Installation and Operating Manual

Cowa COMPACT Cell DHW

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1 Introduction

The Cowa COMPACT Cell DHW is a compact thermal battery that serves as a hot water heater. Thanks to its special thermal storage technology based on phase change materials (PCM), cold water is heated on demand using the flow-through heater principle. The following sections provide more information about the product as well as instructions for installing and operating the Cowa COMPACT Cell.

2 Product Description

2.1 Functionality

Phase change materials are substances that store energy through a phase change by absorbing or releasing heat. Cowa uses materials in its heat storage systems that change their state between solid and liquid. This phase change occurs at a specific temperature, referred to as the melting point or freezing point. During the melting process, large amounts of energy are absorbed and stored without loss and then released again during the freezing process. The phase change is a purely physical process and thus loss-free and reversible. By exploiting the phase change, up to 250 J/g (95 kWh/m³) of thermal energy can be stored. Over a defined temperature delta ΔT, this results in a specific storage density that is several times higher than that of water.

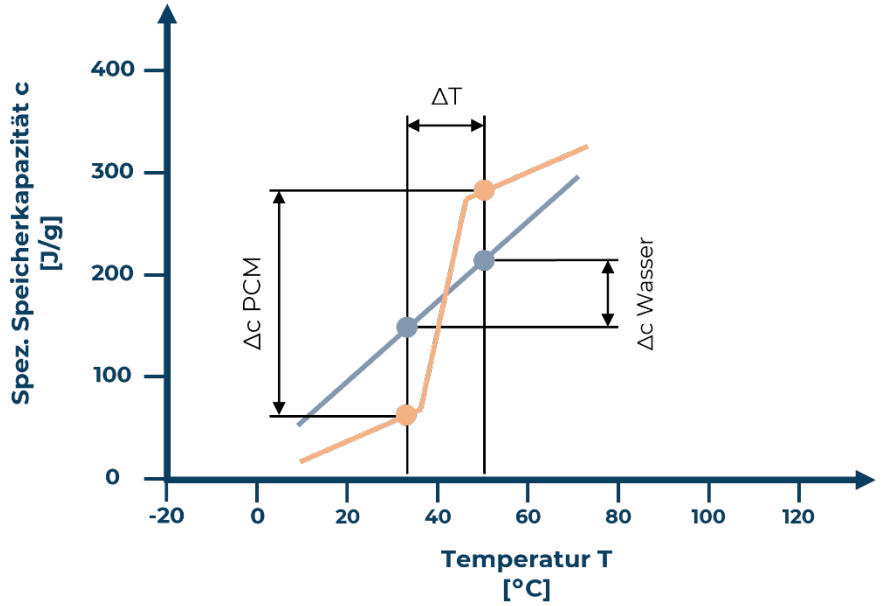

Figure 1: Graphical representation of PCM storage capacity compared to water

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In the COMPACT Cell, PCM is used in combination with a heat exchanger. During a charging process, the PCM is melted via hot heating water; during a discharging process, cooled heating water is heated using the heat from the PCM. The use of the heat exchanger offers two main advantages: firstly, the water never comes into contact with the PCM, and secondly, the COMPACT Cell housing can be designed as a non-pressurized system. Additionally, this technology has the advantage that fresh water is heated on demand, which reduces the risk of legionella formation to a minimum.

2.2 Advantages

The Cowa COMPACT Cell technology offers many advantages compared to a conventional hot water storage tank.

Most compact heat storage

The use of Cowa PCM results in an energy density that is 2 to 3 times higher compared to conventional systems. This either significantly reduces the required space or greatly increases the storage capacity.

Hygiene storage tank

The drinking water is heated using the instantaneous water heater principle. This minimizes the amount of standing water and prevents the risk of legionella.

Cubic shape

The Cowa COMPACT Cell housing is non-pressurized, which enables a cubic shape. The dimensions are coordinated so that the storage unit can be easily transported and installed.

Simple installation and planning

Thanks to its modular and compact design, the Cowa COMPACT Cell can be easily integrated into an overall system, especially in existing buildings, without major construction work.

Low maintenance and corrosion-resistant

The storage container is made entirely of plastic and is corrosion-free. There is no need for a sacrificial anode or similar protective devices. The heat exchangers are made of copper pipes approved for drinking water.

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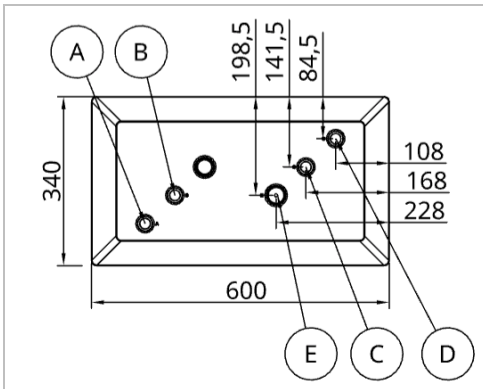
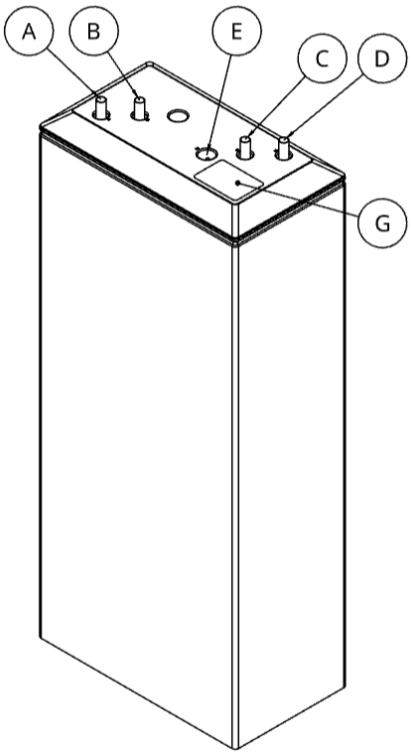
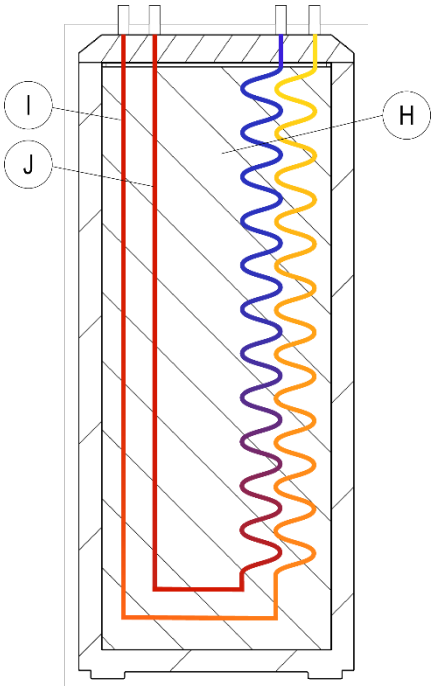
2.3 Design and Components



A	Charging circuit flow (22mm copper pipe)
B	Hot water connection (22mm copper pipe)
C	Cold water connection (22mm copper pipe)
D	Charging circuit return (22mm copper pipe)
E	Immersion sleeve for temperature sensor(s)
F	COMPACT Cell casing (including insulation)
G	Nameplate
H	Phase change material (PCM)
I	Heat exchanger for heating circuit
J	Heat exchanger for drinking water circuit





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2.4 Accessories

Hydraulic connection

The connections can either be mounted directly onto the copper pipes of the COMPACT Cell or via the optionally supplied push-fit connections (Nyffenegger sudoFIT).

WARNING: The pipes of the Cowa COMPACT Cell are permanently installed. If press fittings are used, the pipes may not be able to be cut and re-pressed.

Examples:

- Nyffenegger sudoFIT
- VSH Tectite connector IG/IG Typ 316 22x3/4''
- VSH Tectite connector IG/IG Typ 316 22x1''

Emergency Heating

If the heat pump does not have an integrated emergency heating function, we recommend installing an external electric auxiliary heater.

Example:

- ASKOMA PV Elektro OP
- ASKOMA Askoheat+ 2.0 PV Elektro AHIR-TI-plus
- Tenko SDKE 9-400 (with circulation pump)

2.5 Optional Accessories

Scald Protection

At water temperatures above 60°C, there is a risk of scalding. By installing a scald protection device, the hot water temperature can be continuously adjusted and limited to between 35 - 60°C.

Example:

- Scald protection VTA32

Storage Expansion

If the storage capacity of a single Cowa COMPACT Cell is insufficient, multiple COMPACT Cells can be connected in parallel. It is important to ensure that both the heating and the domestic water circuits are connected according to the Tichelmann principle.

3 Installation

3.1 General Requirements

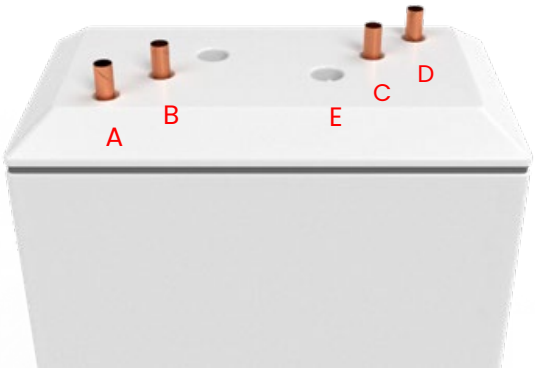
a) Dynamic minimum pressure of the water supply = 1.5 bar
b) Dynamic maximum pressure of the water supply = 6.0 bar

3.2 Requirements for the Heat Pump

COMPACT Cell DHW 48	COMPACT Cell DHW 58
• Modulating heat pump • Possible flow temperature: min. 57°C • Possible return temperature: min. 52°C • Setpoint can be set to 55°C (see Chapter 5.1)	• Modulating heat pump • Possible flow temperature: min. 65°C • Possible return temperature: min. 60°C • Setpoint can be set to 62°C (see Chapter 5.1)

3.3 Connection of Cold and Hot Water Supply Lines

The COMPACT Cell has four connections. Two are used for charging the COMPACT Cell (A & D), B is connected to the hot water, and C to the cold water. At position E, an immersion sleeve is pre-installed to allow the use of a temperature sensor.



A: Charging circuit flow
B: Hot water connection
C: Cold water connection
D: Charging circuit return
E: Position for temperature sensor

The connections can either be mounted directly onto the copper pipes of the COMPACT Cell or via the optionally supplied push-fit connections (Nyffenegger sudoFIT).

WARNING: The pipes of the Cowa COMPACT Cell are permanently installed. If press fittings are used, the pipes may not be able to be cut and re-pressed.

3.4 Requirements for the Water Distribution Network

The water distribution network must be planned and dimensioned to meet the requirements of the relevant sections of the drinking water guidelines W3/E3.

3.5 Requirements for the Heating Water

To prevent corrosion and deposits, standard engineering practices must be followed. The heating water must be demineralized and should have a conductivity of < 100 µS/cm.

3.6 Requirements for the Drinking Water

To prevent corrosion and deposits, standard engineering practices must be followed. In regions with hard water, where the hardness of the tap water may exceed 15 °fH total hardness, a descaling device must be installed at the cold water inlet of the thermal storage tank to reduce lime build-up.

Water hardness (French unit):	< 15 °fH
Water hardness (German unit):	< 8,4 °dH
Water hardness (American unit):	< 150 ppm

If these values are not maintained, the service life may be shortened. The operator bears full responsibility in this case.

3.7 Connecting a Temperature Sensor

If a temperature sensor is used, it can be inserted at position E. The sensor should be inserted approximately 60 cm into the immersion sleeve.

4 Hydraulics

The Cowa COMPACT Cell DHW can be integrated as a standalone domestic water heater. It is also possible to combine it with a buffer storage tank. Cowa also offers a solution for this: the Cowa COMPACT Cell SH.

4.1 Cowa Domestic Water Heater

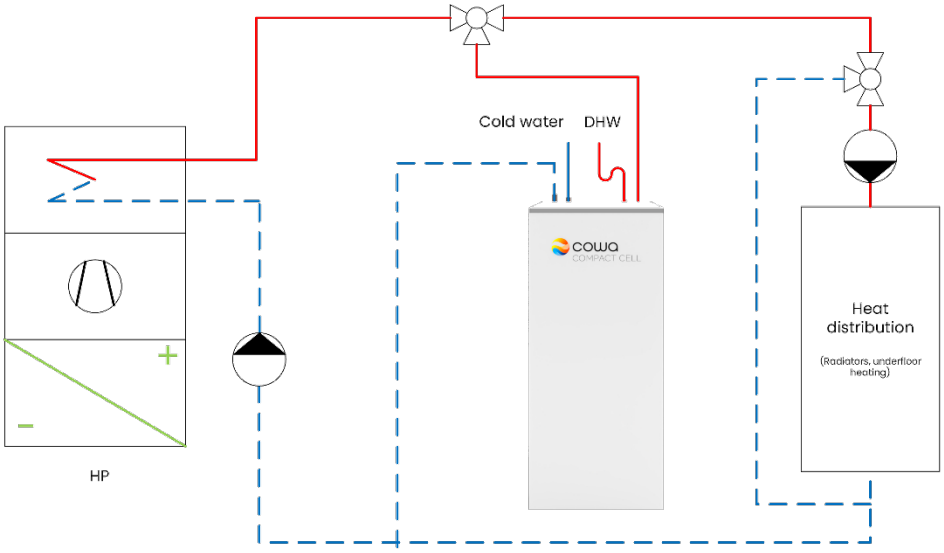


Figure 2: Connection schematic for integrating the Cowa COMPACT Cell DHW as a domestic hot water heater

4.2 Cowa Domestic Water Heater + Cowa Buffer Storage Tank

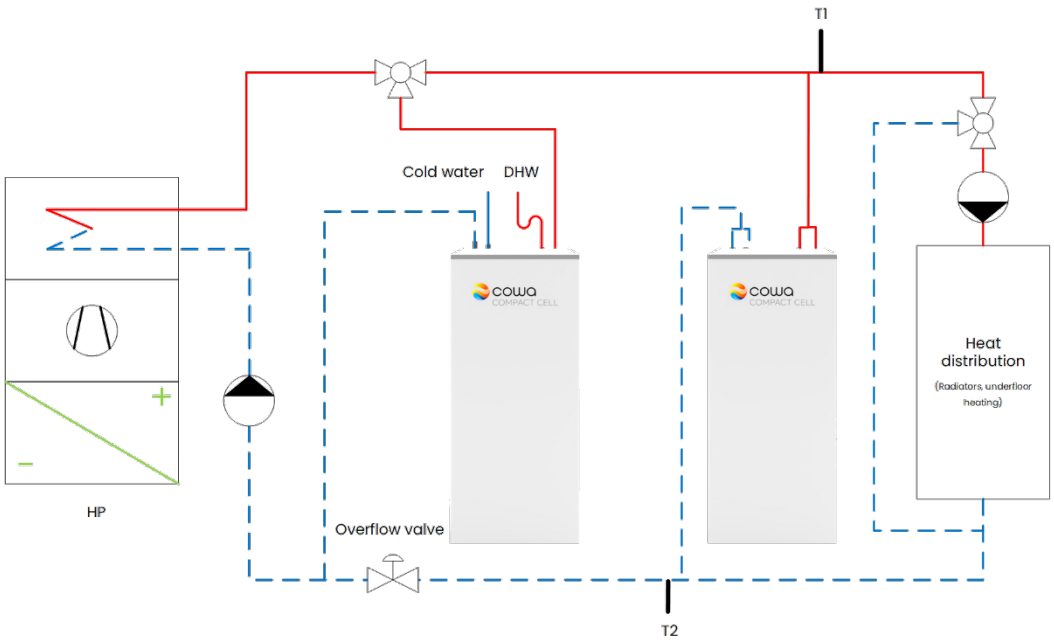


Figure 3: Connection schematic for integrating the Cowa COMPACT Cell DHW as a domestic hot water heater in combination with the Cowa COMPACT Cell SH

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5 Operation

5.1 Setpoint Settings

In normal operation, the COMPACT Cell DHW is charged up to the upper setpoint by a domestic hot water loading cycle. If the measured temperature falls below the lower value (approx. 50% charge level), the heat pump switches on to carry out another domestic hot water charge. The requirement for this operation is a heat pump that allows a flow temperature of at least 65°C and a return temperature of at least 60°C.

Table 1: Position and Threshold Values of the Temperature Sensors

Variant	Position[1]	Lower Value	Upper Value
COMPACT Cell DHW 58	600mm	51°C	62°C
COMPACT Cell DHW 48	600mm	43°C	55°C

[1] Measured from the top edge of the COMPACT Cell ± 5%

5.2 Hygiene recommendation COMPACT Cell DHW 48

In the COMPACT Cell, hot water is heated using the instantaneous water heater principle. This concept means that there is only approx. 10 liters of standing water in the COMPACT Cell, which greatly reduces the risk of legionella. After the first 10 liters have been discharged, fresh water flows in again. Nevertheless, it is recommended to charge the COMPACT Cell DHW 48 once a week to over 60°C using a legionella charging.

The COMPACT Cell DHW 58 is already charged above 60°C during normal operation, so there is no risk of legionella here.

6 Maintenance

Cowa technologies offer a very low-maintenance product. The use of PCM eliminates corrosion risk from stored water, as well as the need for tank cleaning. No sacrificial anode or similar protection is required.

Due to relatively high flow rates in the water-carrying pipes and thermal or pressure expansion, possible lime deposits are loosened and flushed out.

7 Technical Data

The table lists the dimensions and technical data of the Cowa COMPACT Cell DHW.

Table 2: Dimensions and technical data

Cowa COMPACT Cell DHW		48	58
Height	mm	1400	1400
Width	mm	600	600
Depth	mm	340	340
Weight	kg	262	250
Storage capacity per m³	kWh/m³	70	75
Max. storage capacity[1] charged to 55°C/65°C	kWh	11 / 13	- / 13.5
Nominal storage capacity[2] charged to 55°C/65°C	kWh	10 / 12	- / 12.5
Max. draw-off volume[2] V_{40} charged to 55°C/65°C	L	350 / 410	- / 430
Nominal draw-off volume[2] V_{40} charged to 55°C/65°C	L	310 / 370	- / 390
Discharge temperature	°C	45	55
Energy label[3]		B	B
Possible water flow rate	L/min	25	25
Pressure drop at max. flow rate	kPa	48	48
Minimum operating pressure	bar	1.5	1.5
Maximum operating pressure	bar	6	6
Maximum operating temperature	°C	75	75
Compatible heat pumps		Standard HP	R290, R454 C
Min. supply temperature	°C	57	65
Min. return temperature	°C	52	60

[1] Storage capacity measured from a charge level > 55 °C resp. > 65°C to an outlet temperature < 40 °C at small volume flow.
[2] Storage capacity measured from a charge level > 55 °C resp. > 65°C to an outlet temperature < 40 °C at 10L/min volume flow.
[3] Calculated at an average storage temperature of 60 °C and an ambient temperature of 15 °C.

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7.1 Pressure Drop Curves

The following graphic shows the pressure drop curves. In addition, the graphic shows which heat pump outputs can be operated depending on the spread (difference between flow and return temperature).

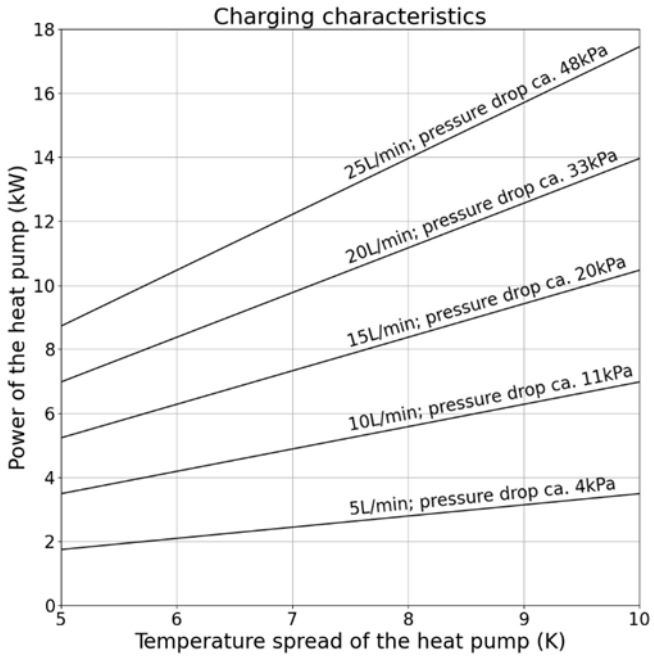
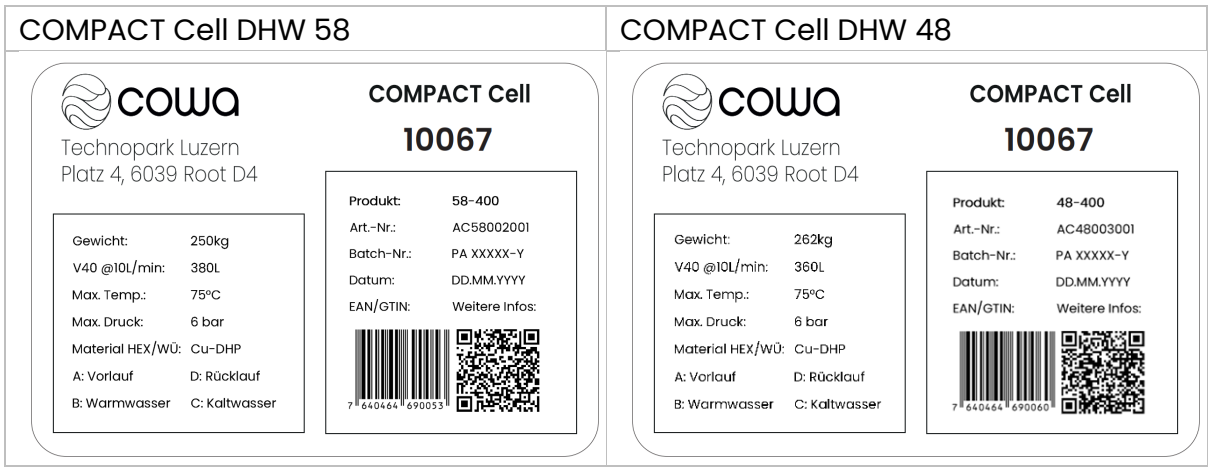


Figure 1: Pressure drops depending on the flow rate

7.2 Nameplate



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7.3 Performance Data COMPACT Cell DHW 48

7.3.1 Discharging energy [kWh]

		Charging power			
		3kW bis 55°C	6kW bis 55°C	3kW bis 65°C	6kW bis 65°C
Discharging-vfl [L/min]	2.5	11.40	10.98	13.47	13.19
	5	11.04	10.78	13.05	12.95
	10	10.19	9.85	12.03	11.89
	15	9.21	8.91	11.00	12.82

7.3.2 Tap volume V_{40} [L]

		Charging power			
		3kW bis 55°C	6kW bis 55°C	3kW bis 65°C	6kW bis 65°C
Discharging-vfl [L/min]	2.5	353	340	418	409
	5	342	334	405	401
	10	316	305	373	369
	15	285	276	341	335

7.4 Performance Data COMPACT Cell DHW 58

7.4.1 Discharging energy [kWh]

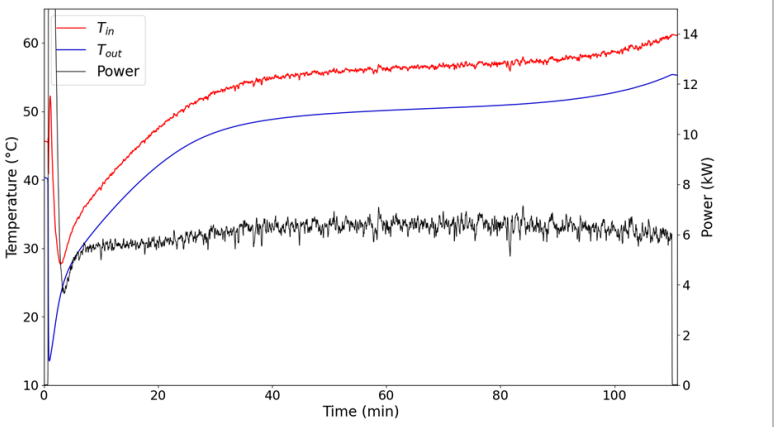
		Charging power	
		3kW bis 65°C	6kW bis 65°C
Discharging-vfl [L/min]	2.5	13.87	13.46
	5	13.54	13.29
	10	12.77	12.51
	15	11.95	11.74

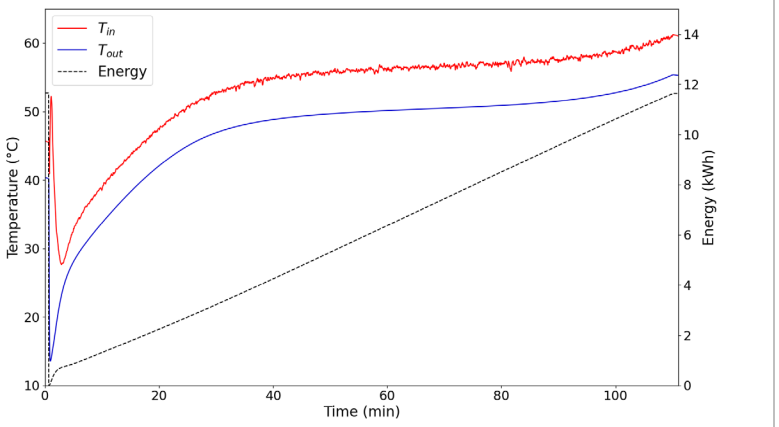
7.4.2 Tap volume V_{40} [L]

		Charging power	
		3kW to 65°C	6kW to 65°C
Discharging-vfl [L/min]	2.5	432	419
	5	422	414
	10	398	389
	15	372	365

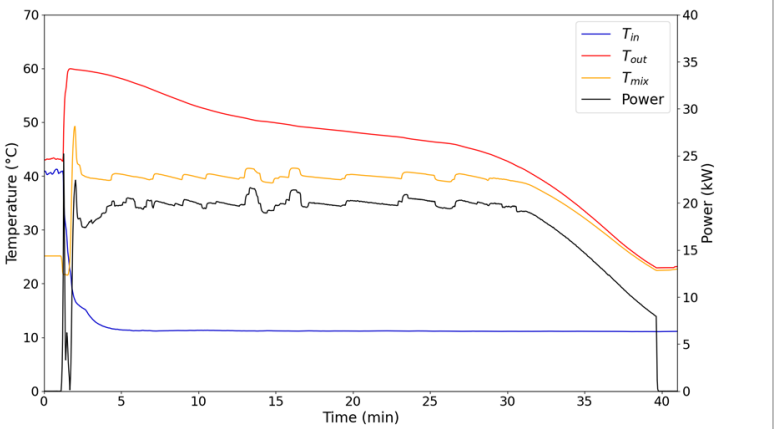
7.5 Charging and discharging behavior COMPACT Cell DHW 48

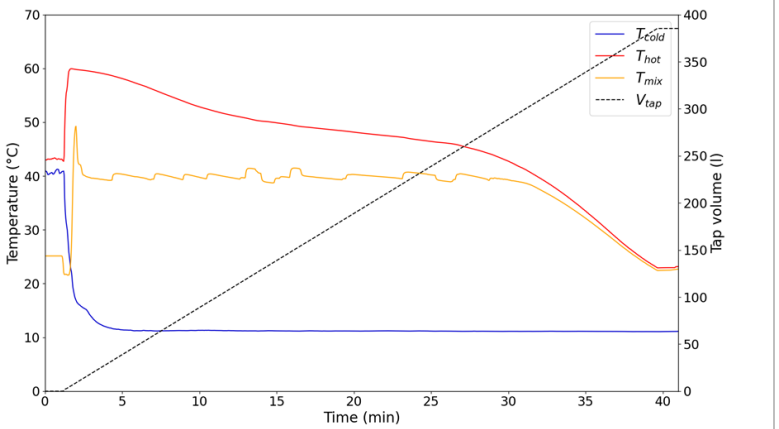
7.5.1 Charging temperature up to 55°C





Charging behavior (charged up to 55°C)





Discharging behavior (charged up to 55°C; 10L/min volume flow at 40°C)

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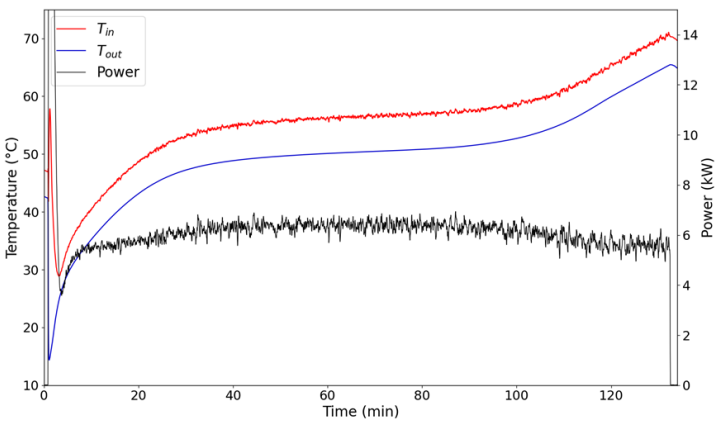
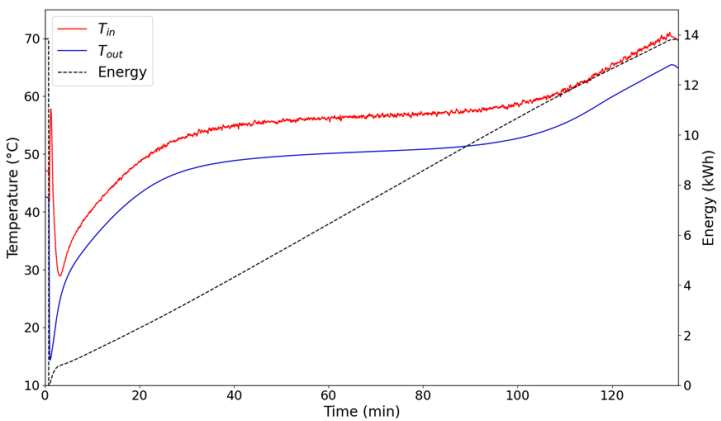
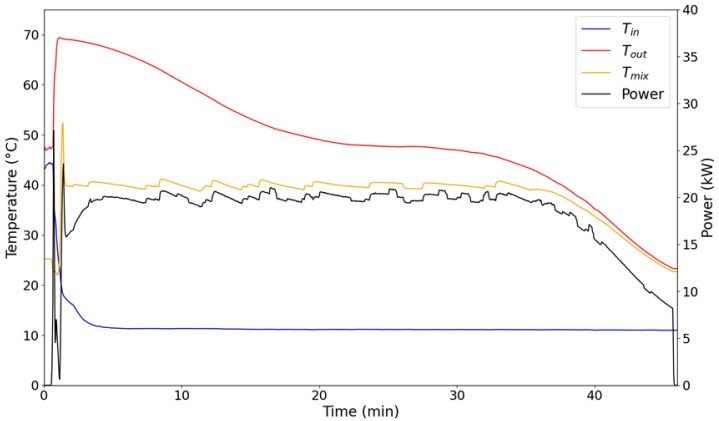
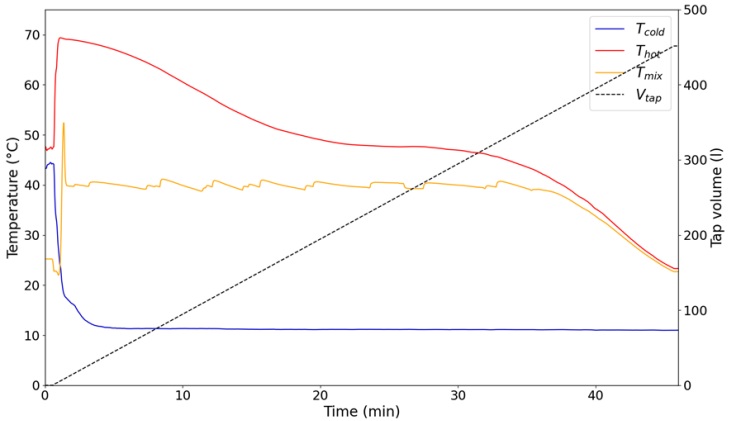
7.5.2 Charging temperature up to 65°C

		Charging behavior (charged up to 65°C)
		Discharging behavior (charged up to 65°C; 10L/min volume flow at 40°C)

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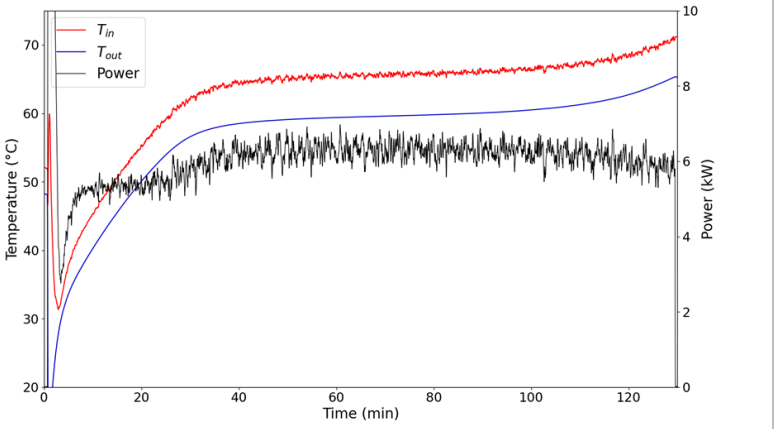
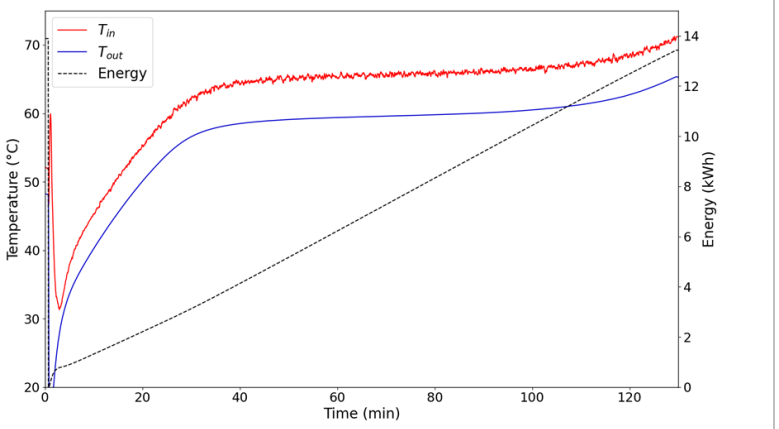
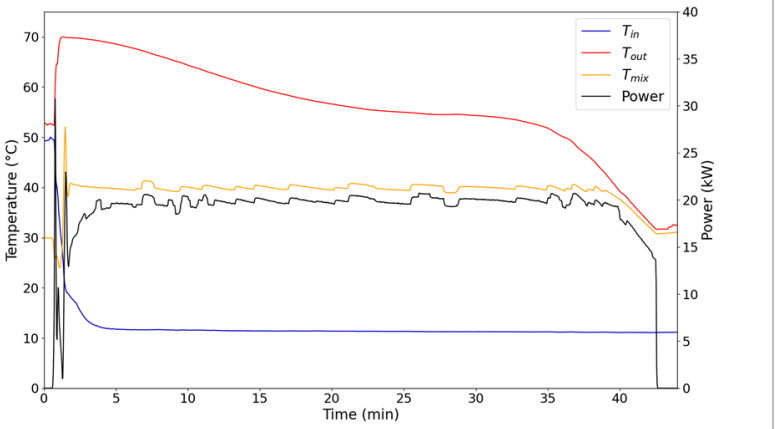
7.6 Charging and discharging curves COMPACT Cell DHW 58

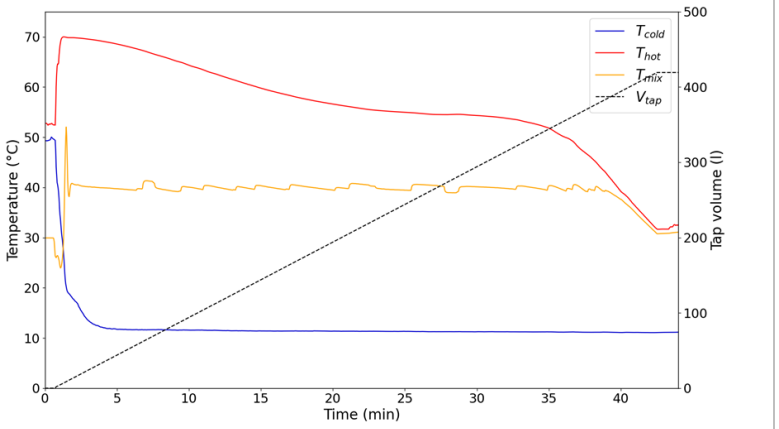
7.6.1 Charging temperature up to 65°C





Charging behavior (charged up to 65°C)





Discharging behavior (charged up to 65°C; 10L/min volume flow at 40°C)

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