

Inspired by **temperature**



from -125°C
to $+425^{\circ}\text{C}$



Temperature Control
for botanical extraction and processing

huber

Precise solutions for the complete cannabinoid isolation process



Our mission: make your work easier

Our temperature control technology makes work in research and industry easier and more efficient. This is our mission and our products and services follow this concept.

Our products have proved themselves through experience and are recognised as technology leaders in the field of Temperature Control in experimental, research facilities and industrial production processes. A typical application is process temperature control in the chemical and pharmaceutical industry.

In other industries, our temperature control units are used to carry out material and stress tests, temperature-dependent testing of food and beverage, cosmetic products and building materials and the simulation of environmental conditions and ageing processes.

Please do not hesitate to contact us if you need an individual temperature control solution. We would be happy to advise you personally and show you suitable solutions or completed reference projects.



Extraction Winterization Filtration Solvent Recovery Decarboxylation Distillation Recrystallization

Temperature Control for botanical extraction and processing

During the isolation and refinement process of CBD, or other cannabinoids, stable and accurate temperature control can aid in many ways such as, the reduction of process times, increases in solvent recovery, and improvements in product purity. Not only does robust and reliable temperature control increase process efficiencies, but it also allows for precise and repeatable methods to be developed; these easily replicated temperature control patterns allow for greater and more uniform yields.

Reducing the time it takes to reach process critical temperature will increase the number of batches achievable in a working day, or single shift. In every aspect of the

botanical extraction process, increased efficiency leads to a greater return on investment. Reliability is also a key factor. When the pressure is on to meet timelines, or client demands, down-time can be costly.

You can always count on the reliability and robustness of Huber units. There is no compromise in the quality of engineering nor in the materials used. It is a major reason why Huber sets the bar in performance and reliability across numerous sectors. The Huber standard can be seen across many industries such as aerospace, automotive, semiconductor, chemical, and pharmaceutical.

Applications

- Hydrocarbon Extraction
- Ethanol Extraction
- CO2 Extraction
- Ice Water Extraction
- Winterization
- Filtration
- Decarboxylation
- Solvent Recover
- Short-Path Distillation
- Thin / Wiped Film Distillation
- Recrystallization
- Formulations

Get the most out of your extraction and distillation process



Solvent Recovery

The solvent is distilled off and thus separated from the extract. Solvent recovery generally calls for condenser temperature of between -10°C to 0°C. The ideal unit will depend on the volumes of solvent to be recovered.

Decarboxylation

The extract is generally decarboxylated via heat. The process of breaking the carboxylic group not only activates certain cannabinoids, but also helps off-gas any residual solvent or volatiles.

Distillation

In this stage crude oil is further purified through the process of fractional distillation. It involves heating the extract beyond its boiling point, causing it to evaporate. Once re-condensed it is in a much more pure concentration.

- Vacuum Distillation
- Short-Path Distillation
- Thin / Wiped Film Distillation

Winterization/Filtration

In this step, fats and waxes of the extract are removed. The raw extract is dissolved in solvent and is cooled severely. At these temperatures the various fats and waxes congeal, causing them to drop out of solution.

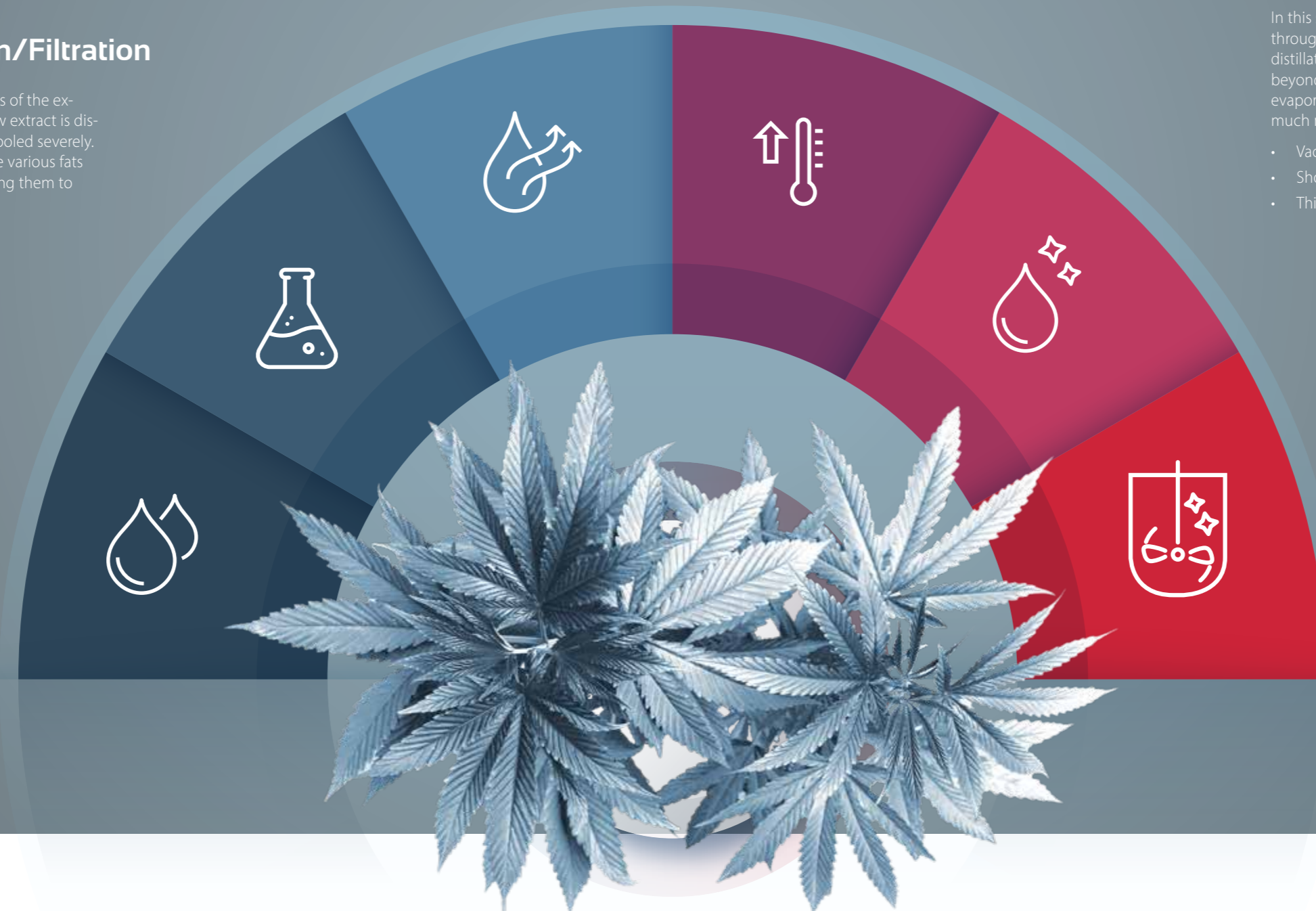
Extraction

With the introduction of a solvent the cannabinoids are stripped from the bio-mass, and then held in solution. The selection of solvent does affect extraction methodology, but sub-zero temperatures are almost always preferred

- Hydrocarbon Extraction
- Ethanol Extraction
- CO2 Extraction
- Ice Water Extraction

Recrystallization

The recrystallization of cannabinoids is most commonly done within a jacketed reactor. In order to maximize productivity, precise and quick temperature control is essential. For these applications, thermal cycling and temperature ramps are often utilized in the range of -40°C to +40°C.



Extraction

high volume production



There are many ways to perform an initial extraction, but all these methods have one thing in common – Huber. Whether it be ethanol extraction or butane, CO2 or propane, ice water or heptane, Huber TCUs play a vital role in the cooling of solvent and the regulation of extraction temperatures.

Hydrocarbon Extraction

For hydrocarbon extraction, operators often utilize Huber CC and Unistat series to cool down solvent tanks, material columns, and various components. The target temperature range is generally -40°C to -80°C. Huber heating units, such as the KISS 202 and CC-315B are often used on the solvent evaporation side of these closed loop systems.

Ethanol Extraction

In ethanol extraction, Unistats and Cool Smart CS Chillers are routinely used. Ethanol is generally brought down to temperature in a holding tank and then transferred to the process. Heat exchangers and flow through chillers can also allow for the cooling of ethanol. These applications generally call for large process volumes to be cooled quickly, requiring a high cooling capacity in the -20°C to -80°C range.

CO2 Extraction

In the CO2 extraction process temperature control plays a crucial role. Columns are heated and chilled, as are feed and solvent lines, all in order to ensure extraction temperatures as well as maintain solvent pressure and flow. The Unistat T305 heating unit and Cool Smart CS Chillers are routinely paired with these units.

Ice Water Extraction

Huber Chillers are not commonly seen, but sometimes utilized in the process of ice water extraction. Jacketed tanks are chilled down to temperature, in order to increase efficiency and reduce resource consumption.

With higher production goals comes larger equipment requirements; with the associated increase in cooling and heating powers. The Huber standard product range starts at cooling powers of 280 watts at 15°C up to 130 kW at 15°C. Operation remains simple from the smallest to the largest.

Interfaces facilitate automation, monitoring and recording. Production demands are crucial and flexibility is a highly desirable option, especially with varying production goals. For this reason it is simple to run Huber machines in parallel as “redundant systems”. This also gives a dimension of security in always having spare capacity if needed.

At the industrial scale, Huber units offer high flow pumps along with robust heating and cooling. These large Temperature Control Units (TCU's) can be integrated into high volume production facilities with ease.

Huber's large scale TCU's are capable of providing efficient temperature control to process tanks and reactors with volumes of up to 2,000 liters. Such large volumes can be cooled to low temperatures without the use of liquid nitrogen.

Huber products that are commonly seen in these large scale applications include units that have 60 kW at -40°C (Unistat 680) and units that have 25 kW at -60°C (Unistat 950).

Examples



Fractional Distillation

The wiped film evaporator (WFE) and short path distillation apparatus are the most common methods for refinement of crude oil. In this stage of purification, temperature stability & control are integral to process efficiency. Molecular distillation can take many forms, some more complex than others,

but they all require heating and cooling in varying zones; at varying set points. To maximize automation, our Pilot ONE system will allow all of the temperature control units to be controlled from a central point. Below are some examples of OEM pairings.



Winterization

In order to remove undesirable fats and waxes, cannabis extracts are often suspended in solution and the temperature lowered below ambient. Holding the product at temperatures below -20°C in a jacketed vessel can be achieved by using either a Huber Unistat or a Huber Compatible Control system. The benefit of a Unistat is that the temperature required to initiate the winterization process will be achieved much quicker than with an open bath unit and so increasing the number of batches processed per shift. The most suitable unit will depend on the size of the processing vessel, time-to-temperature requirement and the target temperature.

Filtration

Advanced filtration often requires a wide range of temperatures. For example achieving a process temperature of -80°C facilitates the removal of fats and waxes by filtration. Conversely, elevated temperatures (e.g. 40°C) are required for certain bleaching clays. No matter what your temperature requirements are, Huber has a solution.

Solvent Recovery

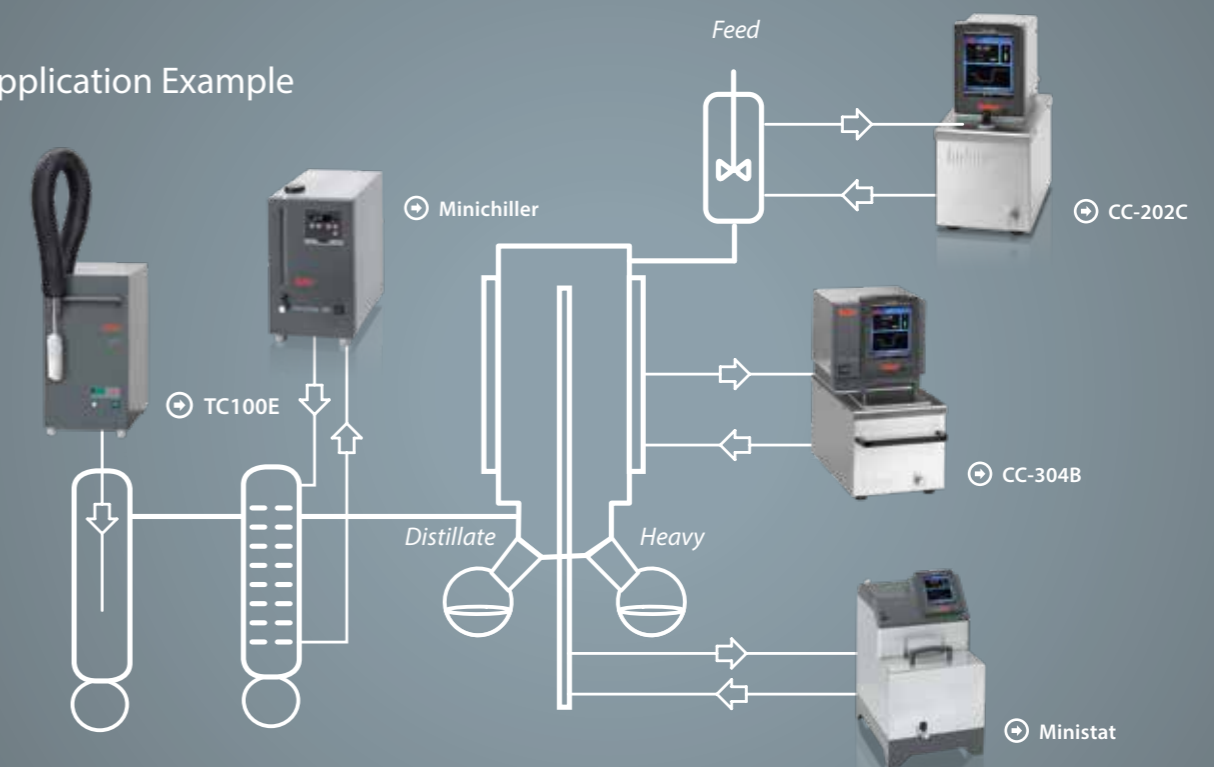
The life blood of any solvent recovery system is its chiller. Robust and reliable chillers eliminate breakthrough and maximize solvent recovery. Huber chillers are ideal for recovery systems such as rotary evaporators and falling films.

Solvent recovery generally calls for condenser temperatures of -10°C to 0°C , Huber CS Chillers as well as Unichillers are frequently paired to these applications.

Decarboxylation

The extract is generally decarboxylated via heat. The process of breaking the carboxylic group not only activates certain cannabinoids, but also helps off-gas any residual solvent or volatiles. The temperature requirements at this stage of the process are typically between 90°C and 150°C . Huber heated circulators are often used to achieve these higher temperatures.

Application Example



Isolation Processing

Weed be good together



Recrystallization

The recrystallization of cannabinoids is most commonly done within a jacketed reactor. In order to maximize productivity, precise and responsive temperature control is essential. Automation is easily attainable with the Pilot ONE programmer allowing for custom cycles and temperature ramps to be created, and if required, saved onto a USB thumb drive. With the Unistat series, isolate production has never been easier or more efficient. Operators most commonly use the CC-508, Unistat 410, or Unistat 525 for these processes.

⊕ CC-130A Visco 3



Formulations & Quality Control

In the final stages of processing, extracts are often blended or mixed into formulations. Whether to facilitate a reaction, aid in homogenization, or encourage an emulsification, temperature control is often needed in the final stages of formulation. Huber has a solution for every application, at every temperature.

⊕ BFT5



As standards are developed, quality control will become more common place in the cannabis sector. Huber recirculating chillers and heated baths regularly play an integral role in analytical and quality assurance labs across the world.



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 www.heidolphna.com	 @ironfistextractorsusa	 www.labsociety.com
 www.machtechnologies.com	 www.pinnaclestainless.net	 www.precisionextraction.com
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Technology leader in temperature control

Huber is the technology leader for high precision and responsive temperature control solutions for research and industry. Our expansive product line offers solutions for all temperature applications ranging from -125°C to +425°C. The product range includes highly dynamic temperature control systems with cooling capacities of up to 250 kW as well as chillers and heating/cooling circulators for applications in R&D laboratories, pilot plants, and production facilities.

Huber has pioneered the technological development in the field of fluid temperature control with several innovative products. A revolution in temperature control technology was the introduction of the Unistat temperature control systems in 1989. 30 years later, Unistats still set the pace when it comes to highly dynamic temperature control processes.

Advantages

- **Responsive thermodynamics for fast control behavior for chemical processes.**
- **Extremely fast heating and cooling rates due to small internal volumes.**
- **Process stability, predictable and reproducible results at any time for solid research and production.**
- **Intelligent TAC function continually monitors performance for optimum control.**
- **Wide range of models covering different temperature ranges with varying cooling/heating capacities.**
- **Broad working temperature ranges without liquid change and working life of the HTF.**
- **Data communication standards and data recording. Interfaces: e.g. Profibus, Modbus, TCP, Ethernet, OPC-UA, RS232, RS485, USB, Analogue.**



Selected models for precise temperature control

Unistat T – high temperature closed loop systems

Chili and Unistats of the T300 and T400 series control temperatures in a highly precise and space-saving manner up to +425 °C. They set the standard for safety, ease of use, and temperature control speed.

HT models are equipped with stepper motor controlled water cooling.

Model	Working temperature range (°C)	Pump max. VPC		Heating power (kW)	Cooling power (kW) at (°C)				Dimensions WxDxH (mm)
		(l/min)	(bar)		400	300	200	100	
Chili	65...300	45	0,9 ¹	3,0	-	-	-	-	240x427x393
Unistat T305	65...300	45	0,9 ¹	6,0	-	-	-	-	425 x 250 x 631
Unistat T305 HT	65...300 ³	45	0,9 ¹	6,0	-	3,2	2,3	0,6	425 x 250 x 631
Unistat T305w HT	(15) 65...300	45	0,9 ¹	6,0	-	10,0	10,0	10,0	425 x 250 x 631
Unistat T320	65...300	96	3,5 ²	12,0	-	-	-	-	540 x 484 x 719
Unistat T320w HT	(15) 65...300	60	1,5 ²	12,0	-	10,0	10,0	6,0	540 x 484 x 719
Unistat T330w HT	(15) 65...300	60	2,5 ²	24,0	-	18,0	18,0	10,0	540 x 678 x 1174
Unistat T340w HT	(15) 65...300	60	2,5 ²	48,0	-	10,0	10,0	6,0	800 x 1060 x 1600
Unistat T402	80...425	45	0,9 ²	6,0	-	-	-	-	505 x 400 x 765

¹Integrated VPC pressure control ²VPC pressure control via optional bypass ³lowest working temperature 15 K above ambient temperature

Chili – Powerful Heating Circulation Thermostat

Chili is the latest heating circulator for closed systems in the Unistat product family. The powerful unit guarantees highly accurate, reproducible temperature control results with short heat-up times and wide temperature ranges without fluid change. The closed circuit prevents oil vapors and oxidation, which increases the service life of the thermofluid. Chili is the smallest heating thermostat suitable for Malotherm. Perfect for Thin / Wiped Film Evaporator.



Chili

Cooling and Heating Bath Circulators

Classic open bath and circulation thermostats are used for many heating and cooling applications. There are more than 70 models in the series, available with Pilot ONE or KISS controller.



Model	Working temp. range (°C)	Heating power (kW)	Bath			Pump data				Cooling power (kW) at (°C)			Dimensions WxDxH (mm)
			opening (mm)	depth (mm)	volume (ltr)	max. pressure (l/min) (bar)	max. suction (l/min) (bar)	20	0	-20			
CC-202C	(-30)* 45...200	2,0	Ø 25	150	2,0	27	0,7	22	0,4	-	-	-	178x260x355
CC-304B	(-20)* 28...300	3,0	130 x 100	155	5,0	25	0,7	18,5	0,4	-	-	-	210x335x392
CC-308B	(-20)* 28...300	3,0	130 x 110	155	8,5	25	0,7	18,5	0,4	-	-	-	242x404x392
CC-315B	(-20)* 28...300	3,0/4,0	270 x 145	200	15	25	0,7	18,5	0,4	-	-	-	335x382x433
CC-K6	-25...200	2,0	140x120	150	4,5	27	0,7	22	0,4	0,20	0,15	0,05	210x400x546
KISS K6	-25...200	2,0	140x120	150	4,5	14	0,25	10,5	0,17	0,20	0,15	0,05	210x400x546

* Auxiliary cooling device required Temperature stability: CC ±0,02 K



Ministats – smallest Heating and Cooling Bath Circulators

Ministats are the smallest cooling circulators in the world and permit operation in small spaces, for example in a fume hood or within a short path distillation skid. The devices have a wide range of features and are ideally suited for the temperature control of botanical distillation.

Model	Working temp. range (°C)	Heating power (kW)	Bath		Pump data				Cooling power (kW) at (°C)				Dimensions WxDxH (mm)
			volume (ltr)	depth (mm)	max. pressure (l/min) (bar)	max. suction (l/min) (bar)	20	0	-20	-30			
Ministat 125	-25...150	1,0	2,75/1,3*	120	22	0,7	16	0,4	0,30	0,21	0,05	-	225 x 370 x 429
Ministat 230	-40...200	2,0	3,2/1,7*	135	22	0,7	16	0,4	0,42	0,38	0,25	0,14	255 x 450 x 476
Ministat 240	-45...200	2,0	4,9/2,8*	157	22	0,7	16	0,4	0,60	0,55	0,35	0,125	300 x 465 x 516

* with displacement insert

Powerful Cooling Bath Circulators

Cooling bath circulators are equipped with insulated baths made from high-grade stainless steel and offer low working temperatures down to -90°C up to +200°C. The devices are ideally suited for integration into extraction.

Model	Working temp. range (°C)	Heating power (kW)	Bath		Pump data				Cooling power (kW) at (°C)						Dimensions WxDxH (mm)
			volume (ltr)	depth (mm)	max. pressure (l/min) (bar)	max. suction (l/min) (bar)	100	20	0	-20	-40	-60			
CC-505	-50...200	1,5	5	150	25	0,7	18,5	0,4	1,2	1,2	1,0	0,6	0,15	-	410 x 480 x 764
CC-508	-55...200	3,0	5	160	25	0,7	18,5	0,4	1,5	1,5	1,5	1,0	0,3	-	410 x 480 x 764
CC-902	-90...200	1,5	5	150	25	0,7	18,5	0,4	1,2	1,2	1,2	1,1	0,9	0,6	550 x 600 x 911

CC-902



Selected models for precise temperature control

from -125 °C to +425 °C



Minichiller & Unichiller

The Minichiller and Unichiller series offer environmentally friendly and economic cooling solutions. The circulating chillers offer better efficiencies than cooling water as well as stable pressure and flow rates and a constant operating temperature. They are suitable for a wide range of applications such as removing heat from chemical processes or cooling scientific equipment.

Model	Working temperature range (°C)	Pump Data				Heating power (kW)	Cooling power (kW) at (°C)				Dimensions WxDxH (inch)
		max. pressure (l/min)	max. suction (bar)	max. suction (l/min)	max. suction (bar)		15	0	-10	-20	
Minichiller 300 OLÉ	-20...40 (80)**	14	0,25	10,5	0,17	-	0,3	0,2	0,14	0,07	225x360x380
Minichiller 300-H OLÉ	-20...100	14	0,25	10,5	0,17	1	0,3	0,2	0,14	0,07	225x360x380
Minichiller 600 OLÉ	-20...40	24	0,7	18,0	0,4	-	0,6	0,5	0,35	0,15	280x490x424
Minichiller 600-H OLÉ	-20...100	24	0,7	18,0	0,4	2	0,6	0,5	0,35	0,15	280x490x424
Unichiller 025 OLÉ	-10...40	29	1,0	-	-	-	2,5	2,0	1,2	-	460x590x743
Unichiller 160T	-10...40	96	5,6	-	-	-	16,0	8,8	4,0	-	904x1582x1902
Unichiller 300T	-20...40	210	4,7	-	-	-	30,0	18,0	11,0	6,0	904x2172x1870
Unichiller 500Tw	-20...40	220	4,7	-	-	-	50,0	30,0	19,0	-	1000x1103x1634

** Permissible return temperature +80°C Optional heating on request



Unistats – Dynamic Temperature Control

Unistats are ideal for rapid and very precise temperature control of externally connected applications. There are more than 60 models available, with cooling capacities from 0,7 to 130 kW.

Model	Working temperature range (°C)	Pump max. VPC		Heating power (kW)	Cooling power (kW) at (°C)					Dimensions WxDxH (mm)
		(l/min)	(bar)		250	0	-20	-40	-80	
Unistat 405	-45...250	55	0,9 ¹	3,0	1,0	1,0	0,6	0,15	-	426 x 327 x 631
Unistat 410	-45...250	56	0,9 ¹	3,0	1,3	1,5	0,8	0,17	-	460 x 554 x 1201
Unistat 525	-55...250	79	1,5 ²	6,0	10,0	7,0	4,2	1,5	-	1290 x 795 x 1377
Unistat 615	-60...200	60	1,5 ²	12,0	-	9,5	8,0	4,0	-	1290 x 735 x 1596
Unistat 650w	-60...200	130	4,0 ²	48,0	-	65,0	56,0	29,0	-	1800 x 1200 x 1830
Unistat 680w	-60...200	130	4,0 ²	96,0	-	130,0	80,0	60,0	-	4500x2160x2250
Unistat 815	-85...250	40	0,9 ¹	2,0	1,3	1,5	1,5	1,4	0,2	460x604x1465
Unistat 825	-85...250	40	0,9 ¹	3,0	2,3	2,2	2,0	2,0	0,3	460x604x1465
Unistat 905	-90...250	40	0,9 ¹	6,0	4,0	3,8	3,5	2,2	0,7	540x654x1500
Unistat 915w	-90...250	110	1,5 ²	6,0	11,0	11,0	11,0	8,0	1,1	630x704x1565
Unistat 950w	-90...200	240	4,0 ²	36,0	-	36,0	36,0	36,0	10,0	2630x1300x1980

¹ integrated VPC pressure control ² VPC pressure control via optional bypass air- or water cooled models available

CS Chillers

The CS chiller range offers air-cooled models in different performance classes. They combine cool and smart technology in one unit and further reduce water consumption and lower the operating costs for many applications. H = Heating, OD = Outdoor Option

Model	Working temperature range (°C)	Pump Data		Cooling power (kW) at (°C)					Heating power (kW)	Noise Level (dB)	Dimensions WxDxH (mm)
		(l/min)	(bar)	15	10	0	-10	-20			
CS 25	-20...15	50	4,5	3,5	2,5	1,6	0,98	0,7	-	60	579x660x820
CS 35	-20...15	30	4,0	4,0	3,5	2,1	2,0	0,8	-	62	579x660x826
CS 50	-20...15	83	4,0	8	5	4,2	3,5	2	-	63	681x729x1519
CS 100	-20...15	83	4,0	18	10	9,5	7,5	4,5	-	70	800x851x1666
CS 100-H	-20...85	83	3,7	18	10	9,5	7,5	4,5	5,5	70	800x851x1666
CS 200	-20...15	125	4,2	28	20	18	15	9,5	-	78	1400x1001x1801
CS 200-H	-20...85	125	4,2	28	20	18	15	9,5	5,5	78	1400x1001x1801
CS 330 OD	-20...15	125	4,7	42	35	25	17	11	-	78	1400x1001x1801
CS 330-H OD	-20...85	125	4,7	42	35	25	17	11	8	78	1400x1001x1801
CS 550 OD	-20...15	125	4,7	70	60	33	20	12	-	79	1400x1001x1801



CS 25

TC – Immersion coolers

Immersion coolers are a flexible solution for numerous applications. Not only are they invaluable for dewar style cold traps, but they also work great for counter cooling of heating circulators, as well as rapid cooling of liquids.

Model	Working temperature range (°C)	Cooling power (kW) at (°C)				Dimensions WxDxH (mm)
		0	-20	-30	-90	
TC45	-45...100	0,24	0,18	0,1	-	190x295x360
TC45F	-45...100	0,24	0,18	0,1	-	190x295x360
TC50	-50...50	0,3	0,26	0,2	-	260x330x415
TC50E	-50...50	0,3	0,26	0,2	-	260x330x415
TC100	-100...40	0,16	0,15	0,14	0,07	295x500x570
TC100E	-100...40	0,16	0,15	0,14	0,07	295x500x570

Options on request: various other special cooling probes available



TC100E

TC50

TC45-F

Powerful flow through solution for recirculating

or on-demand cooling

Unistats for direct operation with heat exchanger

Unistat are ideal for the rapid and precise temperature control of externally connected applications. When paired with the Huber heat exchanger, a reliable and robust flow through system is created. These systems are capable of producing chilled solvent on demand, as well as recirculating solvent/solute mixtures.

Model	Working temperature range (°C)	Pump max. VPC (l/min)	Pump max. VPC (bar)	Heating power (kW)	Cooling power (kW) at (°C)					Dimensions WxDxH (mm)
					200	0	-20	-40	-60	
Unistat 650w	-60...200	130	4,0 ²	48,0	65,0	65,0	56,0	29,0	10,0	1800x1200x1830
Unistat 680w	-60...200	130	4,0 ²	96,0	130,0	130,0	80,0	60,0	15,0	4500x2160x2250

² VPC pressure control via optional bypass air- or water cooled models available outdoor setup available



Sensor options

A selection of Pt100 sensors for temperature measurement and regulation at relevant points.



Automation

Support for common data communication standards and software solutions for data recording, remote operation and programming. Interfaces: e.g. Profibus, Modbus TCP, Ethernet, OPC-UA, RS232, RS485, USB, Analogue.



SpyLight

Using the free software SpyLight the process-relevant data can be visualised and documented. Communication is achieved via RS232, RS485, USB (virtual COM port) or TCP/IP.

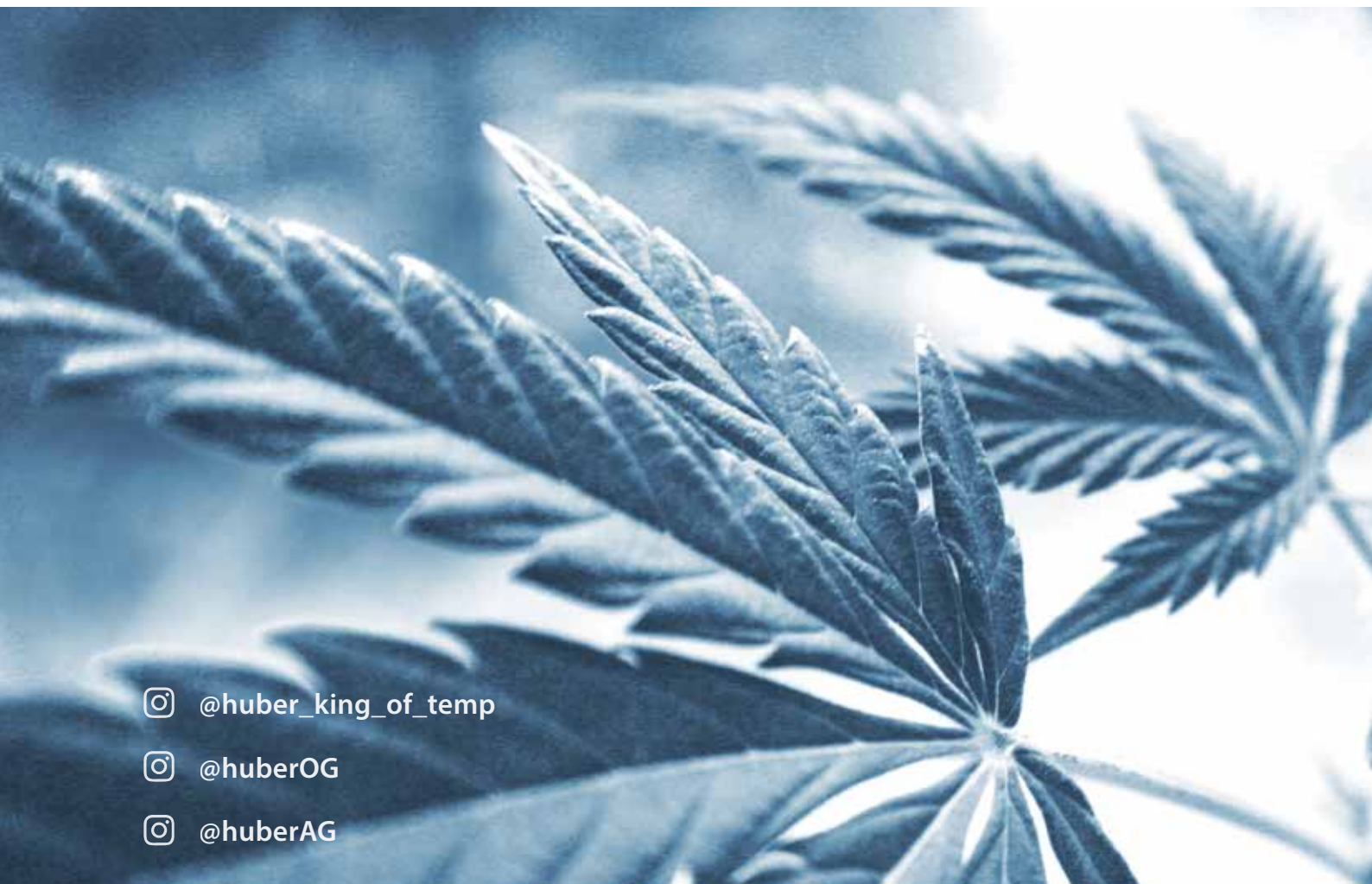
SpyLight is characterised by a low consumption of PC resources and easy operation. The recorded data can be displayed over time. The axes of the diagram are freely scalable and a zoom function simplifies the graphical evaluation of individual time periods.

Heat exchanger with pump and flow control for recirculating or on-demand cooling


Model	for Unistat 650w	for Unistat 680w
Temperature range	-60...+200°C	-60...+200°C
Min. flow rate	0,9 l/min [0.26 gal/min]	0,9 l/min [0.26 gal/min]
Max. flow rate	95 l/min [25 gal/min]	95 l/min [25 gal/min]
Pump connection primary	M38 x 1,5 male	M38 x 1,5 male
Primary side	DW-Therm M90.200.02	DW-Therm M90.200.02
Pressure pump max. secondary circuit	110 l/min / 3 bar	110 l/min / 3 bar
Secondary side	Ethanol 100%	Ethanol 100%
Pump connection secondary	M30x1,5 male	M30x1,5 male
Power supply	460V 3~ 60Hz	460V 3~ 60Hz
Dimensions WxDxH (inch)	39,4 x 59,1 x 59,1	39,4 x 59,1 x 59,1
Specifications		
Primary side inlet	-40°C	-40°C
Primary side outlet	-20°C	-15°C
Primary side flow rate	59 l/min [15.6 gal/min]	89 l/min [23.5 gal/min]
Secondary side inlet	+25°C	+25°C
Secondary side outlet	-35°C	-35°C
Secondary side flow rate	19 l/min [5 gal/min]	36 l/min [9.5 gal/min]


Application Example





 @huber_king_of_temp

 @huberOG

 @huberAG

Technical details and dimensions are subject to change. No liability is accepted for errors or omissions.

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