Installation and Operating Manual

Cowa COMPACT Cell SH

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1 Introduction

The Cowa COMPACT Cell SH is a compact thermal battery that serves as a buffer storage. Cowa's innovative thermal storage technology is based on phase-change materials (PCM) and heats cold water on demand, following the instantaneous water heater concept. The stratification-free storage principle enables a design up to four times more compact than conventional hot-water tanks.

This manual contains all essential information about the product, along with clear instructions for installation, operation, and the safe use of the Cowa COMPACT Cell.

1.1 Intended use

The COMPACT Cell SH is a thermal storage unit designed to serve as a buffer storage for heating applications. The storage unit can be charged by a heat pump or an external electric instantaneous water heater. The necessary requirements for the heat source are described in chapter 3.2.

1.2 Disclaimer

Any necessary repairs during the warranty period may only be carried out by authorized specialists.

In addition to the statutory warranty, the manufacturer's warranty for storage units is 2 years. The entitlement to warranty and guarantee expires:

- in the event of improper use.
- if the COMPACT Cell or any of its components are modified, altered, or removed without the explicit written consent of the manufacturer.
- Cowa Thermal Solutions AG is not liable for any damages resulting from improper use or unauthorized interventions.

For all additional provisions, the General Terms and Conditions (AGB) of Cowa Thermal Solutions AG apply.

https://www.cowa-ts.com/agb

2 Product Description

2.1 Functionality

The COMPACT Cell is filled with phase-change materials (PCM), using exclusively non-toxic, recyclable salt hydrates. PCMs are substances that store heat by changing between solid and liquid states.

- Charging: when heat is supplied, the PCM melts and absorbs energy.
- Discharging: when heat is released, the PCM solidifies and releases the stored energy.

The phase change occurs at a fixed temperature:

- For the COMPACT Cell DHW 48 at 48 °C (±2 °C)
- For the COMPACT Cell DHW 58 at 58 °C (±2 °C)

Through the phase change, up to **250 J/g** (equivalent to approx. **95 kWh/m³**) of thermal energy can be stored. Compared to water, this results in a significantly higher storage density over a defined temperature interval ΔT. This is illustrated in the following graphic.

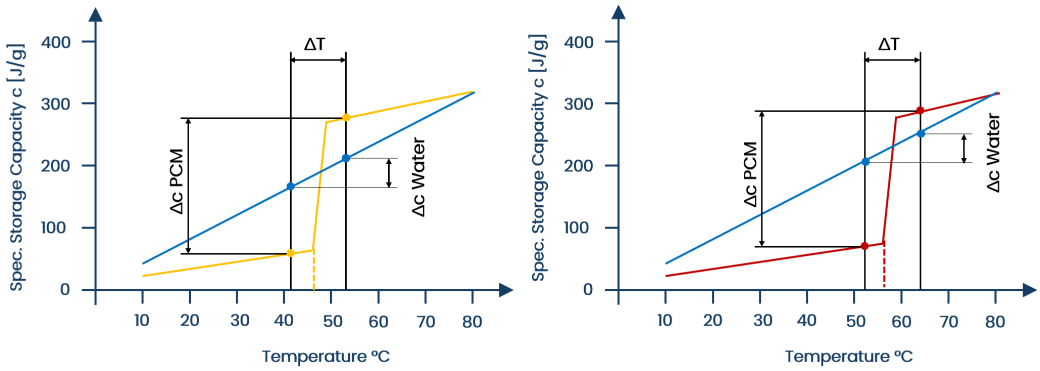


Figure 1: Graphical representation of the specific storage capacity of PCM compared to water. Left: PCM 48 (COMPACT Cell DHW 48), right: PCM 58 (COMPACT Cell DHW 58).

In addition, the COMPACT Cell contains an integrated heat exchanger. This enables:

- the transfer of heat from the heating water into the PCM (charging)
- the release of the stored heat from the PCM to the cold heating water (discharging)

2.2 Advantages

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

Compact and cubic design

Thanks to the use of PCM, the COMPACT Cell achieves a significantly higher energy density than conventional systems. This allows a multiple amount of domestic hot water to be provided on a minimal footprint. The non-pressurized design enables a cubic shape, making the storage unit easy to transport and install.

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.

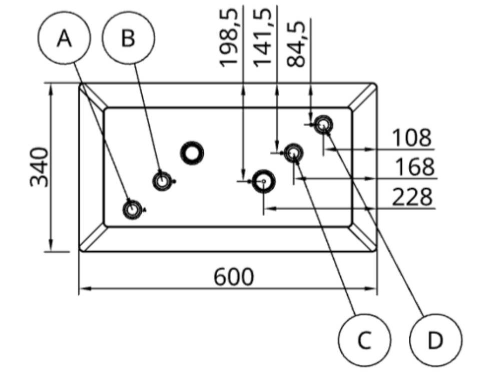
Low maintenance and corrosion-resistant

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.

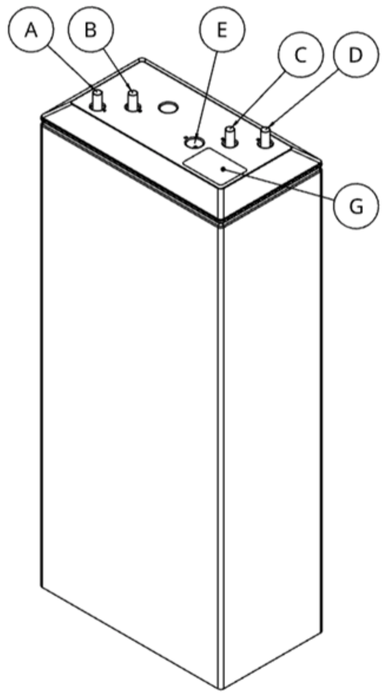
Modularity

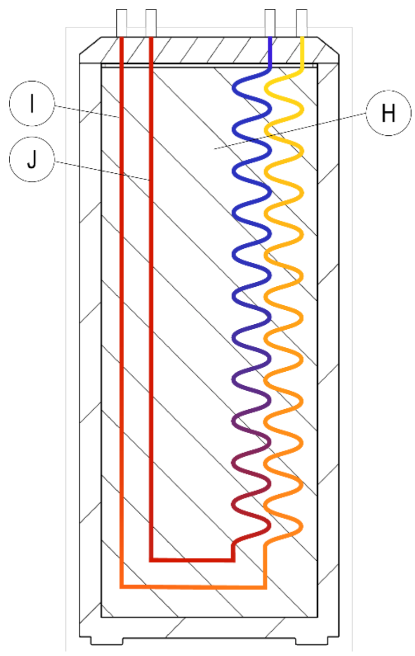
The storage capacity can be increased by connecting several Cowa COMPACT Cells. They can be connected in parallel or in series. However, special attention must be paid to the increased pressure drop in series connections.

2.3 Structure and components



A&B	Flow (22 mm copper pipe)
C&D	Return (22 mm copper pipe)
E	Immersion sleeve for temperature sensor(s)
F	COMPACT Cell casing (incl. insulation)
G	Nameplate
H	Phase Change Material (PCM)
I&J	Heat exchanger





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"

Bypass Valve

To use the Cowa COMPACT Cell as a buffer storage unit, a bypass valve is required in the return line (see Chapter 4.2).

Example:

- Oventrop bypass valve 25
- Danfoss bypass valve AVDO 25
- Or similar product, setting range 0 – 0.4 bar

Emergency Heater

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

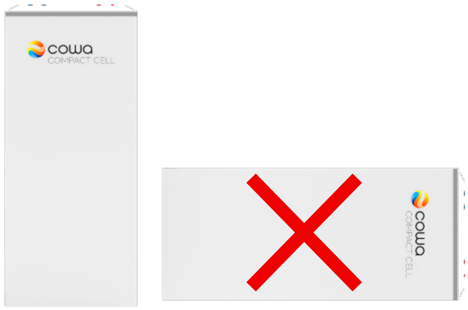
Storage Expansion

If the thermal output of a single Cowa COMPACT Cell is not sufficient, multiple COMPACT Cells can be connected in parallel and in series. The Tichelmann principle must be observed. In a series connection, increased pressure loss must be considered.

3 Installation

3.1 General Requirements

- Dynamic minimum pressure of the water supply = 1.5 bar
- Dynamic maximum pressure of the water supply = 6.0 bar
- Maximum operating temperature: 75 °C
- The COMPACT Cell must always remain in an upright position during operation.



3.2 Requirements for the Heat Pump

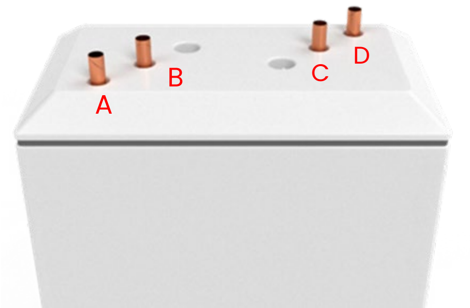
To ensure that the COMPACT Cell SH can be reliably charged, the connected heat pump must meet certain requirements and reach specified minimum temperatures:

Table 1: Requirements for the heat pump

Model	Requirements
COMPACT Cell SH 48	• Modulating (capacity-controlled) heat pump • Capability for signal processing via SG Ready or LAN • Minimum flow temperature of the heating circuit: 57 °C • Minimum return temperature of the heating circuit: 52 °C • Setpoint adjustable to 55 °C (see Chapter 5.2) • Configuration option for using PV surplus, increasing the generator heating circuit to 55 °C.
COMPACT Cell SH 58	• Modulating (capacity-controlled) heat pump • Capability for signal processing via SG Ready or LAN • Minimum flow temperature of the heating circuit: 65 °C • Minimum return temperature of the heating circuit: 60 °C • Setpoint adjustable to 62 °C (see Chapter 5.2) • Configuration option for using PV surplus, increasing the generator heating circuit to 65 °C.

3.3 Connecting the Flow and Return

The COMPACT Cell has four connections. To connect the COMPACT Cell correctly, connections A and B must be connected and act as the flow. The return is connected to connections C and D, which also need to be connected. The Tichelmann principle must be observed.



A & B: Flow
C & D: Return flow

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 Water Distribution Network Requirements

The water distribution system must be designed and sized to comply with the requirements of the relevant sections of DIN EN 1717.

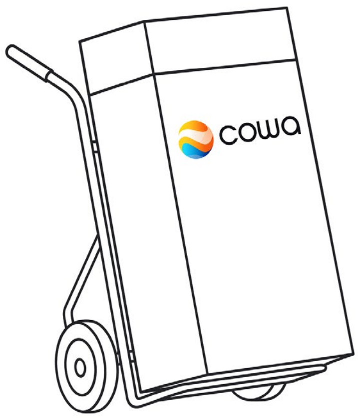
3.5 Heating Water Requirements

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

If these values are not adhered to, the service life may be reduced. The responsibility for this lies solely with the operator.

3.6 Transport

The Cowa COMPACT Cell has a weight of approx. **250–262 kg** (depending on the model, see Chapter 7). For safe transport, we recommend using a hand truck. This allows the COMPACT Cell to be moved comfortably even in narrow spaces or on stairs. Please observe the load limits of the hand truck.



4 Hydraulics & Sensors

The Cowa COMPACT Cell SH can be integrated as a parallel buffer storage with a mixing group, based on WPSM 1.5 and 1.6. For integration with a domestic hot water tank, Cowa also offers a solution – the Cowa COMPACT Cell DHW.

⚠️ **Note**: Due to Cowa's PCM technology, there are two key differences compared to a conventional water storage tank

1. **Pressure Loss:** The Cowa COMPACT Cell has a pressure loss. To ensure the cell discharges correctly, a bypass valve must be installed in the return line of the heat pump, set to 0.2 bar.
2. **Temperature Measurement:** Unlike a water tank, temperatures cannot be measured directly in the storage unit, but must be monitored in the piping. To capture the temperatures precisely in all operating states, they should be measured at the T-pieces of the flow and return.
   - T1: corresponds to the "top" temperature in the tank
   - T2: corresponds to the "bottom" temperature in the tank

4.2 Cowa Buffer Storage

Standard integration

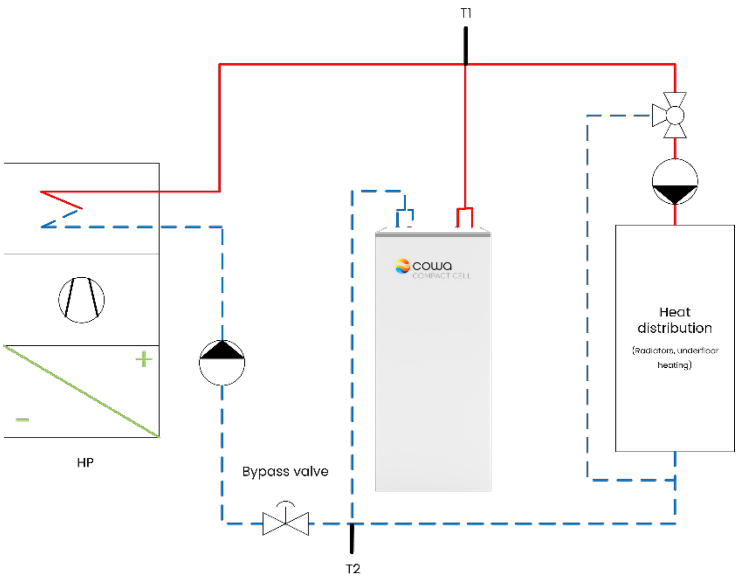


Figure 2: Connection diagram for integrating the Cowa COMPACT Cell SH as a parallel buffer storage unit.
T1: corresponds to the temperature measurement at the "top" of the storage unit
T2: corresponds to the temperature measurement at the "bottom" of the storage unit

Parallel integration of 2 COMPACT Cells

If more than one Cowa COMPACT Cell is required, the storage units can be connected in parallel. It is important to ensure that the Tichelmann principle is observed.

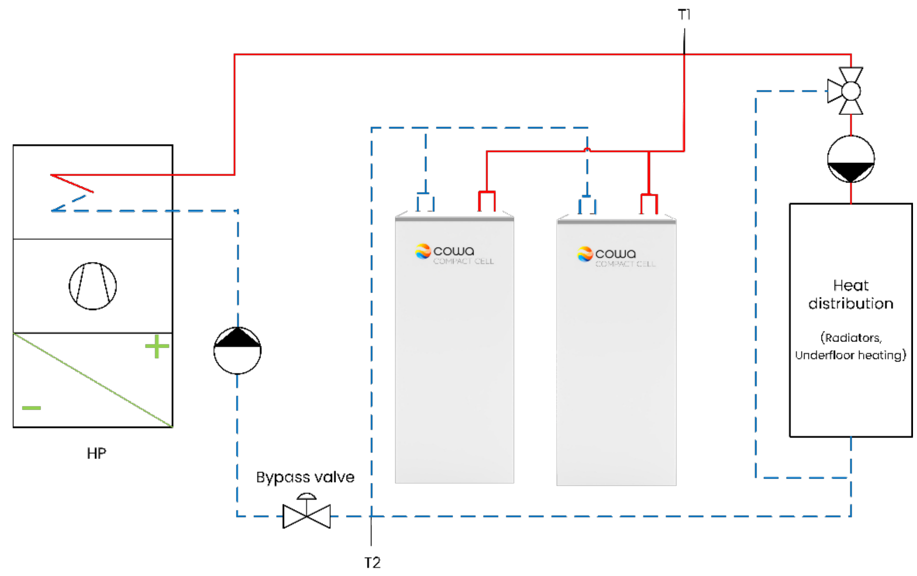


Figure 3: Connection diagram for integrating two Cowa COMPACT Cell SH units as parallel buffer storage.
T1: corresponds to the temperature measurement at the “top” of the storage unit
T2: corresponds to the temperature measurement at the “bottom” of the storage unit

4.3 Cowa Buffer Storage + Domestic Hot Water Tank

In a similar way, the Cowa COMPACT Cell SH can be combined with a Cowa COMPACT Cell DHW (WPSM 1.6).

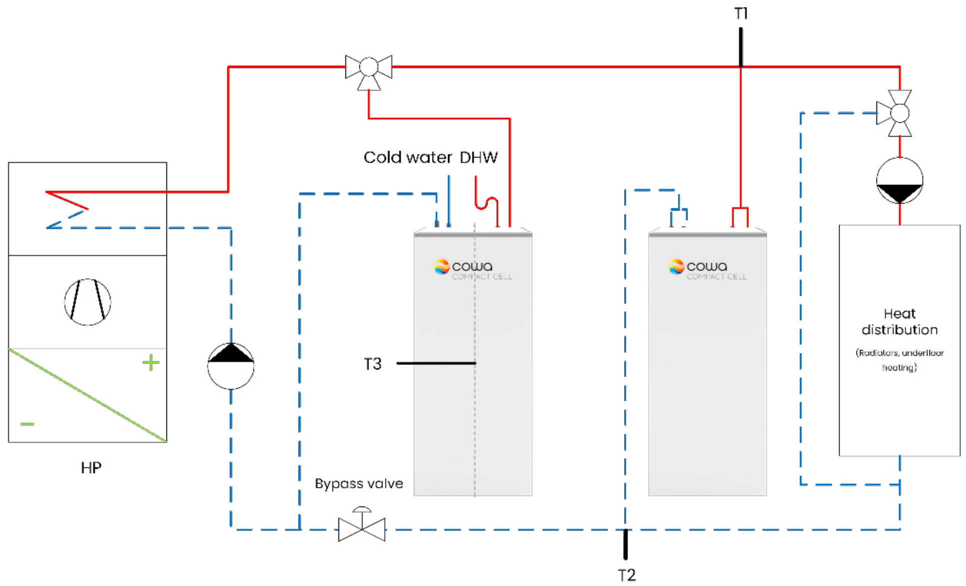


Figure 4: Connection diagram for integrating the Cowa COMPACT Cell DHW as a domestic hot water tank in combination with the Cowa COMPACT Cell SH
T1: corresponds to the temperature measurement at the “top” of the storage unit
T2: corresponds to the temperature measurement at the “bottom” of the storage unit
T3: temperature measurement in the middle of the storage unit

5 Operation

The Cowa COMPACT Cell SH is designed to store surplus photovoltaic energy in the form of heat. In normal operation, it functions like a conventional water storage tank and can, for example, provide thermal energy for defrosting the heat pump. When surplus photovoltaic energy becomes available, the Cowa COMPACT Cell SH can be charged above the phase-change temperature to utilize its full storage capacity.

The following section explains the two operating modes and the required conditions for each. One mode applies when the heat pump is controlled via a single sensor, and the other when the heat pump uses two sensors for control.

5.1 Modulating Operation

In regular heating mode, the Cowa COMPACT Cell SH is charged within the heating system in a modulating manner, similar to a water buffer tank. The stored energy corresponds to a buffer volume of approximately 75 L, which is sufficient to provide the thermal energy required for defrosting and to reduce the switching cycles of the heat pump. The following parameters can be set for controlling the heat pump.

Settings for single-sensor control

Signal	Control
WP_{on}	$T_2 < T_{target} - \Delta T$
WP_{off}	$T_2 > T_{target} + \Delta T$

Settings for two-sensor control

Signal	Control
WP_{on}	$T_1 < T_{target} - \Delta T$
WP_{off}	$T_2 > T_{target} + \Delta T$

5.2 PV-Surplus

When surplus photovoltaic energy is available, the setpoint in the Cowa COMPACT Cell SH is increased by operating the heat pump in an intensified mode, controlled via suitable interfaces. The PCM inside the cell fully melts, allowing up to 14 kWh of thermal energy to be stored. Discharging occurs later in the same manner as in conventional systems, by raising the buffer storage temperature via the mixing group. The necessary parameters for this are shown in the following table.

Settings for single-sensor control

Variante	Signal	Regelung
COMPACT Cell SH 48	WP_{on}	$T_2 < T_{target} - \Delta T$
	WP_{off}	$T_2 > 54°C$
COMPACT Cell SH 58	WP_{on}	$T_2 < T_{target} - \Delta T$
	WP_{off}	$T_2 > 62°C$

Settings for two-sensor control

Variante	Signal	Regelung
COMPACT Cell SH 48	WP_{on}	$T_1 < T_{target} - \Delta T$
	WP_{off}	$T_2 > 54°C$
COMPACT Cell SH 58	WP_{on}	$T_1 < T_{target} - \Delta T$
	WP_{off}	$T_2 > 62°C$

6 Maintenance

Cowa's technologies enable a very low-maintenance product. The use of PCM eliminates the risk of corrosion caused by storage water and therefore removes the need to clean the tank. Likewise, sacrificial anodes or similar components are not required.

Due to the relatively high flow velocities in the water-bearing pipes and the thermal or pressure expansions, any limescale deposits detach and are flushed out.

7 Technical Data

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

Table 2: Dimensions and technical data

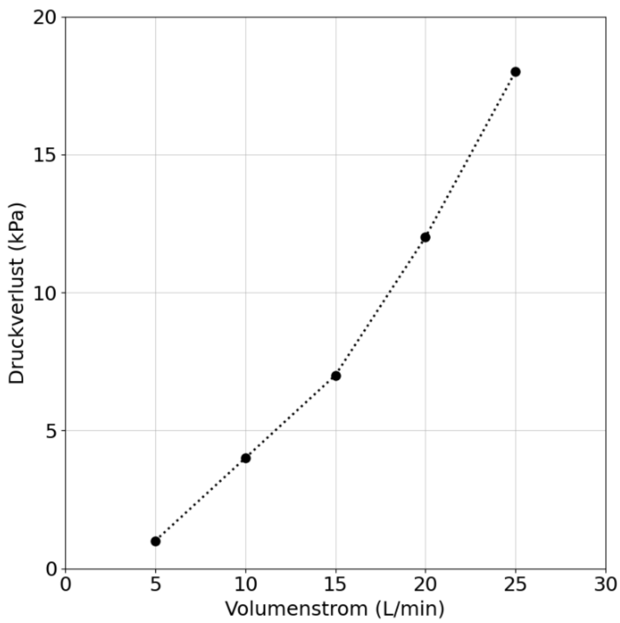
COMPACT Cell SH		48	58
Height	mm	1400	1400
Width	mm	600	600
Depth	mm	340	340
Weight	kg	262	250
Capacity[1] fully charged to 55°C/65°C	kWh	12 / 14	- / 14.5
Storage equivalent fully charged	L	320	320
Storage equivalent modulating operation	L	75	75
Discharge temperature	°C	45	55
Energy label[2]		B	B
Possible volume flow	L/min	25	25
Pressure drop at max. volume flow	kPa	18	18
Minimum operating pressure	bar	1.5	1.5
Maximum operating pressure	bar	6	6
Maximum operating temperature	°C	75	75
Compatible heat pumps		Standard WP	R290, R454 C
Min. flow temperature	°C	57	65
Min. return temperature	°C	52	60

[1] Storage capacity measured from charge state > 55°C resp. >65°C to temperature at outlet < 25°C.

[2] Calculated at an average storage temperature of 60°C and ambient temperature of 15°C

7.1 Pressure Drop Curves

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



Example:

- Heat pump output: Q = 10 kW
- Temperature spread of the heat pump: ΔT = 7 K
- Resulting volume flow:
  Calculation: V = Q/(ΔT*4.18) * 60
  V = 20.5 L/min
- Resulting pressure drop according to the graph:
  Δp = ca. 12 kPa

Figure 5: Pressure drops depending on the flow rate

7.2 Nameplate

COMPACT Cell SH 48	COMPACT Cell SH 58