

B-series**CHILLER COOLING STATIONS**

The Adwatec B-series water cooling stations are closed loop liquid cooling solutions designed especially to cool down **energy storage systems**.

Customized cooling solutions are built from Adwatec standard modules. A modular structure and multiple available options such as different size and type of heat exchangers and pumps ensure the optimized solution with suitable cooling power and flow rate.

Structure of the cooling station is based on DNV-GL type approved C-series cooling stations.

KEY FEATURES

- **Temperature control** with 3-way valve to ensure a constant temperature and to avoid condensation at batteries
- **Patented leakage detection system** to detect even the smallest leakages in the coolant circuit
- **PLC control system** including fully tested functions, alarm history, fieldbus etc.
- **The constant pressure system** keeps the batteries inlet pressure at certain level even if a cooling branch would be isolated during maintenance.
- **A buffer tank ensures long lifecycle for the chiller and compensates short heat load peaks of batteries.**
- **Minimum footprint with maintenance-friendly layout**



Cooling station BCC104R-3-10S-W-B0-F6-0

Project-specific approvals with following classification societies:



PRODUCT KEY

COMPONENT	ALTERNATIVES	CODE	EXAMPLE CODE
Cooling unit	Open frame	BCE	BCE
	With cabinet	BCC	
Pump size	3-6	36	104
	5-6	56	
	10-4	104	
	15-3	153	
	32-2	322	
Number of pumps	Single	S	R
	Redundant	R	
Bypass valve	PLC-controlled 3-way valve	3	3
Chiller module acc. Max constant cooling power (selecting guide at page 4)	BCD10	10S	20S
	BCD20	20S	
	BCD30	30S	
	BCD60	60S	
	Combination of BCD modules	[x]D	
Secondary (condenser) circuit type	Standard water-to-water condenser	W	W
	Water-to-air heat exchanger + circuit	E	
	Sea water resistant heat exchanger + circuit	T	
Free cooling module	No free cooling module	0	0
	Free cooling module included	F	
Buffer tank size	Standard 50L, integrated into BCD	B0	B0
	External buffer 200L	B2	
	External buffer 400L	B4	
	External buffer 800L	B8	
	External buffer, other sizes	BX	
Supply voltage and frequency	50 Hz, 380 – 480 V	D5	D5
	60 Hz, 380 – 480 V	E6	
	50 Hz, 660 – 690 V	F5	
	60 Hz, 660 – 690 V	F6	
Remote control / monitoring	Hardwired, no fieldbus	0	0
	Profinet	N	
	Profibus	B	
	DNP3	D	
	Modbus TCP	M	

Product key writing example: **BCE104R-3-20S-W-0-B0-D5-0**

TECHNICAL DATA

Control system	Siemens PLC S7 control system + HMI as a standard
Pump frequency converter(s)	Included as a standard
IP class	IP44 without cabinet
Pressure class	PN6

PUMP MODULE						
		BCE36S / BCE36R	BCE56S / BCE56R	BCE104S / BCE104R	BCE153S / BCE153R	BCE322S / BCE322R
Dimensions (height 2100mm as an open frame solution)	mm	W300 x D575 / W500 x D575	W300 x D575 / W500 x D575	W500 x D575 / W500 x D575	W500 x D595 / W500 x D595	W550 x D715 / W690 x D745
Flow rate range (max flow rate depends on the pressure losses)	l/min	15–90	50–170	100–250	175–470	300-800
Connection pipe size class		DN20	DN32	DN40	DN50	DN65
Max power consumption	kW	1,1	2,2	3	4	7,5
Dry weight	kg	180	200	230	290	660

CHILLER MODULE					
		BCD10	BCD20	BCD30	BCD60
Add-on dimensions	mm	W600 x D575	W600 x D575	W600 x D700	W900 x D750
Nominal cooling power	kW	10	20	30	60
Max power consumption @ 50 / 60 Hz	kW	2,9 / 2,9	5,6 / 5,5	7,7 / 8,3	18,0 / 14,8
Evaporator / buffer tank circuit, flow rate	l/min	~35	~65	~100	~170
Condenser circuit flow rate	l/min	~55	~100	~150	~270
Condenser circuit inlet temp (1)	°C	Optimal area: 25–38. Special sizing area: 38–55			
Add-on dry weight	kg	230	270	330	380
Refrigerant		R513A			

BUFFER TANK MODULE					
		B0	B2	B4	B8
Coolant volume	liter	40	200	400	800
Add-on dimension	mm	-	W420 x D420	W600 x D600	W720 x D720
Add-on dry weight	kg	-	150	200	250
Energy compensation	kJ/°C	159	795	1590	3180

(1) If condenser circuit inlet temperature is lower, the thermostatic bypass valve needs to be added.

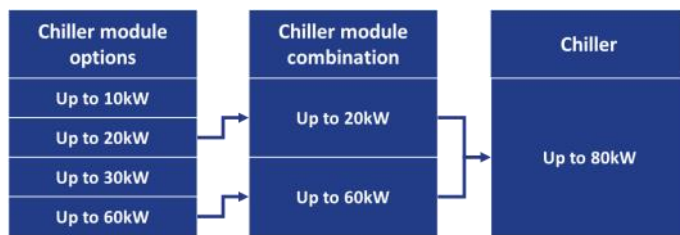
Use the cooling module selecting guides on next page or ask Adwatec to take care the sizing

COOLING MODULE SIZING GUIDES

Chiller module selection

Chiller and pump station are selected separately in battery cooling stations.

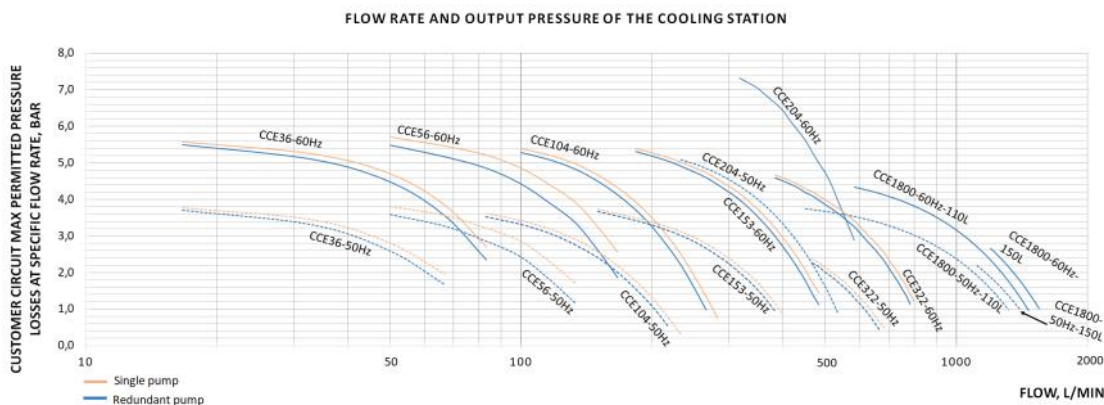
Desired cooling capacity can be obtained by selecting the chiller module or combination of chiller modules.



Select chiller modules from options and create chiller with desired cooling capacity

Pump station selection

Pump station can be selected from flow and pressure curve by selecting the cooling circuit pressure losses and desired flow.



Buffer tank selection

Chiller cooling power is configured to nominal heat load. Heat load peaks are compensated with buffer tank sizing. **Needed cooling energy compensation is calculated by Adwatec**, but preliminary values can be calculated with instructions shown below.

Total energy compensation can be calculated in 4 steps.

1. Reduce the Chiller cooling power from heat load peak (equation 1) and calculate the needed cooling energy with equation 2.

1. *Needed cooling power [kW] = Heat load peak [kW] – Chiller cooling power [kW]*
2. *Needed cooling energy [kJ] = Needed cooling power [kW] * peak duration [s]*

2. Calculate the coolant energy compensation by using the equation 3 and table 1.

$$3. \text{Coolant energy compensation} = \text{Coolant line [kJ/}^\circ\text{C]} * \Delta T_{\text{Coolant line}}$$

Table 1. Buffer tank / Coolant energy compensation

Coolant volume	liter	50	100	200	300	400
Energy compensation	kJ/°C	199	397	795	1192	1590

$\Delta T_{\text{coolant line}}$ is the allowed deviation in coolant temperature. Coolant volumes can be summed up from values in tables 1 and 2. For example 250 liter volume energy compensation is:

$$795 \text{ kJ/}^\circ\text{C} + 199 \text{ kJ/}^\circ\text{C} = 994 \text{ kJ/}^\circ\text{C}$$

Table 2. Battery energy compensation

Battery mass	kg	1000	5000	10000	20000	40000
Energy compensation	kJ/°C	896	4480	8960	17920	35840

Same applies for battery mass and energy compensation.

3. Calculate the battery energy compensation by using the table 2 and equation 4.

$$4. \text{Battery energy compensation} = \text{Battery [kJ/}^\circ\text{C]} * \Delta T_{\text{battery}}$$

4. Select the buffer tank size so total energy compensation is higher than the needed cooling energy by using table 1 and equations 5, 6 and 7.

$$5. \text{Buffer energy compensation} = \text{Buffer [kJ/}^\circ\text{C]} * \Delta T_{\text{buffer}}$$

$$\Delta T_{\text{buffer}} = 10^\circ\text{C (may vary)}$$

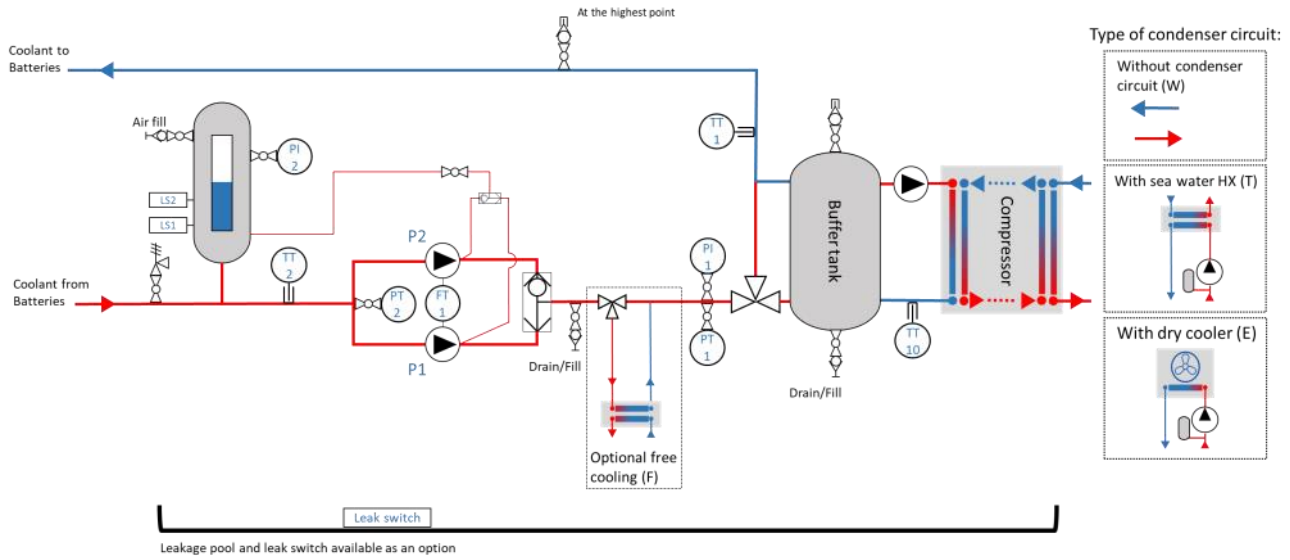
$$6. \text{Total energy compensation} =$$

$$\text{Coolant energy compensation [kJ]} + \text{Battery energy compensation [kJ]} + \text{Buffer energy compensation [kJ]}$$

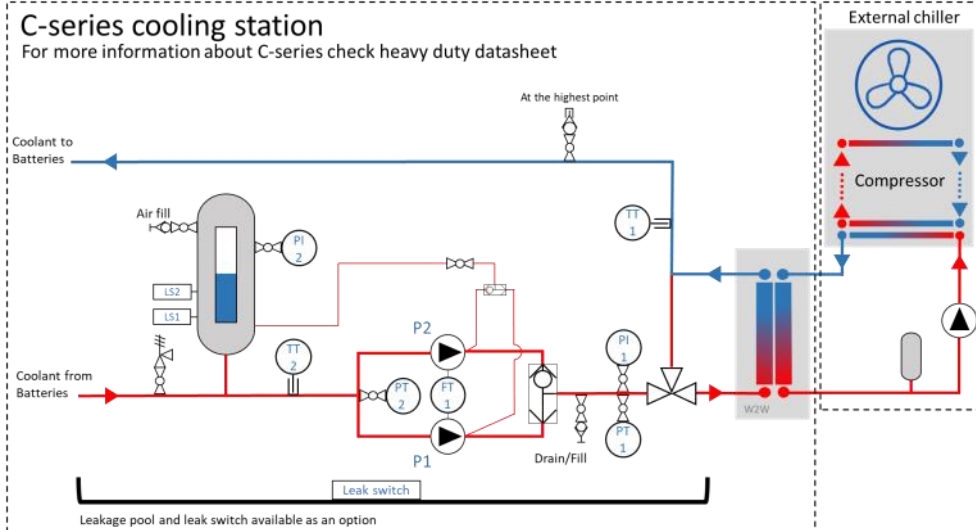
$$7. \text{Total energy compensation} > \text{Needed cooling energy}$$

PROCESS DIAGRAM EXAMPLES

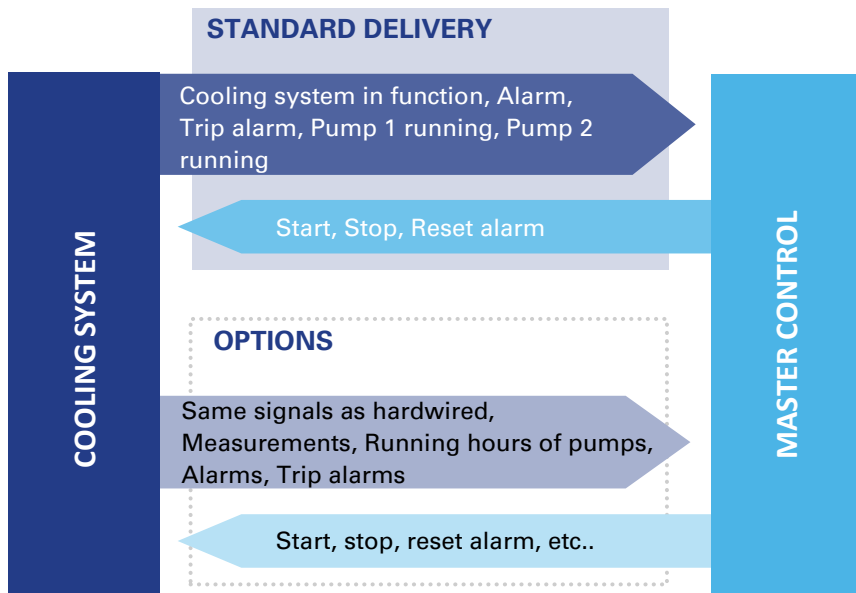
Case 1: All in one frame / room



Case 2: When an inroom chiller station is not possible



REMOTE CONTROL / MONITORING



ACCESSORIES

CATEGORY	NAME	STANDARD (X) OPTION (O)	TYPE CODE ⁽¹⁾	
Sensor measurements (locations shown in P&ID at page X)	Temperature sensor x2	X	AD0005035	
	Pressure sensor x2	X	AD0005036	
	Tank level switch x2	X	AD0005037	
	Coolant flow rate calculation	X	AD0005038	
	Leakage detector sensor	O	AD0005039	
	Ambient temperature sensor	O	AD0005040	
process instrumentation, internal	Pressure gauge (1pcs)	X	AD0005041	
	Tank coolant level visual indicator	X	AD0005042	
	Sight glass (to see the coolant quality)	X	AD0005043	
	Pressure relief valve	X	AD0005044	
Process instrumentation, outside of the frame	Leakage pool (compatible with Rittal VX25 cabinet)	O	AD0005045	
	Additional frequency converter (model: Vacon100)	O	AD0005046	
	Additional draining valve assembly	O	AD0005047	
	Additional air bleeding valve assembly	O	AD0005048	
	Coolant de-ionizator module (de-ionizer + filtration + sensors)	O	AD0005049	
	Electric 3kW pre-heater for coolant	O	AD0005050	
	Additional expansion tank for large scale w-2-a systems	O	AD0005051	
	Shut-off ball valve, welded	O	AD0005052	
	Shut-off butterfly valve, flange connection	O	AD0005053	
	Flow control valve, welded, stainless steel	O	AD0005054	
	Rotameter (=local flow indicator)	O	AD0005055	
	Flow control valve with integrated flow indicator (brass)	O	AD0005056	
	Flow sensor, Vortex, 4..20mA	O	AD0005057	
	Strainer, Y-type, filtration grades 0,3 / 0,5 / 1 mm	O	AD0005058	
	Bag filter, filtration grades starting from 0,01 mm (=10 µm)	O	AD0005059	
	Sea water circuit project-specific filtration kit	O	AD0005060	
	Sea water pump, project-specific sizing	O	AD0005061	
	Portable make-up pump set	O	AD0005062	
	Piping	Standard connection pipe set, power electronics circuit	O	AD0005063
		Standard connection pipe set, technical water circuit	O	AD0005064
Project-specific connection pipes, stainless steel		O	AD0005065	
Project-specific connection pipes, sea water resistant		O	AD0005066	
Pipe rubber joint, anti-vibration element, flange connection		O	AD0005067	
Additional pipe clamp (Axilock-type)		O	AD0005068	
Accessories	Frame vibration damper set	O	AD0005069	
	AdwaCoolant - ready ethylene-glycol based coolant mixture	O	AD0005070	
Classifications	Project-specific survey report by any classification society	O	AD0005071	

(1) Type code is a generic code. Check a specific code for right-size and type component from option catalogue.