Cool-down times:
Bath fluid: Ethanol




FP50-MS FP88-MS

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20	-40	-60	-80°C	Pressure pump capacity max. l/min. psi	Bath opening/ bath depth WxL / D in	Filling volume liters	Dimensions W x L x H in	Weight lbs
9 238 650	FP50-MS	-50 ... +100	±0.02	1.3	0.9	0.8	0.5	0.14	--	--	22 13.1	7.1 x 4.7 / 5.9	5.5 ... 8	16.5 x 19.3 x 29.9	125.4
9 238 688	FP88-MS	-88 ... +100	±0.05	1.3	1.1	0.96	0.92	0.73	0.59	0.15	22 13.1	5.1 x 5.9 / 6.3	5.5 ... 8	21.7 x 24 x 35.8	266.2

Technical features (see icon feature page)

Included with each unit: 2 each barbed fittings for tubing 8 and 12 mm inner dia. (pump connections M16x1 male)
Voltage: Available in 230V/60Hz or 230V/50Hz

Refrigerated/Heating Circulators

For MOCVD applications for temperature control of bubblers in the circulator bath

Special benefits:

- Fan-air-cooling, instead of water-cooling
- Bath openings for one or two bubblers
- Bath depth 7.9 or 9.8 inches

- Active Cooling Control throughout the entire temperature range
- Removable venting grid
- Front drain accessibility


FS20-MC


FS30-MC

JULABO Order No.	JULABO Model	Working temp. range °C	Temp. stab. °C	Heat. cap. kW 1)	Cooling capacity kW (Bath fluid: Ethanol) 20	0	-20°C	Pressure pump capacity max. l/min. psi	Bath opening/ bath depth W x L / D in	Filling volume liters	Dimensions W x L x H in	Weight lbs
Refrigerated/Heating Circulators												
9 150 622	FS20-MC	-25 ... +80	±0.02	1 / 2	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	74.8
9 150 636	FS30-MC	-30 ... +80	±0.02	1 / 2	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	92.4
water-cooled models												
9 150 623	FW20-MC	-25 ... +80	±0.02	2 / 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	74.8
9 150 635	FW30-MC	-30 ... +80	±0.02	2 / 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	92.4

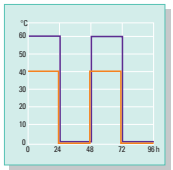
1) At voltage: 115V/60Hz / 230V/50Hz

Forcing Test Refrigerated/Heating Circulating Bath

For simulating the beer aging process to determine the 'best before' date

- Temperature and time-dependent test ramps according to forcing test already pre-programmed
- Program modification possible any time
- Built-in counter for temperature cycles
- Large bath opening with insert for 20 bottles of beer each 0.5 liters
- Removable Plexiglas® cover

Forcing test
Program steps




F38-ME

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	Filling volume liters	Dimensions W x L x H in	Weight lbs
9 160 638	F38-ME	-38 ... 80	±0.05	2	0.92	0.66	0.32	11-16 3.3-6.5	13.8 x 16.1 / 10.6	45	17.3 x 25.2 x 32.3	176

Technical features

Voltage: Available in 230V/60Hz or 230V/50Hz

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… 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 13–15). 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 high 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. Besides 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 (Xp, 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, high 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' 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 (page 49).

Which refrigerants are used by JULABO?
For more than 10 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.

Which advantages are featured by JULABO early warning systems (patented)?
The reason for an untimely 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 are CE certified and comply with the safety requirements. JULABO units comply with the following harmonized norms: EN 1050, EN 292, EN 61010, EN 60204, EN 563, EN 61326.

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. Optimal ambient conditions are ambient temperature of +20 °C and approximately 50 % relative humidity.

Which mains voltages and frequences 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 products are designed and manufactured to provide the highest level of uninterrupted performance. JULABO USA, Inc. warrants all equipment against material or workmanship defects for a period of 2 years.

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 slipping off.
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.

Which advantages does metal tubing offer?
Flexible JULABO metal tubing can be connected with the circulator and the external system thus avoiding slipping. The integrated insulation avoids 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 take in composites from components thus causing corrosion.
JULABO THERMAL bath fluids offer extended temperature ranges. They have the advantage of much smaller specific heat capacities. When selecting bath fluids special attention has to be paid to the flash point and fire point (page 33 and 44).
Especially when it comes to low temperatures the permissible viscosity as stated in the operating manuals may 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 smaller specific heat capacities than water and alcohol.

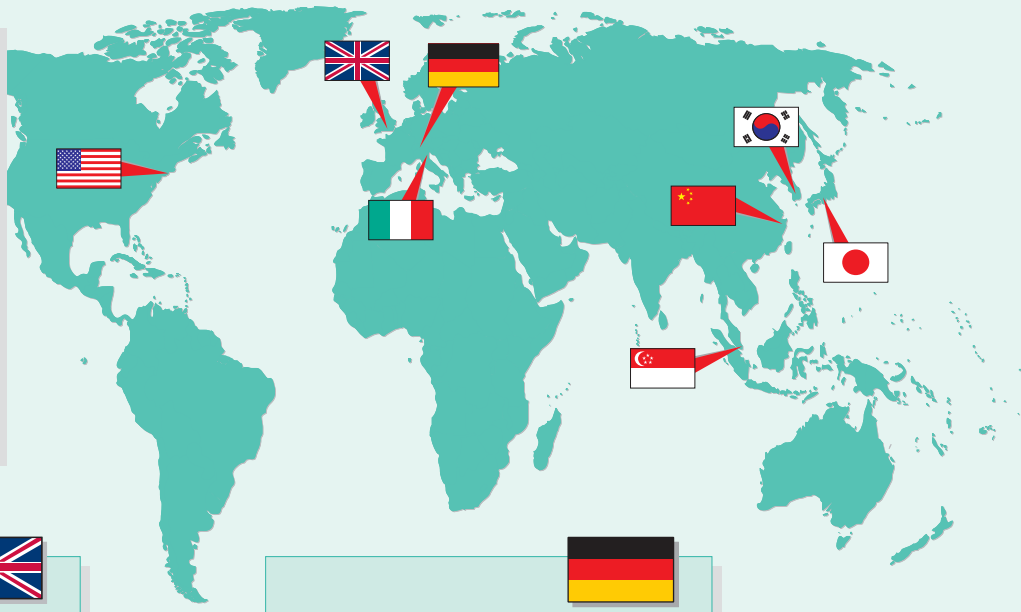
How do you calculate the required cooling or heating capacity?
The following formula can be used for a time-dependent calculation:
$P = (m * c * dT) / t$
P = required cooling/heating capacity in kW
m = mass of material in kg
c = specific heat capacity (water = 4.2 / Ethanol = 2.5 / silicon oil = 1.8)
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 with RS232 interface feature a special function to support the enduser. During operation a black box which is integrated in the circulator works unnoticed and invisible in the background recording all relevant data of the last 30 minutes. In case of a problem this data can be downloaded via software from the circulator to the 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 at www.julabo.com.

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JULABO Worldwide



Julabo USA

JULABO U.S.A., Inc.
754 Roble Road
ALLENTOWN, PA 18109

☎ +1 610 231 0250
+1 610 231 0260
info@julabo.com
www.julabo.com

Julabo UK

JULABO UK, Ltd.
Garrick House, High Street
GLINTON
PETERBOROUGH PE6 7JP

☎ +44 1733 252711
+44 1733 253649
info@julabo.co.uk
www.julabo.co.uk

Julabo Headquarters:

JULABO LABORTECHNIK GMBH
77960 Seelbach / Germany

☎ +49 7823 51 0
+49 7823 2491
info@julabo.de
www.julabo.de

Julabo ITALIA S.R.L.

JULABO ITALIA Srl
Via M. Prestinari, 2
20158 MILANO

☎ +39 02 3932 5483
+39 02 3931 7064
info@julaboitalia.it
www.julaboitalia.it

Julabo JAPAN

JULABO JAPAN Co., Ltd.
Via Ritz Ibaraki
8-18 Sonoda-cho, Ibaraki
OSAKA 567-0825

☎ +81 72 638 7200
+81 72 638 7201
info@julabo-japan.co.jp
www.julabo-japan.co.jp

Julabo CHINA

JULABO Technology (Beijing) Co., Ltd.
Room 503C, Building 106, Wangjing
New Industrial Zone, Lize Zhongyuan
Chaoyang District, BEIJING 100 102

☎ +86 10 6428 9002
+86 10 6427 9434
info@julabo.com.cn
www.julabo.com.cn

Julabo SINGAPORE

JULABO SINGAPORE Pte., Ltd.
16, Ayer Rajah Crescent # 04-05G
Tempco Technominium
SINGAPORE 139965

☎ +65 6775 1516
+65 6775 1627
info@julabo-singapore.com
www.julabo-singapore.com

Julabo KOREA

JULABO KOREA Co., Ltd.
3F, Pyongchon-Dong # 57
Dongan-Gu, Anyang-Si
KYONGGI-DO

☎ +82 31 426 5315
+82 31 426 5317
info@julabo-korea.co.kr
www.julabo-korea.co.kr

PLUS more than 100 partner distributors worldwide.

Julabo
When Temperature Matters

JULABO USA, INC.
754 Roble Road
ALLENTOWN, PA 18109

☎ 800 458 5226
610 231 0260
info@julabo.com
www.julabo.com

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