

Services and Core Competencies of the SolarNext AG

Solar Cooling Division

CLEAN ENERGY FOR YOU

The Solar Cooling Division of the SolarNext AG is an expert in the area of thermal cooling, and offers support during the whole implementation process ranging from consulting, concept, planning, and designing, through to the realisation of sorption assisted cooling processes. Our in-house research and development department with

staff from industry and research continuously develops our sorption chillers. This enables us to offer innovative climatic concepts based on ab-, or adsorption chillers, in combination with highly efficient heat sources like solar energy, district heating, or waste heat from co-generation, biomass and processes.

Our services:

- Development and improvement of single components of ab-, and adsorption cooling technology in the small capacity range (up to 20 kW)
- Detailed construction and building simulations
- Cooling- and heating load calculation according to VDI 2078 or to DIN EN 12831/A1
- Energy demand calculations according to VDI 2067 / 10+11
- Testing and benchmarking of ab- and adsorption chillers up to 20 kW cooling capacity of all manufacturers
- Conception, planning and realization of thermal climatic concepts of each capacity range (5 kW to several MW)
- Development of an integrated controller adaptable to your system
- Installation, commissioning and maintenance of our chillii®-systems

- Support and advice during the whole runtime of our chillers
- Professional training and information events for the chillii® Solar Cooling Technology

Additionally we offer:

- chillii® Solar Cooling Kits
- chillii® STC adsorption chillers with water / silica gel
- chillii® PSC absorption chillers with ammonia / water
- chillii® WFC absorption chillers with water / lithium bromide
- Absorption chillers with water / lithium bromide

SolarNext AG

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chillii® System Controller H



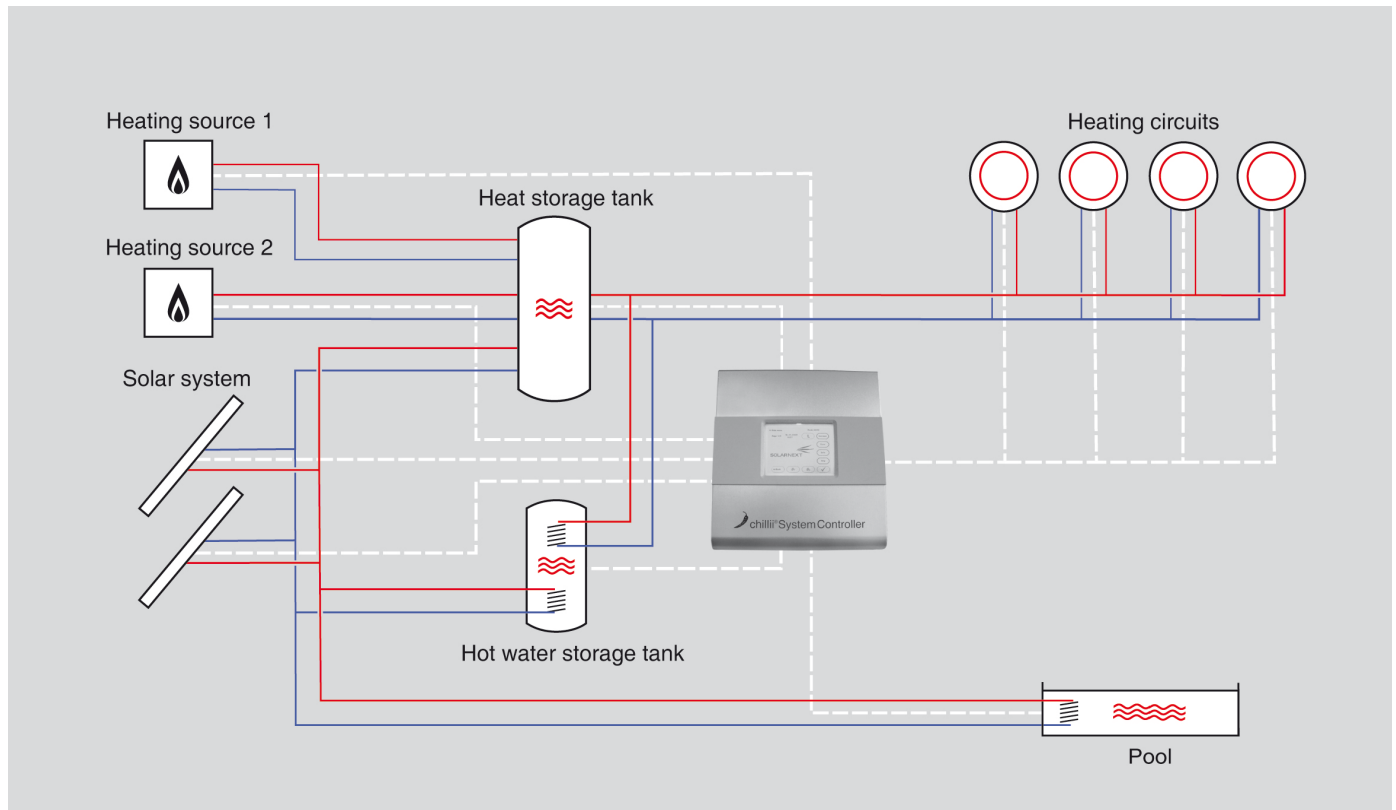
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Product features

- High efficiency control for simple and complex heating and cooling systems with priority to renewable energy sources
- More than 46.000 hydraulic schemes
- Several heat sources simultaneously controllable (solar, biomass, CHP unit, heat pump, oil / gas burner, district heat)
- Heat generation management (basic-/ peak demand control)
- 4 mixed heating / cooling circuits
- 81 inputs / outputs for sensors and actors
- Variable speed control of pumps (0-10 V / pulsing)

Technical characteristics

- Illuminated touchscreen for intuitive use
- Ethernet interface (maintenance / remote data transmitting)
- CAN-Bus for extension modules
- SD-Card memory for data logging and customer settings
- Integrated help function for easy handling
- Robust aluminium case with attractive design



Functional range

- Solar system (2 fields, different charging options)
- 2 additional heat sources (CHP unit, biomass, heat pump, oil / gas burner, process waste heat, district heat, etc.)
- Heat-/ and hot water storage control
- Additional heat sink (e.g. pool, overheat protection of collectors, charging heat reservoir for heat pump, etc.)
- 4 mixed heating-/ cooling circuits

Advantages

- Individual energy mix possible
- Lower costs compared to individual control units
- Energy- and CO₂- savings by optimal control strategy of entire system
- High usability and control comfort
- Comfortable system configuration via setup assistant
- Easy installation and maintenance
- Future oriented extension opportunities
- Customer settings saveable

Applications

- Single-/ Multi-family homes
- Commercial buildings
- District heat networks
- Energy supply stations
- etc.

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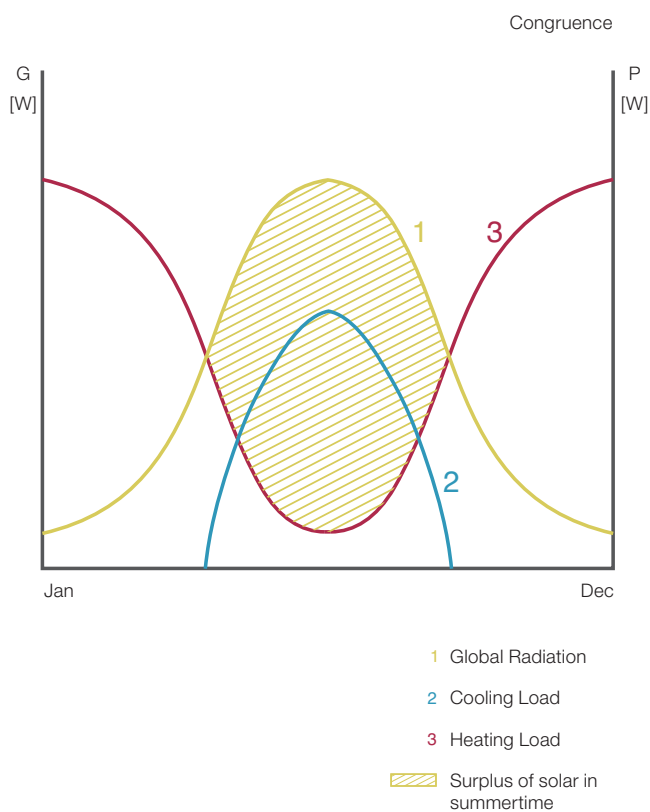
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Solar Cooling

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Solar cooling as an add-on to solar thermal domestic hot water and heating systems:

Generation of heat, hot water and cold.



Why solar cooling ?

- Enables the usage of the surplus solar heat during the summer
- No overheating of the solar system during summer time
- Simultaneity of solar heat supply and cooling demand
- Minimal operating costs for cooling / air-conditioning
- Solar heat as a renewable energy source

Advantages compared to electrically driven compression cooling technology:

- Increased independence from public energy suppliers
- Decrease in electricity and operating costs
- Saving of expensive electricity costs
- Reduction of CO₂ – emission by reducing the use of primary energy
- Reduction of global warming potential (GWP) by using environmentally friendly, natural refrigerants

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Possible areas of application of solar thermal cooling:

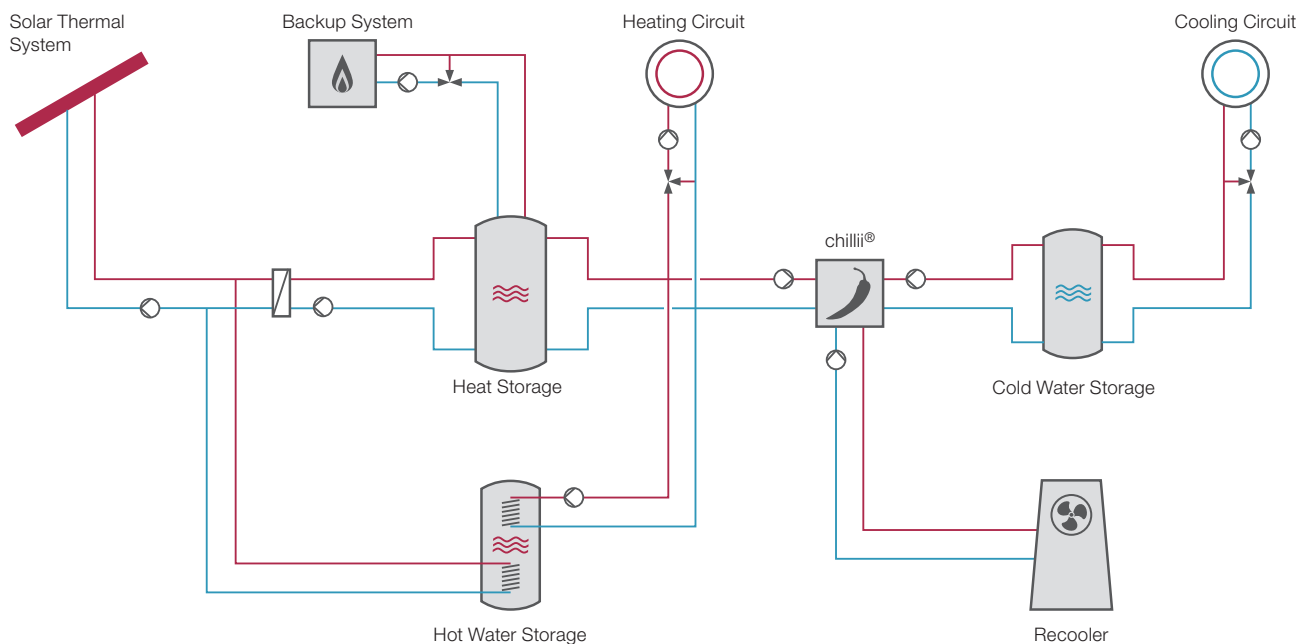
Air-conditioning of buildings:

- Public institutions
- Shopping malls
- Hospitals
- Administration buildings
- Banks
- Hotels
- Office buildings
- Residential homes

Process cooling:

- Pharmaceutical industry
- Electrical industry
- Printing- and media-industry
- Food industry
- Agriculture
 - Milk cooling
 - Piggery cooling

Example for hydraulic integration:



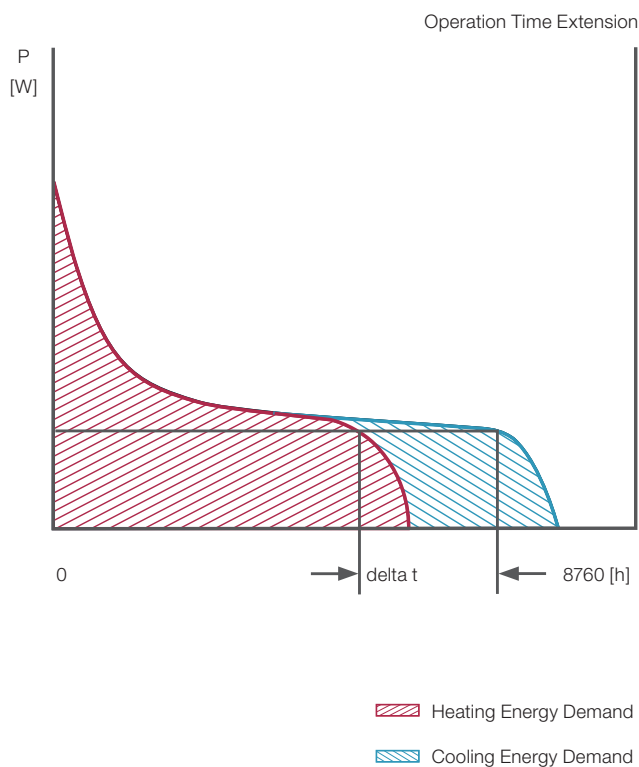
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CHPC – Combined Heat, Power and Cold Generation

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The combined heat, power and cold generation can be described as an extended heat and power generation system (CHP):
Generation of energy, heat and cold.



Why combined heat-power-cold-generation?

Advanced efficiency due to

- Longer operating-times of CHP-machines
- Increased energy production
- Reduction of emergency cooling of CHP-systems

Advantages compared to electrically driven compression cooling technology:

- Reduction of electricity and operating costs for the generation of cold
- Saving of expensive electricity costs
- Reduction of CO₂ – emissions by reducing the use of primary energy
- Reduction of global warming potential (GWP) by using environmentally friendly, natural refrigerants

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Possible areas of application of combined heat-power-cold generation:

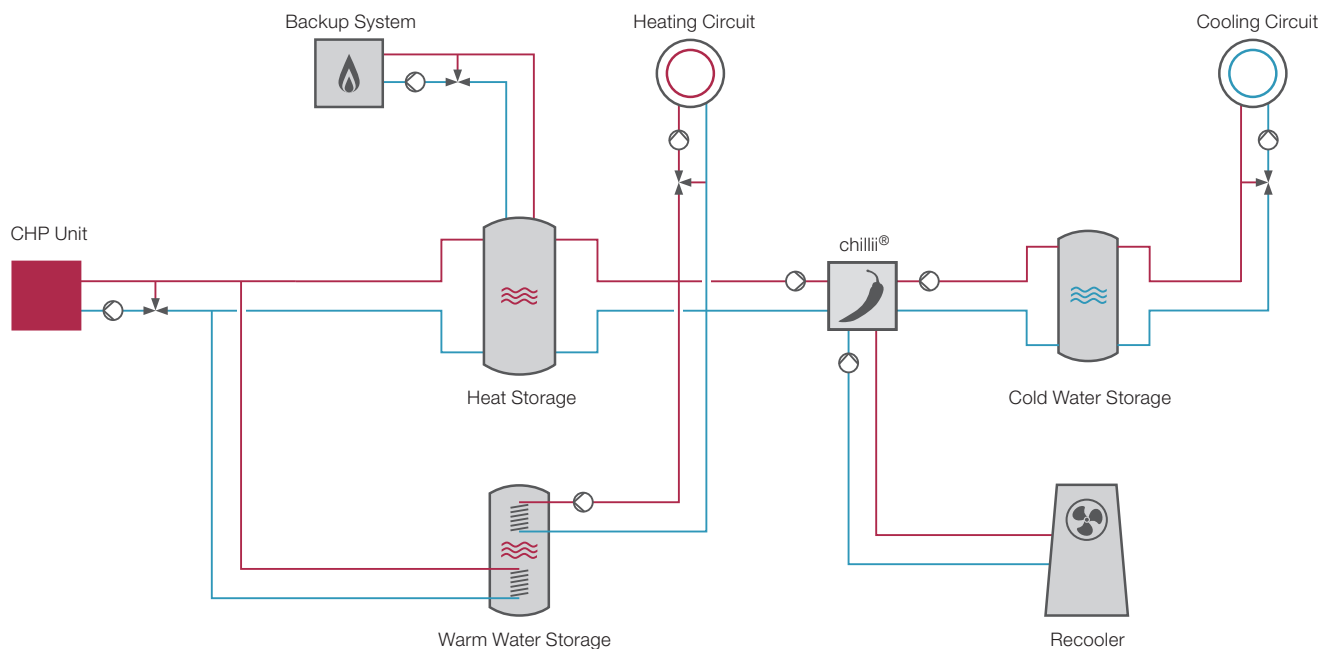
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Thermal Cooling

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Cooling is becoming increasingly important in relation to global warming. Comparing the amount of energy used for heating and cooling worldwide, about 75% is being used for cooling, and only 25% for heating. As scarce fossil energy-resources are becoming increasingly expensive and burning them accelerates the global warming process even further, regenerative alternative energies are becoming more and more important. Conventional cooling technology, the so

called compression refrigeration, is driven by electricity. In addition environmentally harmful refrigerants are being used, which reach the environment through leakages and thereby boost the greenhouse effect. In comparison, thermal cooling uses heat instead of electricity as the driving energy source, and water or ammonia are used as the environmentally friendly refrigerants.

The following heat sources can be used as driving energy:

Heat source	Advantages
Solar energy	Use of excess solar heat supply during summer time No overheating of the solar system due to system halts Simultaneity of solar heat supply and cooling demand Minimal operating costs Solar heat as renewable energy source
Biomass	Using heat during summer time CO ₂ – neutral heat and cold generation
District heating network	Heat transformation during the summer months Reduction of expensive electricity costs New business fields through cold-contracting
Combined heat & power	Advanced efficiency due to: <ul style="list-style-type: none"> · Longer operating hours for combined heat & power generators · Increased electric power generation · Reduction of emergency cooling
Process heat	Using surplus/for-free heat to generate expensive cooling energy Reliable heat source

Advantages compared to electrically driven compression cooling technology:

- Increased independence from public energy suppliers
- Decrease in electricity usage and operation costs (electricity)
- Stable cooling energy costs
- Reduction of CO₂ – emission by reducing the use of primary energy
- Reduction of global warming potential (GWP) by using environmentally friendly natural refrigerants

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Possible areas of application of thermal cooling:

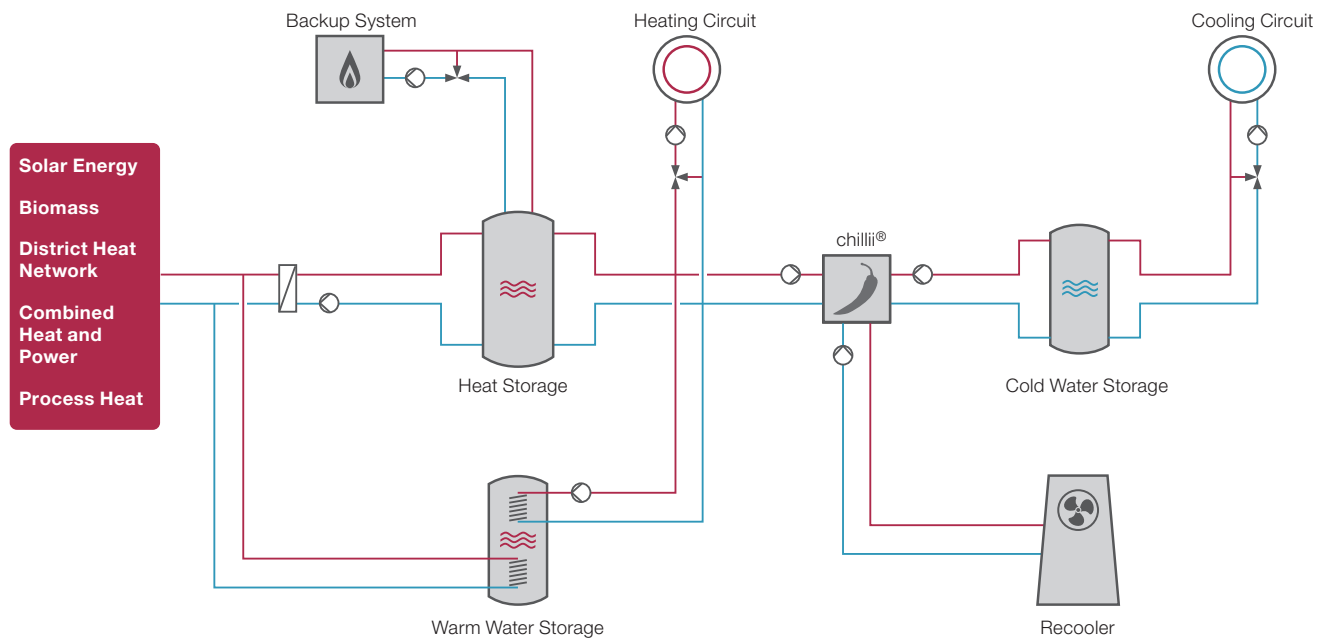
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Example for hydraulic integration:



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chillii® System Controller HC



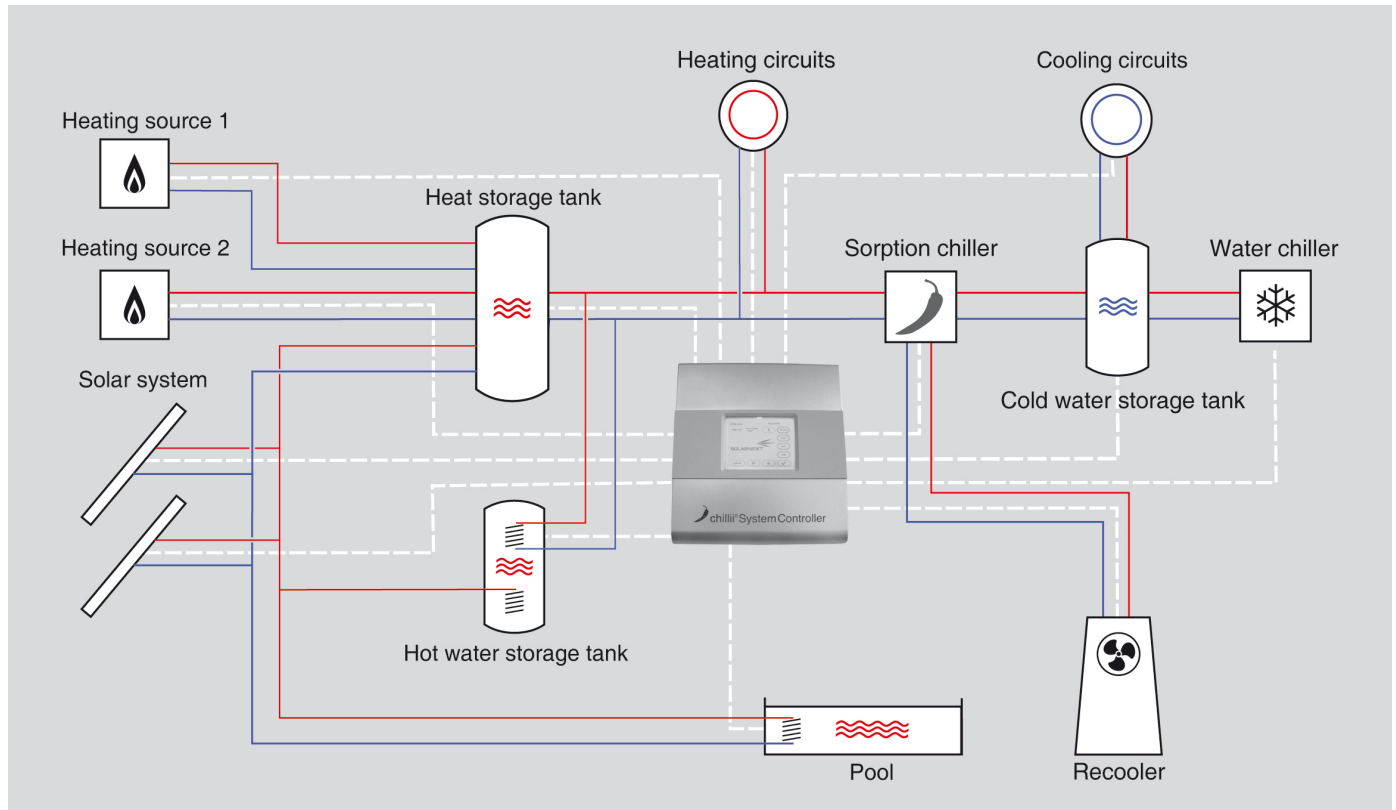
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- High efficiency control for simple and complex heating and cooling systems with priority to renewable energy sources
- More than 43 Million hydraulic schemes
- Several heat sources simultaneously controllable (solar, biomass, CHP unit, heat pump, oil / gas burner, district heat)
- Heat generation management (basic-/ peak demand control)
- 4 mixed heating / cooling circuits
- 127 inputs / outputs for sensors and actors
- Variable speed control of pumps (0-10 V / pulsing)
- Ab-/ Adsorption chiller control

Technical characteristics

- Illuminated touchscreen for intuitive use
- Ethernet interface (maintenance / remote data transmitting)
- CAN-Bus for extension modules
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Functional range

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- Heat-/ and hot water storage control
- Additional heat sink (e.g. pool, overheat protection of collectors, charging heat reservoir for heat pump, etc.)
- 4 mixed heating-/ cooling circuits
- Ab-/ Adsorptions cooling chillers
- Cold water storage control
- Conventional chiller for peak demand

Advantages

- Individual energy mix possible
- Lower costs compared to individual control units
- Energy- and CO₂- savings by optimal control strategy of entire system
- High usability and control comfort
- Comfortable system configuration via setup assistant
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Absorption Cooling Technology

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Absorption chillers with water / lithium bromide or ammonia / water generate cold through a closed, continuous cycle.

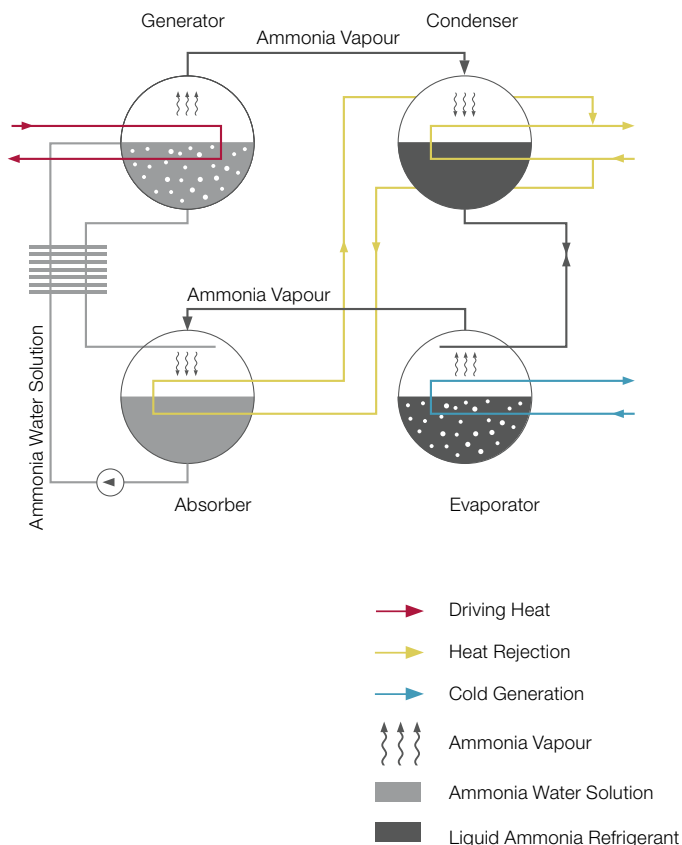
The evaporator temperature of ammonia absorption chillers can be reduced to minus 60 °C, making it applicable for industrial cooling processes. When water is being used as the refrigerant, the evaporator temperature is limited to temperatures above freezing point at 5 to 6 °C.

Schematic description exemplified by our chillii® PSC (ammonia / water):

The absorption chiller consists of four main components: The generator (also named boiler or expeller), the condenser, the evaporator and the absorber.

Inside the generator, hot water is supplied to the chiller through a heat exchanger. A part of the ammonia is being expelled from the ammonia / water solution and condensed again inside the condenser. The ammonia condensate is fed to the evaporator where it is evaporated. During this process, heat energy is discharged from the cooling cycle which cools it down. Inside the absorber, the ammonia is absorbed from the low concentrated refrigerant ammonia / water solution and the cycle starts over again.

As the water chilling process produces waste heat (which is the case for compression cooling for example), a cooling tower is required. The functionality of water / lithium bromide absorbers is nearly identical. In this case water is the refrigerant. The biggest difference is the different pressure levels of the two technologies (ammonia is driven with high pressure and water with a vacuum) and the different evaporator temperatures.



Why absorption technology ?

- Absorption chillers are practically maintenance-free (few mechanical parts)
- The life expectancy of absorption chillers is at least 20 years, but can also be significantly higher. For example, in the USA, an absorption chiller has been in operation for 70 years!
- Absorption chillers consume almost no electrical energy
- Using heat instead of electricity as driving energy reduces CO₂ - emissions
- Absorption chillers use natural refrigerants which have no global warming potential (GWP)



chillii® Cooling Kit PSC12



CLEAN ENERGY FOR YOU

Why chillii® Cooling Kits?

- Optimal aligned system components
- "Plug and Play"
- Pre-configured Cooling Kit
- No separate configuring / dimensioning of components for customer necessary

Applications

Air conditioning, Process applications, i.e. for

- Bakeries / Butcheries
- Wineries
- Fishing industry
- Agriculture
- Metal processing industry
- Further industries

Scope of services of SolarNext AG

Technical support

- Supply of design tools
- Installation manuals
- Technical service

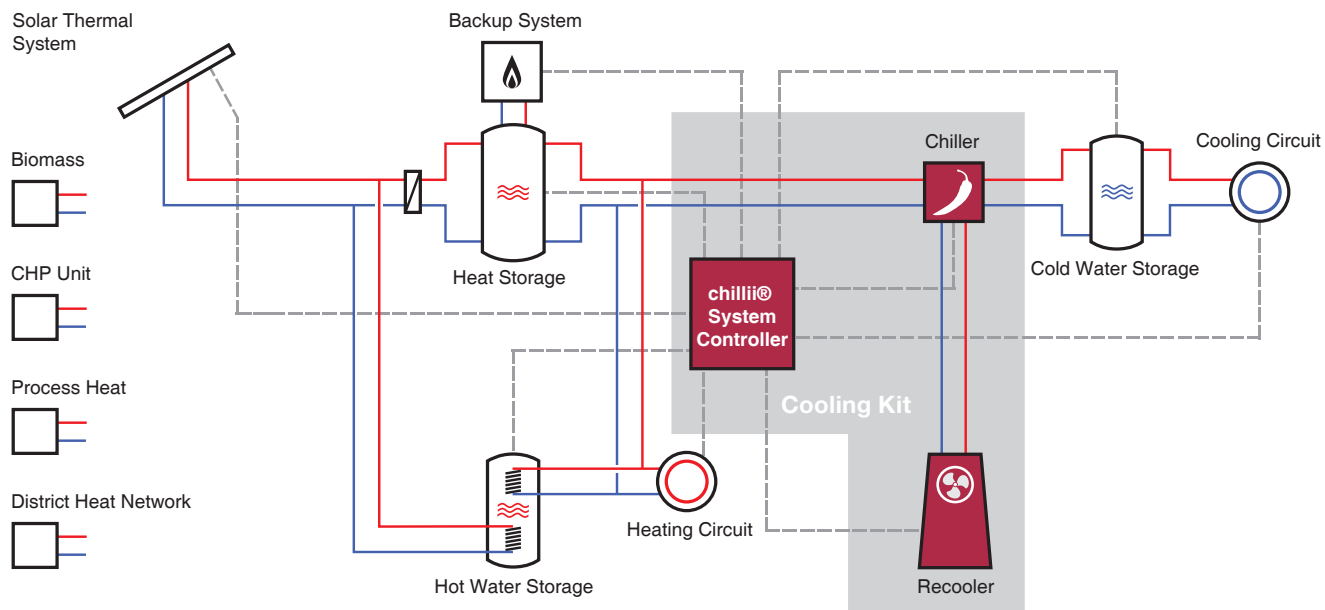
Sales support

- Economic consideration
- Marketing Support
- Negotiations with clients
- Product and sales trainings

Partner training

- Training courses for partners
- Commissioning and maintenance
- Exchange of experiences

chillii® Cooling Kit



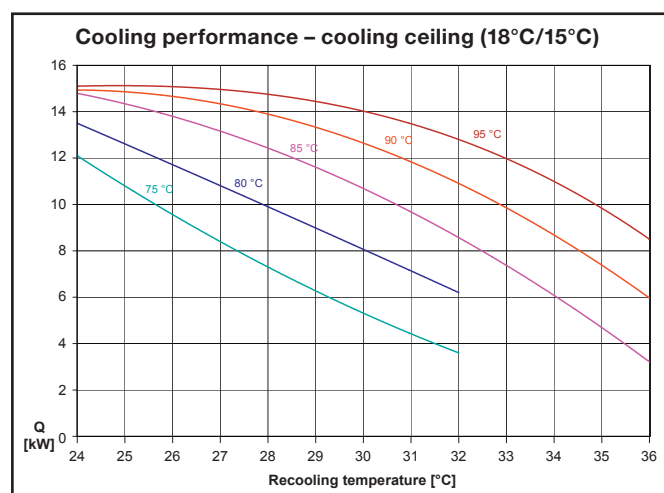
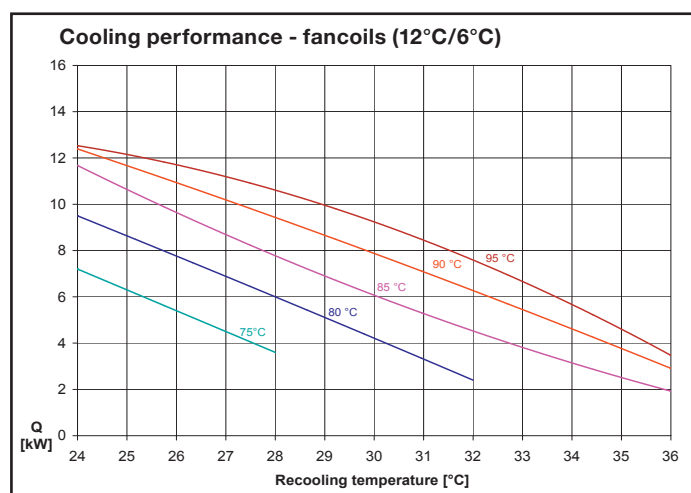
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® PSC12 Absorption chiller**
- **Wet cooling tower**
- Hot water loading pump
- Re-cooling pump
- Mixing valve
- Water treatment

Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® PSC12 performance curves



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chillii® PSC12 - Absorption Chiller



CLEAN ENERGY FOR YOU

Technical Data

Working pair: Ammonia / Water

Dimensions (LxDxH): 0.8 x 0.6 x 2.2 m

Operating weight: approx. 490 kg

Electrical input:

Voltage: 400 V ~3 Ph 50 Hz
Power: 300 W

Cold water cycle:

Cooling capacity:
Temperature in/out:
Flow rate:
Connection:

Hot water cycle:

Capacity:
Temperature in/out:
Flow rate:
Connection:

Recooling cycle:

Capacity:
Temperature in/out:
Flow rate:
Connection:

**Cooling ceiling
(nominal)**

12 kW
18 / 15°C
3.4 m³/h
1" internal thread

Fan coils

12 kW
12 / 6°C
1.7 m³/h

19.4 kW
85 / 78°C
2.4 m³/h

Wet cooling tower

30.5 kW
24 / 29°C
5.2 m³/h
1" internal thread

31.4 kW
24 / 29°C
5.4 m³/h

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chillii® Cooling Kit WFC18



CLEAN ENERGY FOR YOU

Why chillii® Cooling Kits?

- Optimal aligned system components
- "Plug and Play"
- Pre-configured Cooling Kit
- No separate configuring / dimensioning of components for customer necessary

Applications

Air conditioning

- Offices
- Hotels
- Residential buildings
- Banks
- Bakeries
- Supermarkets

Scope of services of SolarNext AG

Technical support

- Supply of design tools
- Installation manuals
- Technical service

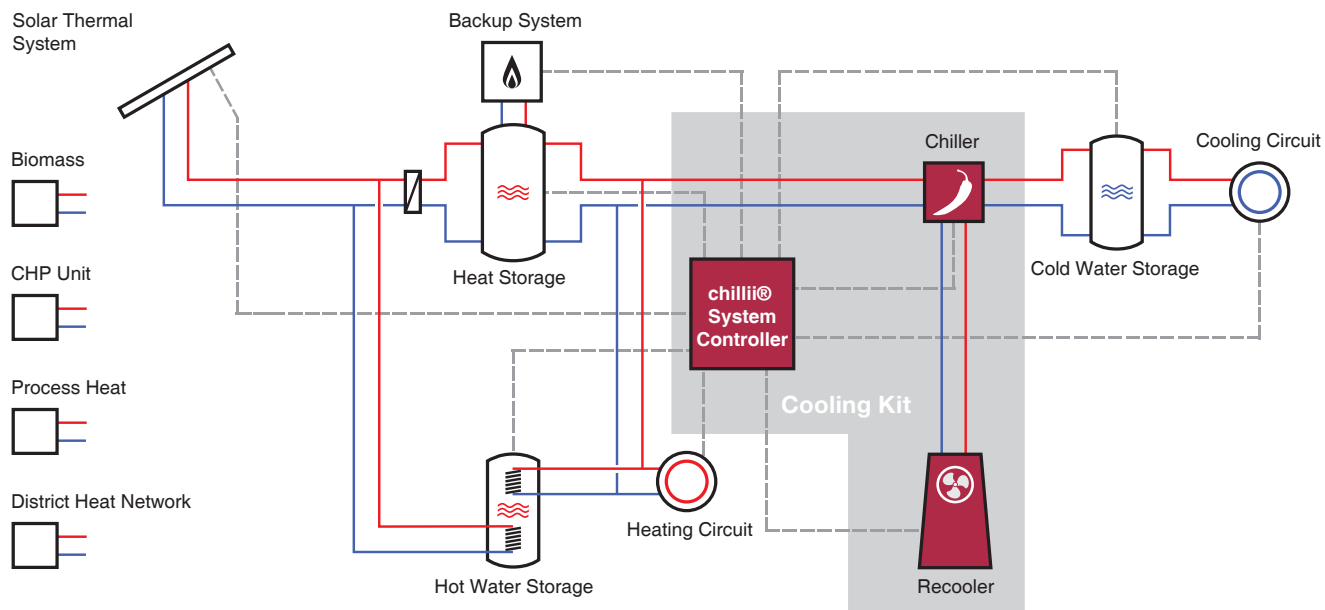
Sales support

- Economic consideration
- Marketing Support
- Negotiations with clients
- Product and sales trainings

Partner training

- Training courses for partners
- Commissioning and maintenance
- Exchange of experiences

chillii® Cooling Kit



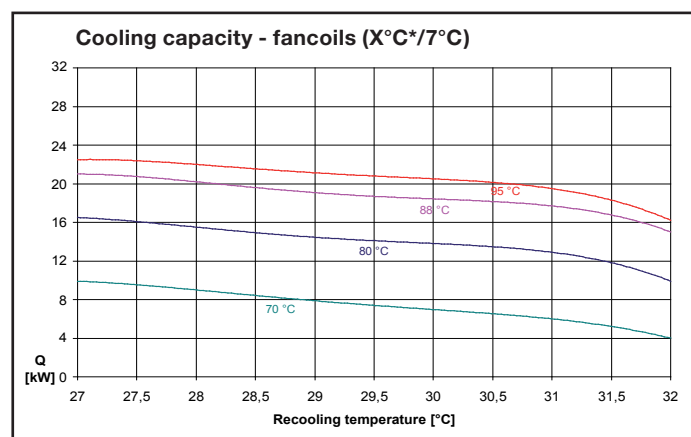
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® WFC18 Absorption chiller**
- **Wet cooling tower**
- Hot water loading pump
- Re-cooling pump
- Mixing valve
- Water treatment

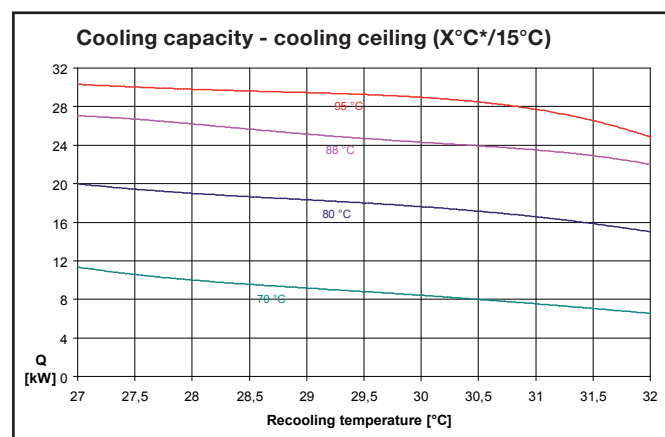
Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® WFC18 performance curves



* variable cold water inlet temperature



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chillii® WFC18 - Absorption Chiller



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Technical Data

Absorber:	Yazaki, Japan
Working pair:	Water / Lithium bromide
Dimensions (LxDxH):	0.6 x 0.8 x 1.94 m
Operating weight:	approx. 420 kg
Electrical input:	
Voltage:	240 V ~1 Ph 50 Hz
Power:	72 W

Cold water cycle:

Cooling Capacity:	17.5 kW
Temperature in/out:	20.5 / 15°C
Flow Rate:	2.8 m³/h
Connection:	1 ¼" internal thread

Hot water cycle:

Capacity:	24 kW
Temperature in/out:	82 / 78°C
Flow Rate:	4.3 m³/h
Connection:	1 ½" internal thread

Recooling cycle:

Capacity:	Wet cooling tower
Temperature in/out:	41.5 kW
Flow Rate:	31 / 35°C
Connection:	9.2 m³/h
	1 ½" internal thread

Cooling ceiling

17.5 kW
20.5 / 15°C
2.8 m³/h
1 ¼" internal thread

Fan coils (nominal)

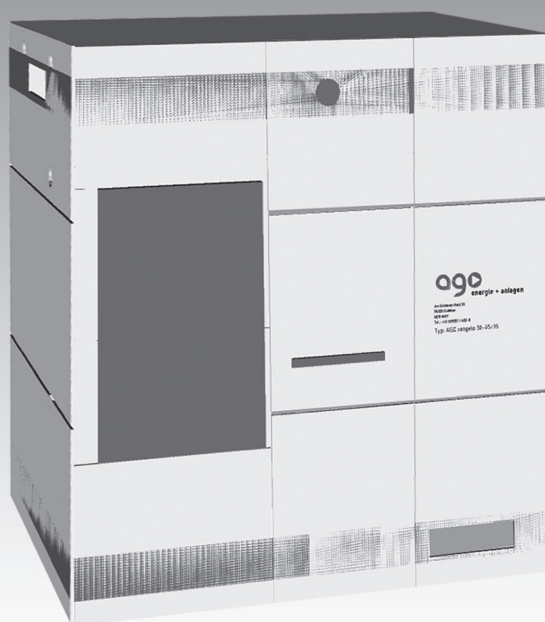
17.5 kW
12.5 / 7°C
2.8 m³/h

25.1 kW
88 / 83°C
4.3 m³/h

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chillii® ACC50 - Absorption Chiller



CLEAN ENERGY FOR YOU

Technical Data

			Process cold (nominal)	Fan coils
Absorber:	AGO AG, Germany	Cold water cycle:		
Working pair:	Ammonia / Water	Cooling capacity:	50 kW	50 kW
Dimensions (LxDxH):	2.35 x 1.65 x 2.63 m	Temperature in/out:	-5 / -10°C	12 / 6°C
Operating weight:	approx. 1600 kg	Flow rate:	7.6 m³/h	7.2 m³/h
Electrical input:		Connection:	DN 50 flange	
Voltage:	400 V ~3 Ph 50 Hz	Hot water cycle:		
Power:	3 kW	Capacity:	91.5 kW	81.5 kW
		Temperature in/out:	115 / 105°C	95 / 85°C
		Flow rate:	7.9 m³/h	7.0 m³/h
		Connection:	DN 50 flange	
		Recooling cycle:	Wet cooling tower	
		Capacity:	141.5 kW	131.5 kW
		Temperature in/out:	25 / 30°C	25 / 30°C
		Flow rate:	24.4 m³/h	22.7 m³/h
		Connection:	DN 50 flange	

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Adsorption Cooling Technology

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Adsorption chillers with water / silica gel or water / zeolith generate cold via a closed, periodical cycle.

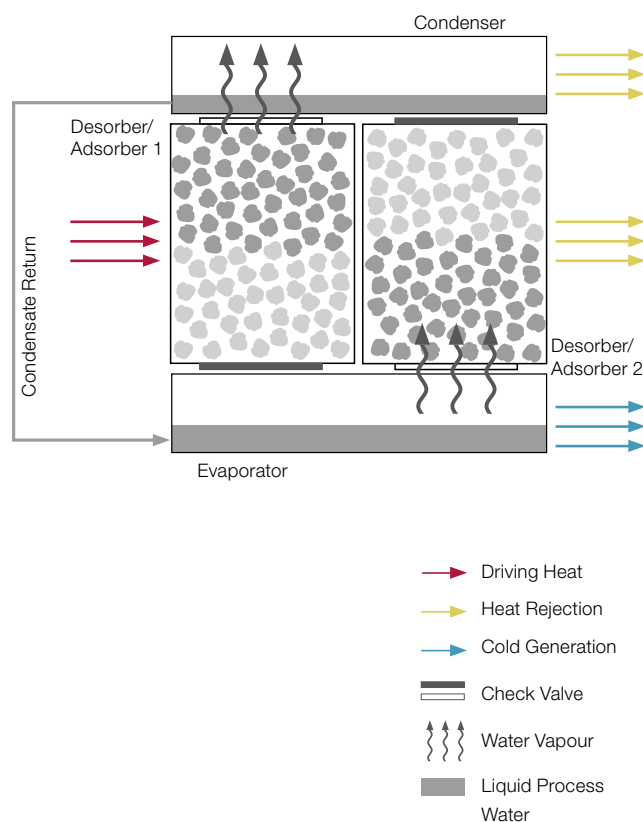
Using water as refrigerant, the evaporator temperature is limited to temperatures above freezing point down to 5 - 6 °C. Using silica gel adsorbers, the water is being desorbed at low temperatures between 60 and 70 °C; using zeolite adsorbers, higher temperatures above 90 °C are required.

Schematic description exemplified by our chillii® STC (water / silica gel):

The adsorption chiller consists of four main components: the desorber / adsorber 1, the condenser, the evaporator, and the desorber / adsorber 2. The adsorbent (silica gel) is dried out by applying heat. Vapour is generated, flows into the condenser, and is liquified, while heat is being rejected. When the material is sufficiently dried out, the heat input into the adsorber stops.

After the cooling phase, the liquid condensate re-reacts and evaporates. The dried adsorbent aspirates the vapour. Chilled water is generated via evaporation, and can be used for air-conditioning. During the adsorption process heat is being produced, which has to be removed by a cooling tower.

In a final step the condensate is conducted to the evaporator and the cycle is closed. To generate cold continuously, two adsorbers are driven anti-cyclic, which means that during desorption of one adsorber, the other one absorbs and generates cold.



Why adsorption technology ?

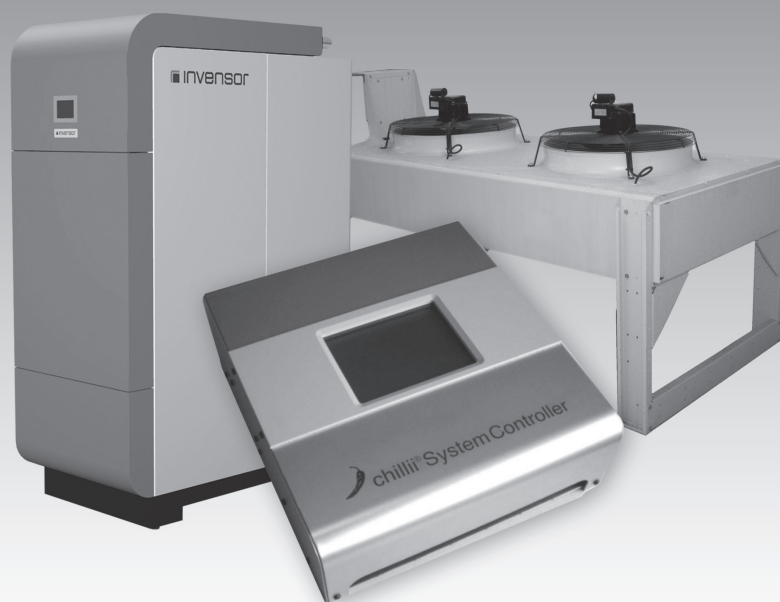
- Adsorption chillers are practically maintenance free (few mechanical parts)
- The service life of adsorption chillers is at least 20 years, but can also be significantly higher
- Adsorption chillers consume almost no electrical energy
- Using heat instead of electricity as driving energy reduces CO₂ - emissions
- Adsorption chillers use water as natural refrigerant which has no global warming potential (GWP)

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chillii® Cooling Kit ISC7



CLEAN ENERGY FOR YOU

Why chillii® Cooling Kits?

- Optimal aligned system components
- "Plug and Play"
- Pre-configured Cooling Kit
- No separate configuring / dimensioning of components for customer necessary

Applications

Air conditioning

- Offices
- Hotels
- Residential buildings
- Banks
- Bakeries
- Supermarkets

Scope of services of SolarNext AG

Technical support

- Supply of design tools
- Installation manuals
- Technical service

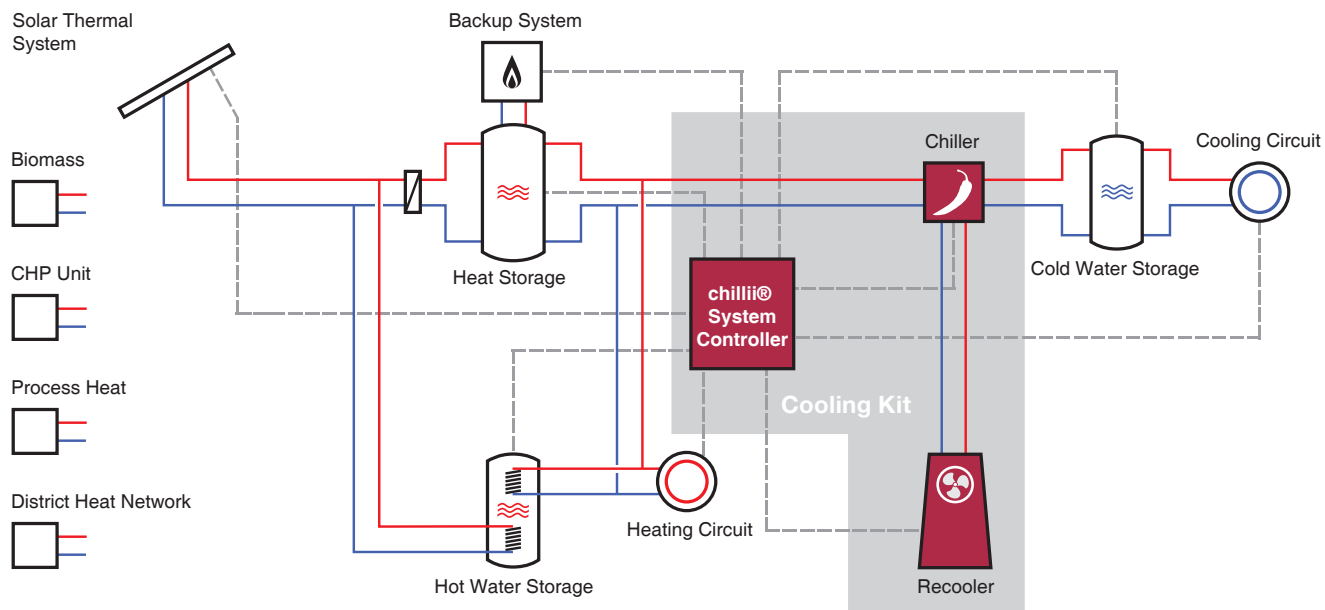
Sales support

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Partner training

- Training courses for partners
- Commissioning and maintenance
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chillii® Cooling Kit



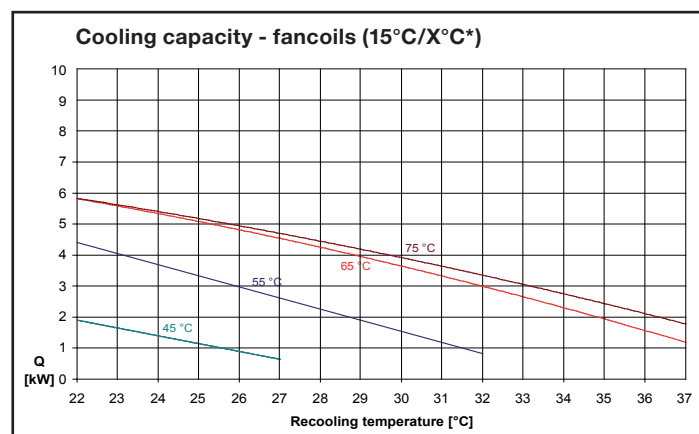
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® ISC7 Absorption chiller**
- **Dry cooler**
- Hot water loading pump
- Re-cooling pump
- Mixing valve

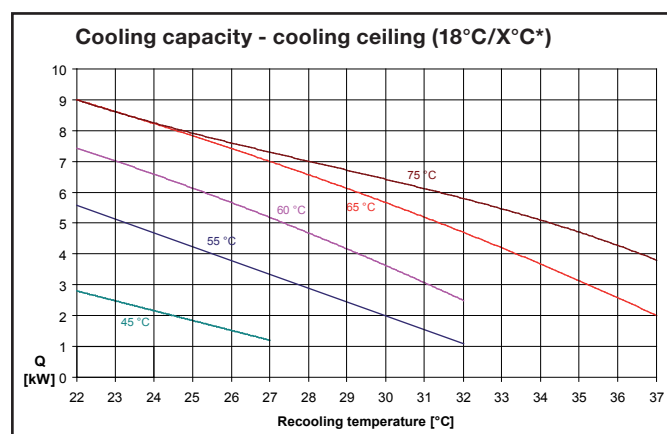
Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® ISC7 performance curves



* variable cold water outlet temperature

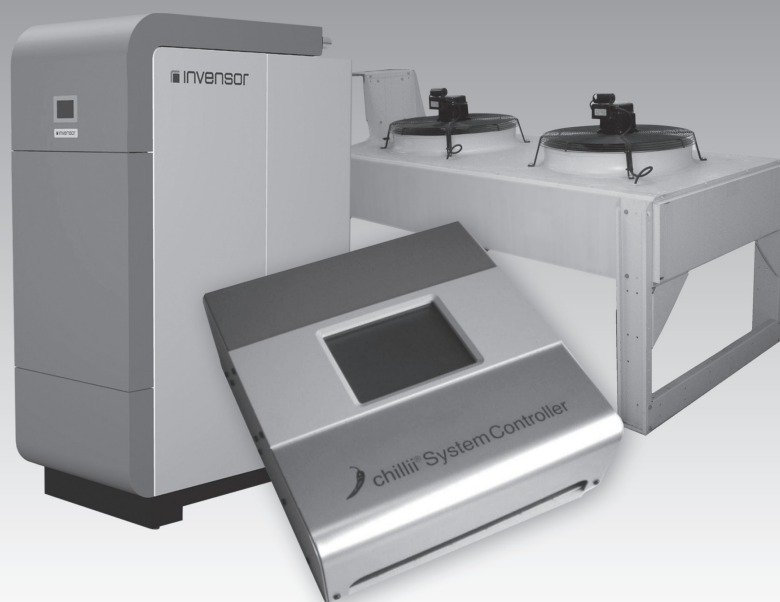


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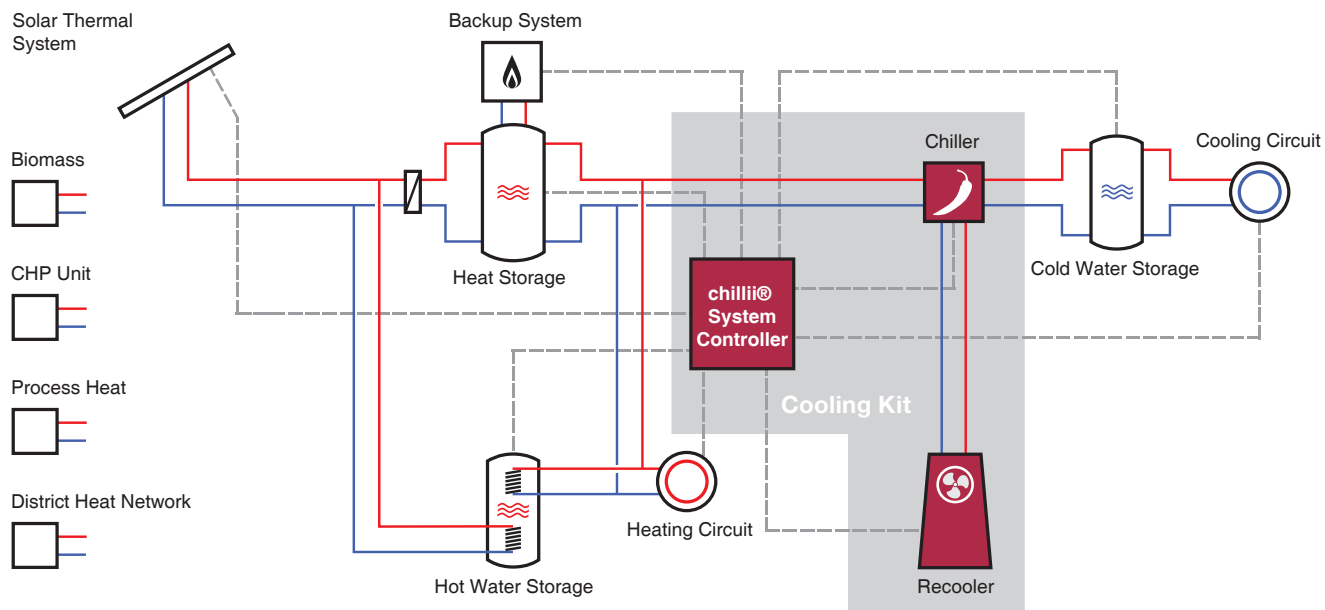
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- Product and sales trainings

Partner training

- Training courses for partners
- Commissioning and maintenance
- Exchange of experiences

chillii® Cooling Kit



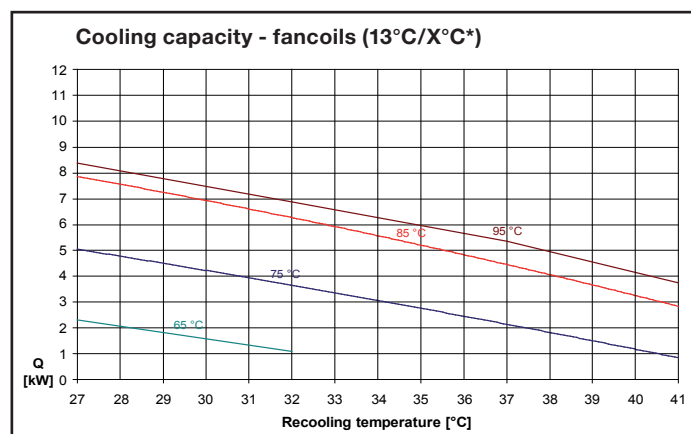
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® ISC10 Absorption chiller**
- **Dry cooler**
- Hot water loading pump
- Re-cooling pump
- Mixing valve

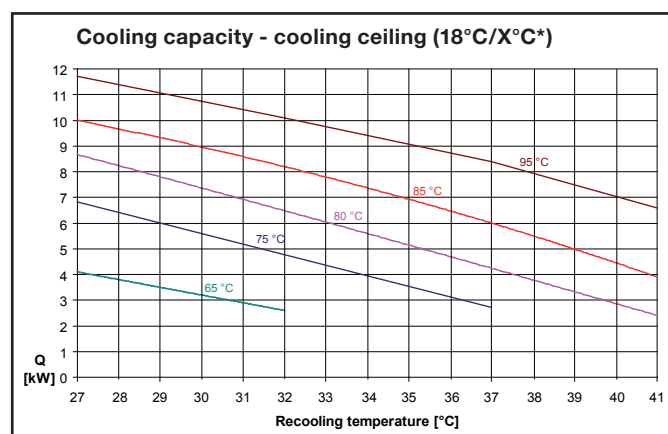
Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® ISC10 performance curves



* variable cold water outlet temperature



SolarNext AG

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chillii® ISC10 - Adsorption Chiller



CLEAN ENERGY FOR YOU

Technical Data

Adsorber: InvenSor GmbH, Germany

Working pair: Water / Zeolith

Dimensions (LxDxH): 0.65 x 1.3 x 1.65 m

Operating weight: approx. 370 kg

Electrical input:

Voltage: 230 V ~ 50 Hz
Power: 20 W

Cold water cycle:

Cooling capacity: 10 kW
Temperature in/out: 18 / 15°C
Flow rate: 2.9 m³/h
Connection: 1¼" external thread

Hot water cycle:

Capacity: 20 kW
Temperature in/out: 85 / 77°C
Flow rate: 2.2 m³/h
Connection: 1" external thread

Recooling cycle:

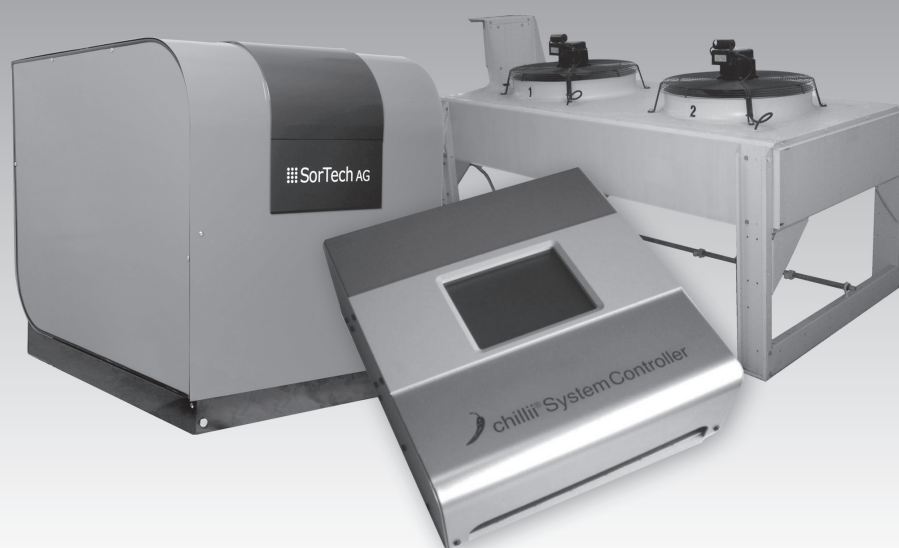
Dry cooler
Capacity: 30 kW
Temperature in/out: 27 / 33°C
Flow rate: 4.5 m³/h
Connection: 1¼" external thread

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chillii® Cooling Kit STC8



CLEAN ENERGY FOR YOU

Why chillii® Cooling Kits?

- Optimal aligned system components
- "Plug and Play"
- Pre-configured Cooling Kit
- No separate configuring / dimensioning of components for customer necessary

Applications

Air conditioning

- Offices
- Hotels
- Residential buildings
- Banks
- Bakeries
- Supermarkets

Scope of services of SolarNext AG

Technical support

- Supply of design tools
- Installation manuals
- Technical service

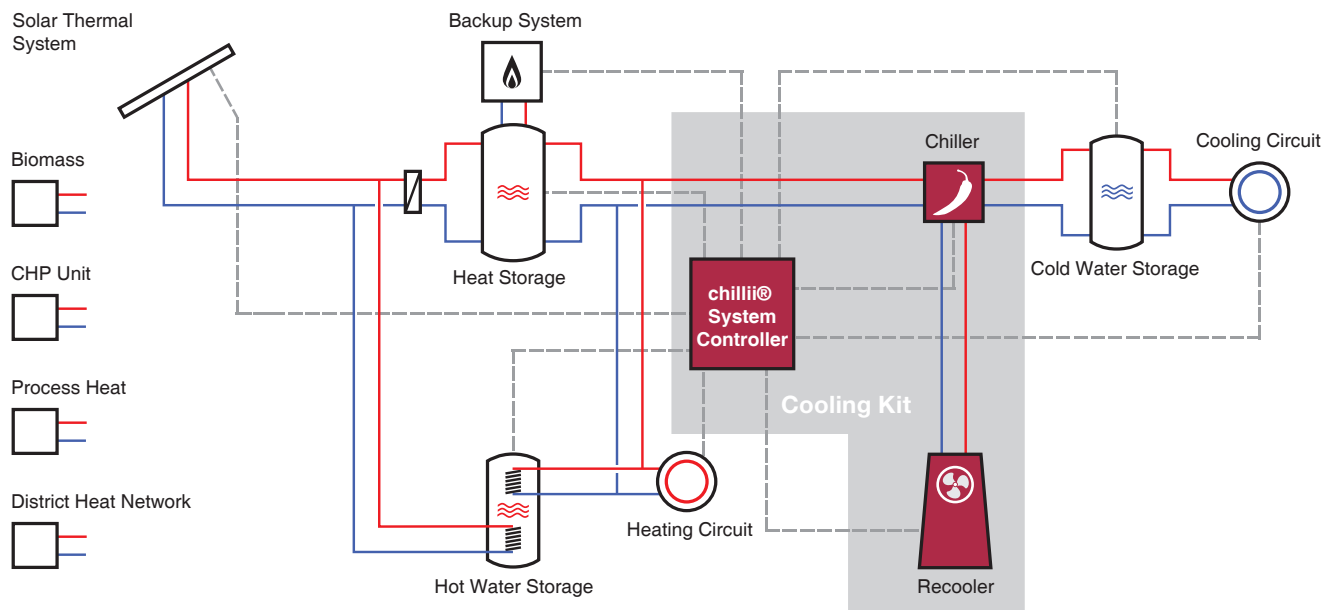
Sales support

- Economic consideration
- Marketing Support
- Negotiations with clients
- Product and sales trainings

Partner training

- Training courses for partners
- Commissioning and maintenance
- Exchange of experiences

chillii® Cooling Kit



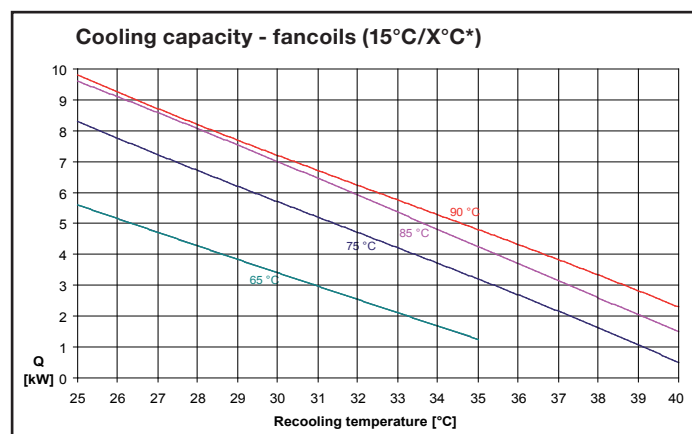
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® STC8 Absorption chiller**
- **Dry cooler with sprinkler**
- Hot water loading pump
- Re-cooling pump
- Mixing valve

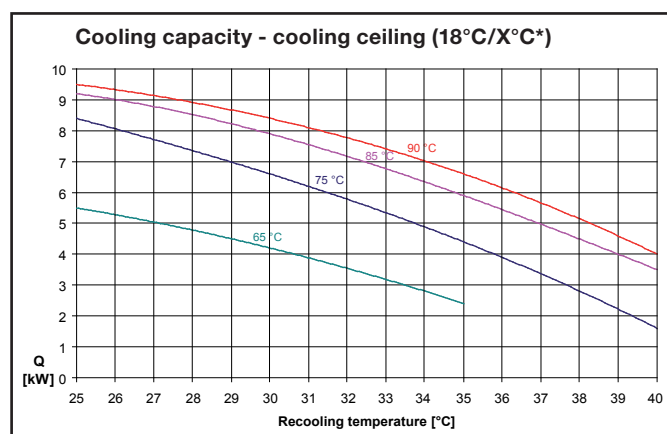
Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® STC8 performance curves



* variable cold water outlet temperature

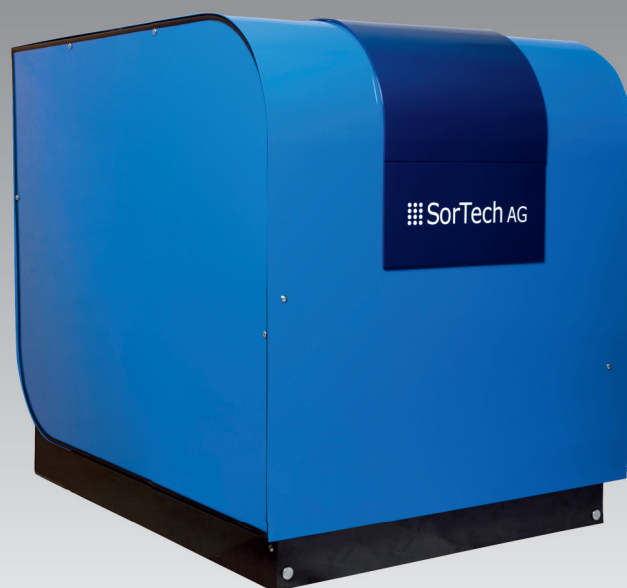


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chillii® STC8 - Adsorption Chiller



CLEAN ENERGY FOR YOU

Technical Data

Adsorber: SorTech AG, Germany

Working pair: Water / Silica Gel

Dimensions (LxDxH): 0.79 x 1.06 x 0.94 m

Operating weight: approx. 260 kg

Electrical input:

Voltage: 230 V ~ 50 Hz

Power: 57 W

Cold water cycle:

Cooling capacity: 7.5 kW

Temperature in/out: 18 / 15°C

Flow rate: 2.0 m³/h

Connection: 1" external thread

Hot water cycle:

Capacity: 13.4 kW

Temperature in/out: 75 / 68°C

Flow rate: 1.6 m³/h

Connection: ¾" external thread

Recooling cycle:

Dry cooler

Capacity: 20.9 kW

Temperature in/out: 27 / 32°C

Flow rate: 3.7 m³/h

Connection: 1" external thread

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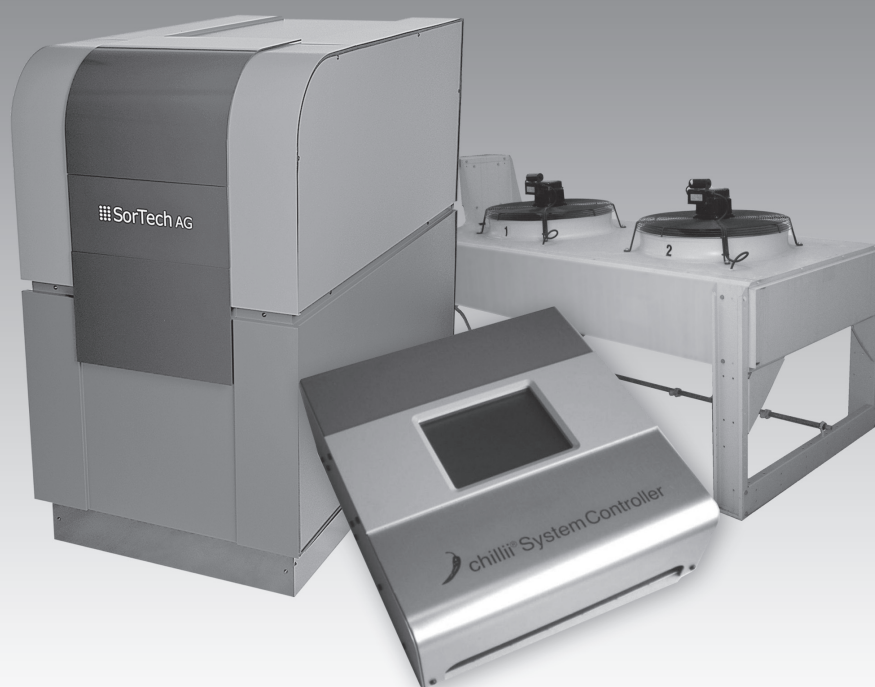
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chillii® Cooling Kit STC15



CLEAN ENERGY FOR YOU

Why chillii® Cooling Kits?

- Optimal aligned system components
- "Plug and Play"
- Pre-configured Cooling Kit
- No separate configuring / dimensioning of components for customer necessary

Applications

Air conditioning

- Offices
- Hotels
- Residential buildings
- Banks
- Bakeries
- Supermarkets

Scope of services of SolarNext AG

Technical support

- Supply of design tools
- Installation manuals
- Technical service

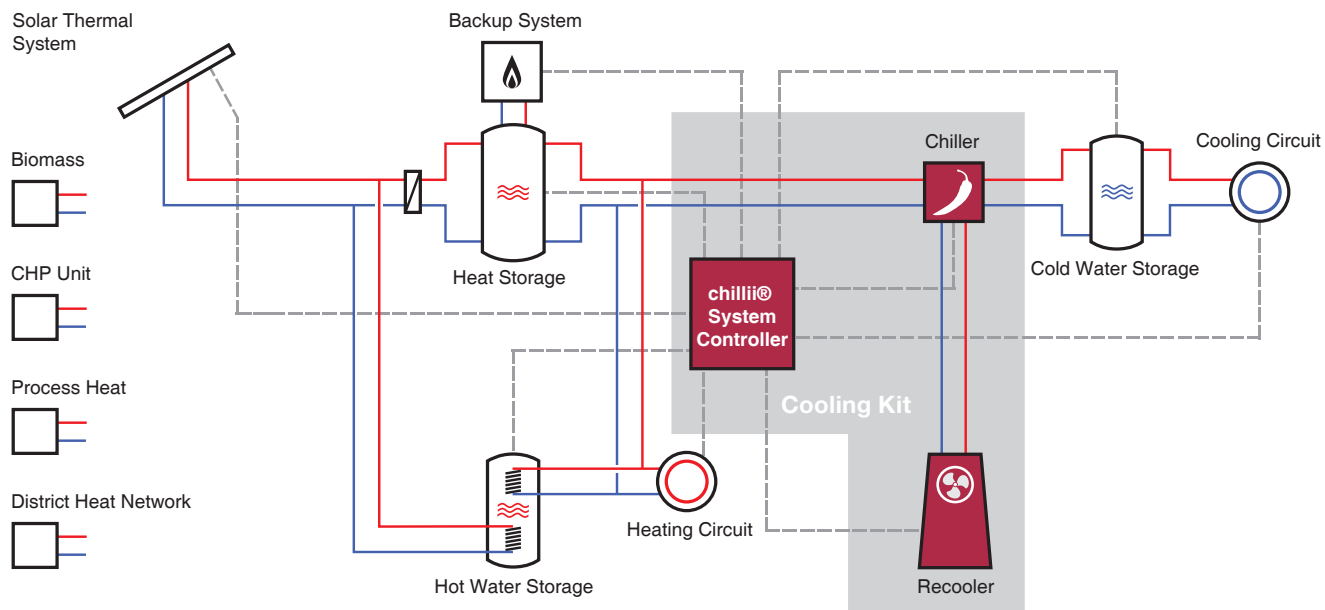
Sales support

- Economic consideration
- Marketing Support
- Negotiations with clients
- Product and sales trainings

Partner training

- Training courses for partners
- Commissioning and maintenance
- Exchange of experiences

chillii® Cooling Kit



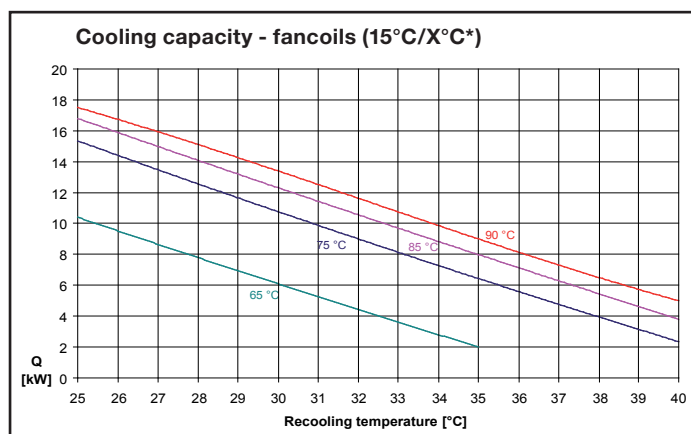
chillii® Cooling Kit components (base version)

- **chillii® System Controller**
- **chillii® STC15 Absorption chiller**
- **Dry cooler with sprinkler**
- Hot water loading pump
- Re-cooling pump
- Mixing valve

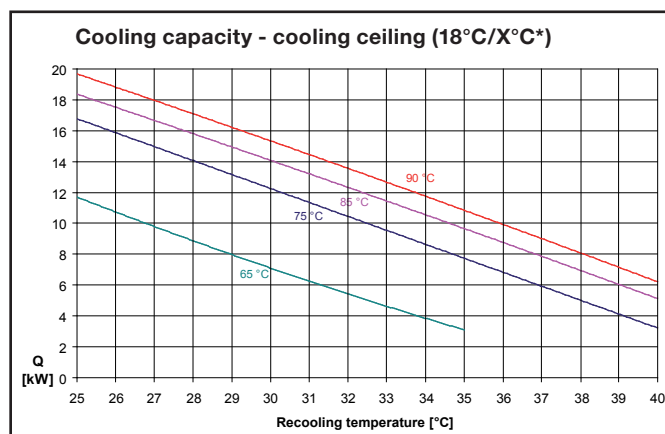
Optional extensions

- Solar package
- Storage package
- Distribution package
- Additional components

chillii® STC15 performance curves



* variable cold water outlet temperature



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chillii® STC15 - Adsorption Chiller



CLEAN ENERGY FOR YOU

Technical Data

Adsorber: SorTech AG, Germany

Working pair: Water / Silica Gel

Dimensions (LxDxH): 0.79 x 1.35 x 1.45 m

Operating weight: approx. 510 kg

Electrical input:

Voltage: 230 V ~ 50 Hz
Power: 30 W

**Cooling ceiling
(nominal)**

Cold water cycle:
Cooling capacity: 15 kW
Temperature in/out: 18 / 15°C
Flow rate: 4.3 m³/h
Connection: 1¼" external thread

Hot water cycle:
Capacity: 26.8 kW
Temperature in/out: 75 / 69°C
Flow rate: 3.8 m³/h
Connection: 1¼" external thread

Recooling cycle:
Capacity: 41.8 kW
Temperature in/out: 27 / 32°C
Flow rate: 7.0 m³/h
Connection: 1¼" external thread

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