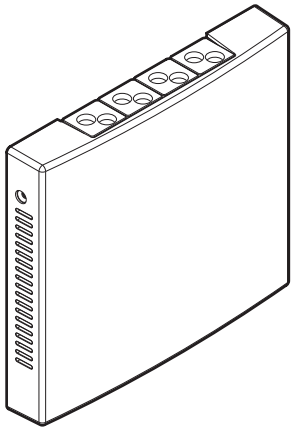
Installer reference guide

Daikin HomeHub



EKRHH ▲

▲= , , A, B, C, ..., Z

Table of contents

1 About this document

Target audience

Authorised installers

Documentation set

This document is part of a documentation set. The complete set consists of:

- **General safety precautions:**
  - Safety instructions that you must read before installing
  - Format: Paper (in the box of the indoor unit)
- **Installation manual:**
  - Installation instructions
  - Format: Paper (supplied in the kit)
- **Installer reference guide:**
  - Preparation of the installation, good practices, reference data, …
  - Format: Digital files on https://www.daikin.eu. Use the search function 🔍 to find your model.

The latest revision of the supplied documentation is published on the regional Daikin website and is available via your dealer.

The original instructions are written in English. All other languages are translations of the original instructions.

2 About the Daikin HomeHub

The Daikin HomeHub (EKRHH) is a versatile smart solution that serves as a central hub to connect and control Daikin equipment. In addition, the Daikin HomeHub also functions as an interface for smart energy management and home control. The Daikin HomeHub allows for app control of a heat pump system and, depending on the model, allows for the integration of a heat pump system in a Smart Grid application.

Depending on the user needs, the Daikin HomeHub can be used in 2 different modes:

- As the main controller; for Use case 1, 2, and 4. In this mode the Daikin HomeHub acts as the home energy management (HEM) system to optimise the energy consumption of a Daikin Altherma (use case 1) or Multi+(DHW) (use case 2) heat pump in combination with a PV system, or of an air-to-air heat pump (use case 4).
- As an interface; for Use case 3. In this mode the Daikin HomeHub is used to control the Daikin Altherma heat pump from a home automation or home energy management (HEM) system through a local interface.

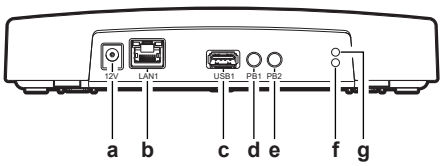
NOTICE

There can ONLY be 1 home energy management (HEM) system [Daikin HomeHub or third party] in a house. Using multiple HEM systems can result in the malfunctioning of one or more of them. In some special cases, an energy manager can be integrated in a home battery or an EV charging station. If there is already a HEM system installed in the house, it is better to use the Daikin HomeHub as an interface.

For more information on the Use cases, see "6 Application examples" [▸ 18].

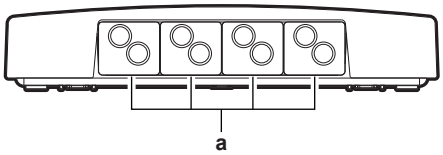
2.1 Components

Bottom



a DC power jack input (12~24 V)
b Ethernet port (LAN1)
c USB Type A port (USB1)
d Push button (PB1)
e Push button (PB2)
f LED (Blue)
g LED (Green)

Top



a Rubber grommets

2.2 Basic parameters

Parameter	Value
Power supply	DC 12~24 V
IP class	IP20

2.3 Compatibility

Use case 1 - PV self-consumption for Daikin Altherma
& Use case 3 – Modbus for Daikin Altherma

Unified MMI2 firmware version 7.5.0 or higher is required.

	Unit	Outdoor	Indoor		Hydro SW version/Micon ID
ASHP	Daikin Altherma 3 H HT	EPRA14/16/18DV37/W17	F	ETVH/X/Z16-E7	20017705 (short version: 0775)
			ECH_2O	ETSH(B)/X(B)16-E7	
			W	ETBH/X16-E7	
	Daikin Altherma 3 H MT	EPRA08/10/12EV3/W1	F	ETVH/X/Z12-E	20007903 (short version: 0793)
			ECH_2O	ETSH(B)/X(B)12-P-E	
			W	ETBH/X12-E	
	Daikin Altherma 3 R	ERGA-EV(7)(H)(A)	F	EHVH/X/Z-E[a]	20002203 (short version: 0223)
			ECH_2O	EHSH(B)/X(B)-P-E	20017704 (short version: 0774)
			W	EHBH/X-E[a]	20002203 (short version: 0223)
	Daikin Altherma 3 R	ERLA11/14/16DV3/W1	F	EBVH/X/Z-D	20007903 (short version: 0793)
			ECH_2O	EBSH(B)/X(B)-D	
			W	EBBH/EBBX-D	
	Daikin Altherma 3 R MT	ERRA-EV3/W1	F	ELVH/X/Z-E	22009C01 (short version: 29C1)
			ECH_2O	ELSH(B)/X(B)-E	
			W	ELBH/X-E	
	Daikin Altherma 3 M	EBLA09/11/14/16D[a] EDLA09/11/14/16D[a]	—[b]		20002203 (short version: 0223)
	Daikin Altherma 3 M	EBLA04/06/08E EDLA04/06/08E	—[b]		20017704 (short version: 0774)

[a] The Modbus holding registers with offset 59 and 61 (Thermostat input) are not operational. See "9.2.1 Holding registers" [▶ 36].
[b] No indoor unit available for this type Daikin Altherma.

Use case 2 - PV self-consumption for Multi+(DHW)

Unified MMI2 firmware version 7.5.0 or higher is required.

	Unit		Micon ID
Tank	EKHWET-BV3	EKHWET90BAV3	21003301
		EKHWET120BAV3	(short version: 1331)
Outdoor	4MWXM-A	4MWXM52A2V1B	—

Use case 4 – Modbus for air-to-air heat pump

All units supporting 4th generation WLAN adapter (BRP069C4*) are compatible. This use case is NOT compatible when more than 5 units are being used.

2.4 System requirements

Make sure the Daikin HomeHub software is ALWAYS up to date. The best system performance is achieved by updating all components to the latest available software. The requirements posed on the Daikin HomeHub system are as follows:

	Use case 1	Use case 2	Use case 3	Use case 4
User interface software of the Daikin Altherma or Multi+(DHW) tank	7.5.0 or higher			—
ONECTA	Optional 3.21.1 or higher			Required 3.21.1 or higher
Remote controller	Highly recommended	Optional		
WLAN adapter	Check your unit manual for the required WLAN adapter			BRP069C4* 1.28 or higher
LAN connection	Recommended (for updates)			Required

INFORMATION

- For an overview of the possible use cases, see "6 Application examples" [▸ 18]. For more information about the electrical wiring, see "4.2 Overview of electrical connections" [▸ 11].
- Some tools and components might already be available on site. Before going on site, find out which components are already at hand, and which ones you need to provide (e.g. router, electricity meter, ...).
- It is STRONGLY RECOMMENDED to keep the Daikin HomeHub connected to the internet via a LAN cable to receive the latest security and feature updates. This will improve compatibility, security and efficiency of the Daikin HomeHub.

2.5 Combination with ONECTA

The Daikin HomeHub can be used in combination with the ONECTA app for all 4 use cases. This is only required for use case 4 for functionality. For the other use cases, the use of ONECTA is optional and only allows to check some basic information.

To use the ONECTA app, it is required to connect the Daikin HomeHub via the app. If you want to move the Daikin HomeHub to a different location, you first need to disconnect the device via the app and connect again on the new location.

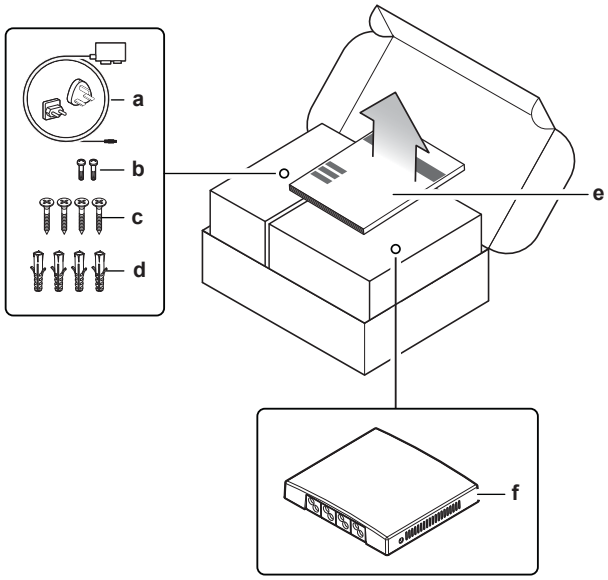
3 About the box

Keep the following in mind:

- At delivery, the unit MUST be checked for damage and completeness. Any damage or missing parts MUST be reported immediately to the claims agent of the carrier.

3.1 To unpack the adapter

1. Open the box.
2. Take out the Daikin HomeHub.
3. Separate the accessories.



a AC/DC power adapter with regional plug adapters (EU/UK)
b Casing screws (x2)
c Mounting screws (x4)
d Wall plugs (x4)
e Installation manual
f Daikin HomeHub

4 Preparation

4.1 Installation site requirements

Do NOT install the Daikin HomeHub in the following places:

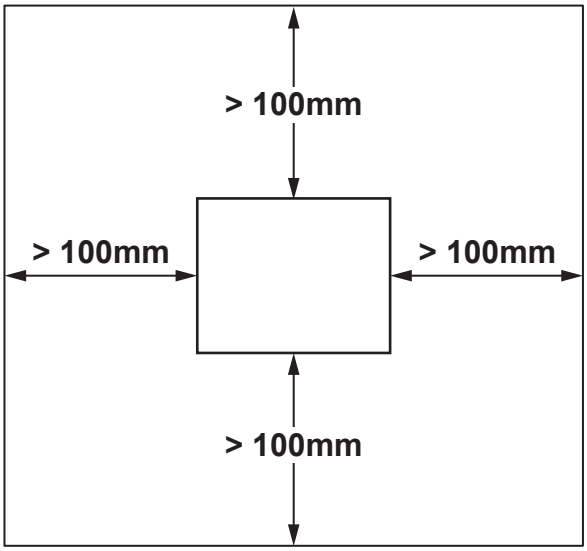
- In places where it is exposed to direct sunlight.
- In places where it is near a heat source.
- In places where it is exposed to a source of steam.
- In places where it is exposed to machine oil vapour.
- In places where it may be exposed to water, or in generally moist areas.

The Daikin HomeHub is designed:

- To be mounted in dry, indoor locations only.
- To be installed in a vertical orientation only.
- To operate in ambient temperatures ranging from –10~50°C.

Make sure a clean installation of the wired P1/P2 connections is possible.

Mind the following spacing installation guidelines:



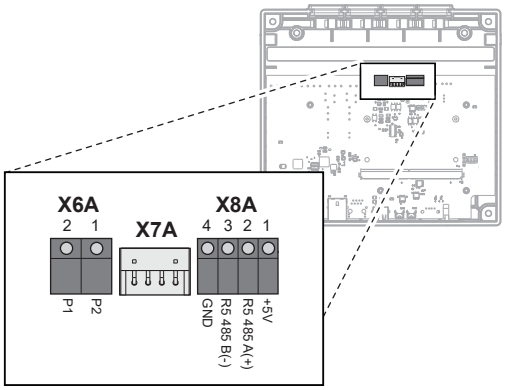
- Provide enough space (>100 mm) on the top side of the Daikin HomeHub to allow field wiring to enter through the rubber grommets.
- Provide enough space (>100 mm) on the left and right side of the Daikin HomeHub, so that a screwdriver can fit in order to remove or tighten the casing screws, and in order to not block any ventilation holes.
- Provide enough space (>100 mm) on the bottom side of the Daikin HomeHub to connect the Ethernet cable on the bottom side without exceeding its minimum bend radius (typically 90 mm).
- When installing the Daikin HomeHub in a control cabinet or enclosure, make sure there is sufficient clearance in front of the Daikin HomeHub to be able to close the cabinet or enclosure.
- Place the Daikin HomeHub within 2.5 m of a fuse box.

INFORMATION

Also read the maximum cable length requirements set out in "4.2 Overview of electrical connections" [▸ 11].

4.2 Overview of electrical connections

Connectors

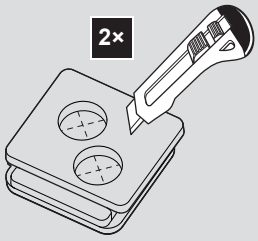


X6A To indoor unit (P1/P2 connector)
X7A To indoor unit (S21 connector) – NOT supported
X8A To Modbus interface (RS-485 connector)

Connections

INFORMATION

Wiring from the top. Remove the grommets from the rear casing when connecting the electrical wiring. Before sliding the grommets back into the holes, cut them open with a utility knife, so that you can let the wiring enter the Daikin HomeHub through the grommets. The grommets MUST be inserted into the holes before you insert the wiring into the Daikin HomeHub.



Indoor unit (P1/P2)

	Connector X6A (screw terminal)
	See the manual or other available documentation of the indoor unit
	Only use harmonised wire providing double insulation suitable for the applicable voltage. Wire size: 0.75–1.25 mm² Maximum length: 500 m
	Voltage: 16 V DC — 120 mA

Modbus Interface (RS-485)

	Connector X8A (screw terminal)
	See the installation manual of the Home Energy Manager (HEM) or Energy Utility Controller
	Only use harmonised wire providing double insulation suitable for the applicable voltage. Wire size: 0.75–1.25 mm² Maximum length: 500 m

5 Installation

5.1 Precautions when installing the Daikin HomeHub

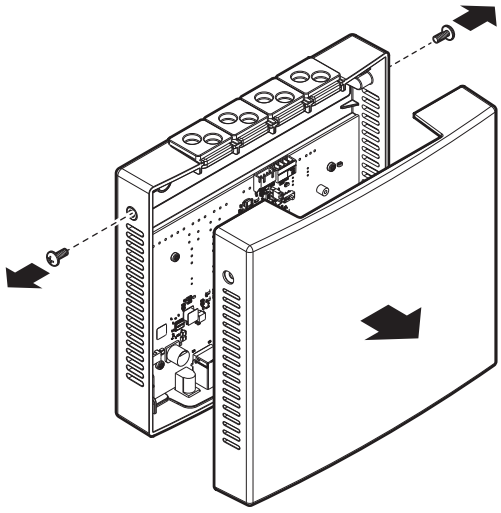
DANGER: RISK OF ELECTROCUTION

- Turn off the power supply before installing the Daikin HomeHub.
- Do NOT handle the Daikin HomeHub with wet hands.
- Do NOT let the Daikin HomeHub get wet.
- Do NOT disassemble, modify or repair the Daikin HomeHub.
- Turn OFF the power supply in case the Daikin HomeHub gets damaged.

5.2 Opening and closing the Daikin HomeHub

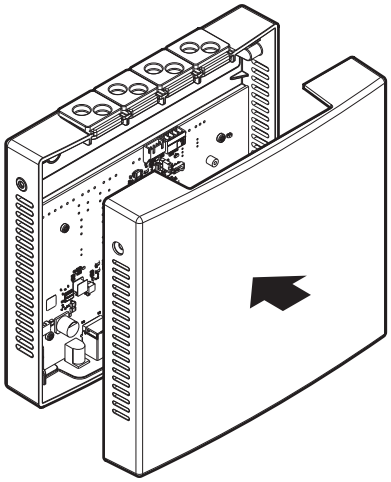
5.2.1 To open the Daikin HomeHub

1. Remove the 2 casing screws on the sides of the Daikin HomeHub with a screwdriver.
2. Detach the front casing from the rear casing.



5.2.2 To close the Daikin HomeHub

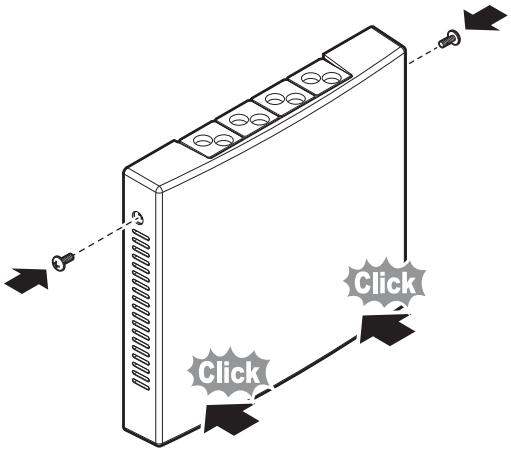
1. Attach the front casing to the rear casing.



2 Gently push or adjust the front casing until it clicks into the rear casing.

3 Insert the 2 casing screws in the holes.

4 Tighten the screws.



5.3 Connecting the electrical wiring

DANGER: RISK OF ELECTROCUTION

Do NOT connect or turn on power supply before you have mounted the Daikin HomeHub, connected the electrical wiring and have closed the Daikin HomeHub.

NOTICE

The wiring for connection is NOT included.

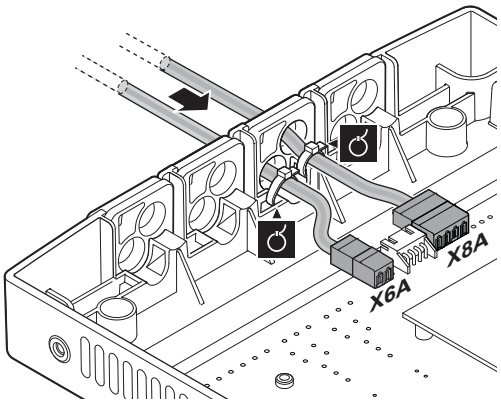
NOTICE

The Daikin HomeHub CANNOT be combined with a LAN adapter (BRP069A61/BRP069A62) or DCOM (DCOM-LT-MB/DCOM-LT-IO).

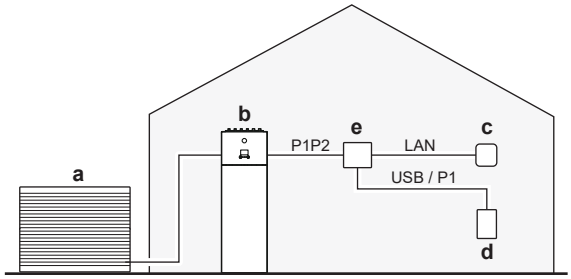
- If a LAN adapter/DCOM is already connected to the unit, you CANNOT add a Daikin HomeHub on the user interface.
- If you connect a LAN adapter/DCOM when a Daikin HomeHub is already connected, the Daikin HomeHub is disconnected.

5.3.1 To connect the electrical wiring

1. Connect the power supply and communication cable(s) to the appropriate terminals. (See following figures per use case.)
2. Ensure strain relief by fixing the cables with cable ties (field supply) to the cable tie mountings in the Daikin HomeHub.



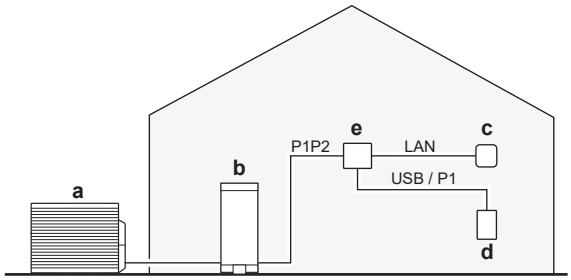
Use case 1 – PV self-consumption for Daikin Altherma



- **a** Outdoor unit
- **b** Daikin Altherma
- **c** Internet router
- **d** Current sensor
- **e** Daikin HomeHub

Connect the EKRHH terminals P1/P2 to the indoor unit terminals P1/P2. If no indoor unit is installed, connect the EKRHH terminals P1/P2 to the outdoor unit terminals P1/P2 or to the user interface terminals P1/P2.

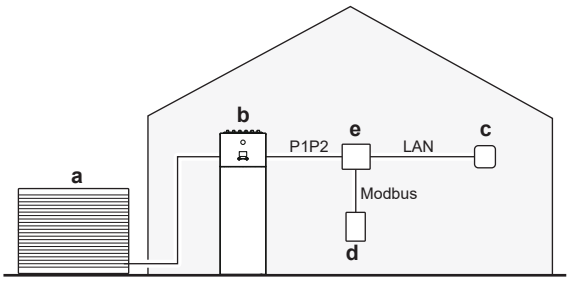
Use case 2 – PV self-consumption for Multi+(DHW)



- **a** Outdoor unit
- **b** Multi+(DHW)
- **c** Internet router
- **d** Current sensor
- **e** Daikin HomeHub

Connect the EKRHH terminals P1/P2 to the tank terminals P1/P2. On the Multi+(DHW), use connector X5M.

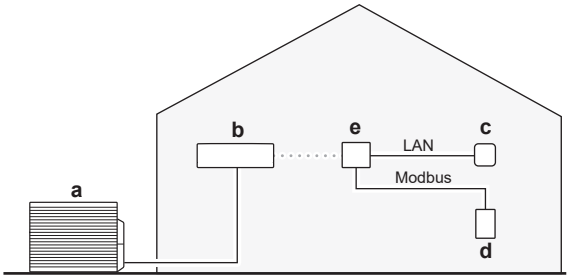
Use case 3 – Modbus TCP/IP or RTU for Daikin Altherma



a Outdoor unit
b Daikin Altherma
c Internet router
d Home Energy Manager (HEM) or Energy Utility Controller
e Daikin HomeHub

Connect the EKRHH terminals P1/P2 to the indoor unit terminals P1/P2.

Use case 4 – Modbus TCP/IP or RTU for air-to-air heat pump



a Outdoor unit
b Indoor unit including WLAN adapter (BRP069C4*)
c Internet router
d Home Energy Manager (HEM) or Energy Utility Controller
e Daikin HomeHub

5.4 Mounting the Daikin HomeHub

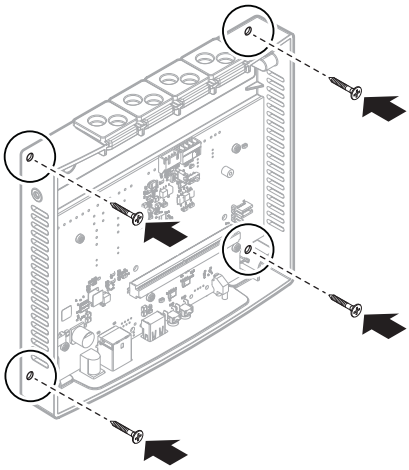
The Daikin HomeHub is mounted to a wall or other flat surface by way of mounting holes in the rear casing. Mounting the Daikin HomeHub to a DIN rail (field supply) is also a possibility.

5.4.1 To mount the Daikin HomeHub

Mounting to a wall

Prerequisite: The front casing of the Daikin HomeHub is removed.

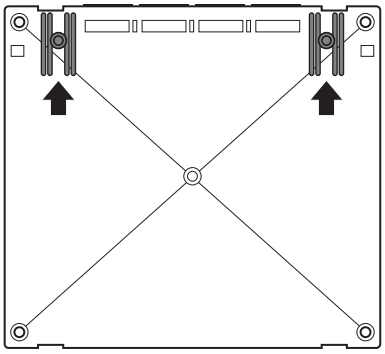
1. Determine the mounting location for the Daikin HomeHub. See "4.1 Installation site requirements" [▸ 10] for more information.
2. Drill holes for the plugs and insert the plugs.
3. Mount the rear casing to the wall by inserting and tightening the 4 included mounting screws.



Mounting to a DIN rail

Prerequisite: The front casing of the Daikin HomeHub is removed.

1. Determine the mounting location for the Daikin HomeHub. See "4.1 Installation site requirements" [▸ 10] for more information.
2. Connect the DIN rail clips to the back of the Daikin HomeHub and secure with screws.
3. Mount the Daikin HomeHub onto the DIN rail (field supply), using the clips on the back of the Daikin HomeHub to seat it onto the rail and click it into place.



6 Application examples

INFORMATION

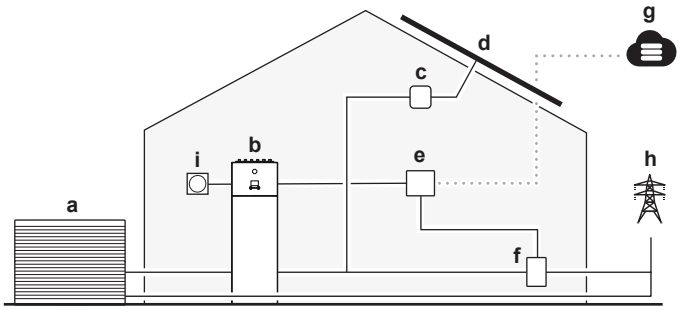
It is NOT possible to activate multiple use cases at the same time.

6.1 Use case 1 - PV self-consumption for Daikin Altherma

To make efficient use of your solar panels, the Daikin HomeHub can buffer energy into the domestic hot water or rooms when there is an excess of PV energy. For more information, see "7.2 About PV optimisation" [▸ 24].

For a list of compatible units, see "2.3 Compatibility" [▸ 6].

An energy sensor is needed for this use case. See "7.1 Energy sensor" [▸ 22].



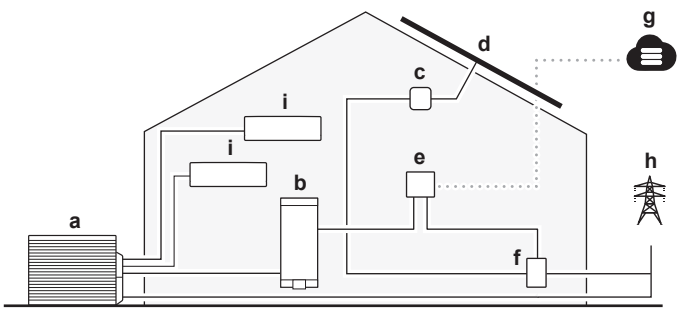
a Outdoor unit
b Daikin Altherma
c Solar inverter
d Solar panels
e Daikin HomeHub
f Digital energy meter or current sensor
g ONECTA cloud
h Electrical grid
i Human Comfort Interface (BRC1*)

6.2 Use case 2 - PV self-consumption for Multi+(DHW)

To make efficient use of your solar panels, the Daikin HomeHub can buffer energy into the domestic hot water without disrupting the cooling of rooms, using the excess of PV energy. For more information, see "7.2 About PV optimisation" [▸ 24].

For a list of compatible units, see "2.3 Compatibility" [▸ 6].

An energy sensor is needed for this use case. See "7.1 Energy sensor" [▸ 22].



a Outdoor unit (4MWXM-A)

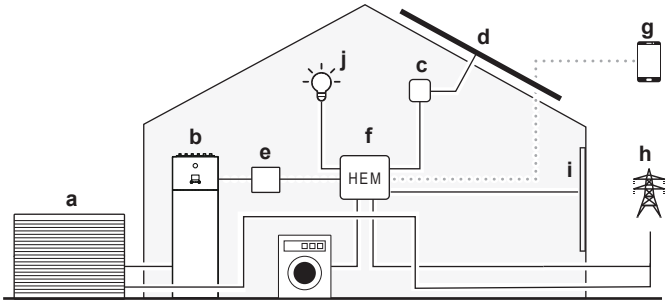
b Domestic Hot Water tank (EKHWET-BV3)
c Solar inverter
d Solar panels
e Daikin HomeHub
f Digital energy meter or current sensor
g ONECTA cloud
h Electrical grid
i Indoor unit

6.3 Use case 3 - Modbus TCP/IP or RTU for Daikin Altherma

6.3.1 Third-party integrations

This use case makes it possible for a third-party Home Energy Manager (HEM) to communicate with the heat pump. Through the Daikin HomeHub, they can execute a range of commands, for example changing the setpoint of the heat pump. For the full list of possible commands, see "9.2 Modbus registers" [▸ 34].

This use case is compatible with the Modbus IP and Modbus RTU standards.



a Outdoor unit
b Daikin Altherma
c Solar inverter
d Solar panels
e Daikin HomeHub
f Home Energy Manager (HEM)
g Home automation app
h Electrical grid
i Smart window blinds
j Smart lighting

INFORMATION

Any power limitation is applied to the whole system. This can affect the system performances.

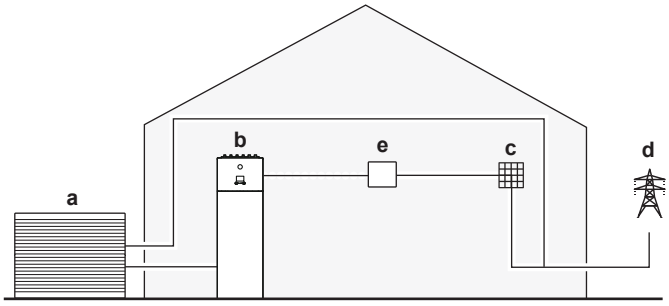
The functionality of the system CAN also be compromised in case of:

- Power loss of the Daikin HomeHub or rebooting,
- Network communication delays.

6.3.2 Smart Grid for utilities

This use case makes it possible for energy utilities to communicate with the heat pump. Through the Daikin HomeHub, they can balance the grid and avoid peaks by enforcing a Smart Grid (SG) operation mode. The SG operation mode adjusts the settings of the heat pump by turning it on/off. In parallel, the power of the heat pump can be adjusted by increasing or decreasing the power limit. For the full list of possible commands, see "9.2 Modbus registers" [▸ 34].

This use case is compatible with the Modbus IP and Modbus RTU standards.



a Outdoor unit
b Daikin Altherma
c Building management or grid controller
d Electrical grid
e Daikin HomeHub

INFORMATION

Any power limitation is applied to the whole system. This can affect the system performances.

The functionality of the system CAN also be compromised in case of:

- Power loss of the Daikin HomeHub or rebooting,
- Network communication delays.

6.4 Use case 4 - Modbus TCP/IP or RTU for air-to-air heat pump

This use case provides Smart Grid (SG) and Demand Control functionality for air-to-air heat pumps. This makes it possible for energy utilities to communicate with air-to-air heat pumps. Through the Daikin HomeHub, they can balance the grid and avoid peaks by enforcing a SG operation mode or providing a Demand Control power limitation value. The SG operation mode adjusts the settings of the air-to-air heat pump by turning it on/off, increasing or decreasing the setpoint, and/or increasing or decreasing the fan speed. The Demand Control power limitation reduces the power consumption of the system. For more information, see "10.3.1 Smart Grid for air-to-air heat pump" [▸ 44].

This use case is compatible with the Modbus IP and Modbus RTU standards.

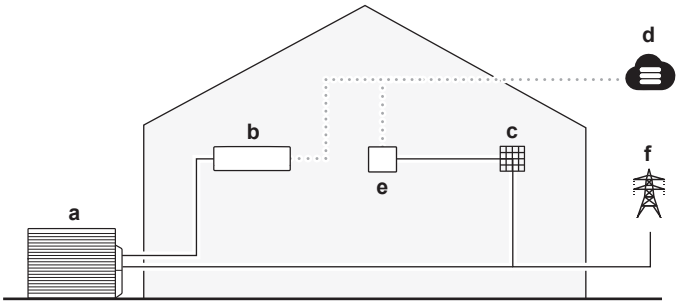
Modbus data can be exchanged through Modbus serial using RTU or through Modbus Ethernet layer using TCP protocol.

INFORMATION

For this use case, ONLY the Smart Grid operation mode (holding register 1001) and Power limit for Demand Control register (holding register 1002) are supported. See "10.2.1 Holding registers" [▸ 44].

This use case supports maximum 5 indoor units. The Daikin HomeHub must always be connected to the internet through LAN.

For a list of compatible units, see "2.3 Compatibility" [▸ 6].



a Outdoor unit
b Wall-mounted indoor unit including WLAN adapter (BRP069C4*)
c Building management or (third-party) grid controller
d ONECTA cloud
e Daikin HomeHub
f Electrical grid

INFORMATION

Any power limitation is applied to the whole system. This can affect the system performances.

The functionality of the system CAN also be compromised in case of:

- Power loss of the Daikin HomeHub or rebooting,
- Wi-Fi or internet connectivity loss,
- Network communication delays.

7 Use case 1 - PV self-consumption for Daikin Altherma

7.1 Energy sensor

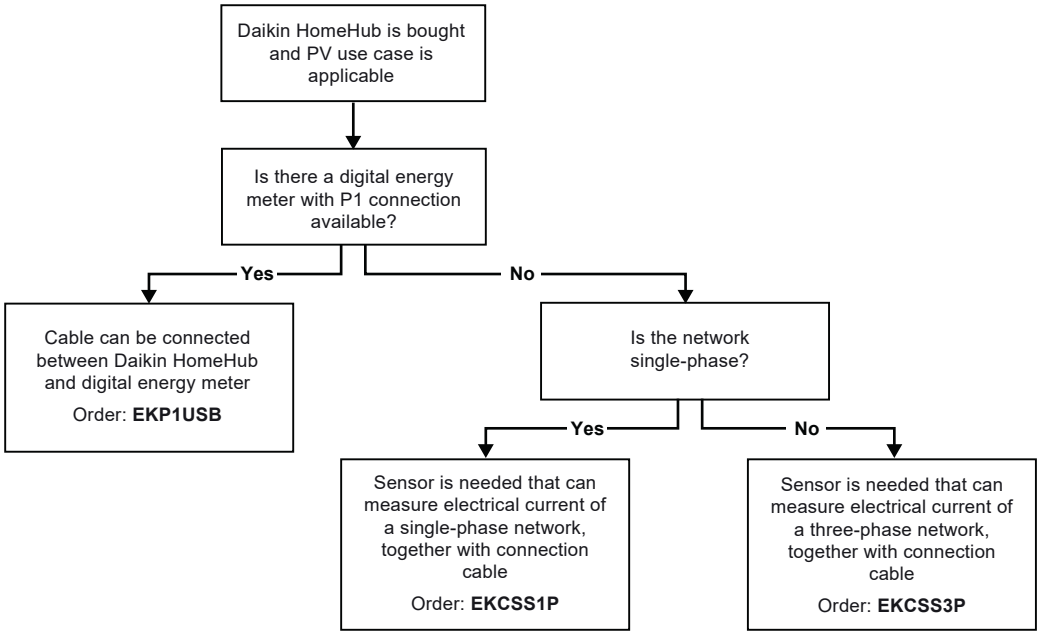
There are 2 possible ways of measuring the electrical consumption on the circuit:

- With a digital energy meter with P1 port[1], or
- with a current sensor, for single-phase or three-phase (both 3×230 V and 3×400 V+N) installations.

INFORMATION

The current sensor measures with a precision of 1 W. The user interface displays the power values in 0.1 kW steps.

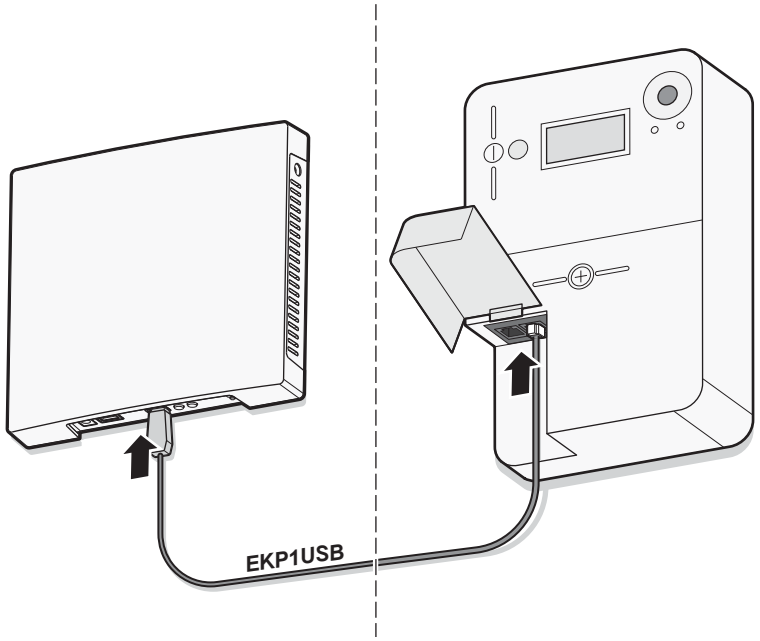
See the following flowchart to check which solution you need:



Connections

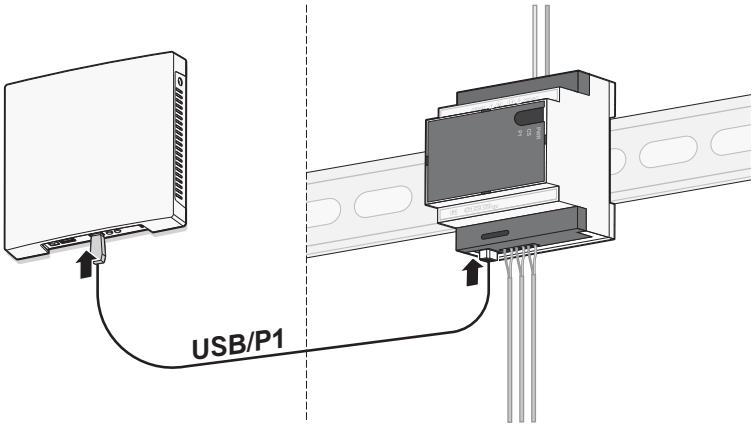
The digital energy meter and current sensor can be directly connected to the Daikin HomeHub with a USB/P1 cable.

[1] Currently only supported in Belgium. Contact your energy utility company to get detailed information about your digital energy meter.



NOTICE

When using a digital energy meter, check in the service portal of your energy utility company if the P1 port is activated. If NOT, send a request to your energy utility company to enable power.



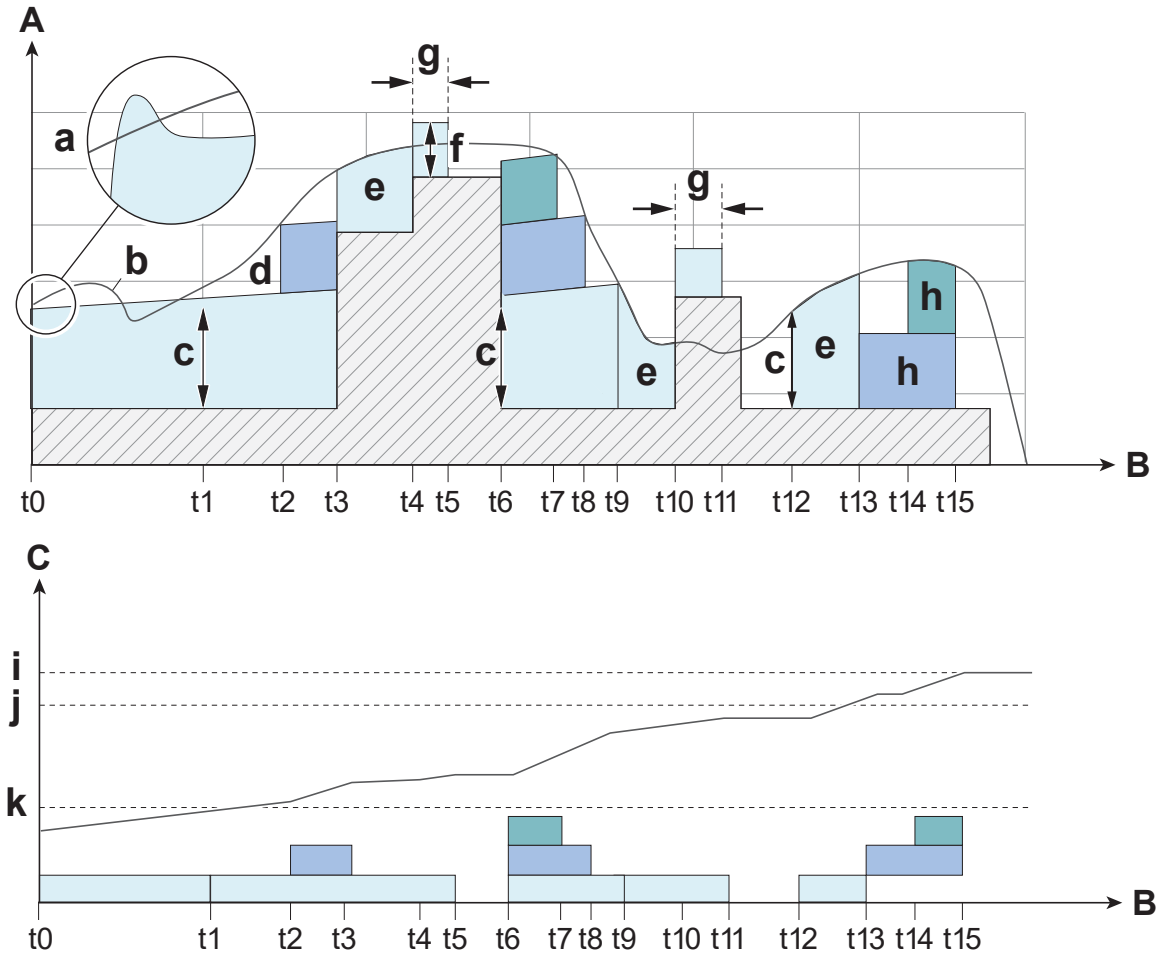
NOTICE

To ensure correct power measurement, make sure that the clamps are attached to the correct corresponding phase, depending on the grid configuration. See the installation manual of the current sensor for detailed instructions.

INFORMATION

- The maximum installation distance between the Daikin HomeHub and the digital energy meter or current sensor depends on the length of the USB/P1 cable.
- Make sure to install the devices so that the cable reaches both ports.
- Length of the supplied USB/P1 cable is 2.5 m.
- For field supplied USB/P1 cables, correct operation CANNOT be guaranteed.

7.2 About PV optimisation



A Power
B Time
C Tank temperature
Heat pump compressor power
Heat pump electrical heater step 1 power
Heat pump electrical heater step 2 power
Household power (excl. heat pump)
a Initial power peak at start-up
b PV solar production
c Minimum PV power
d PV excess power (injected into the grid)
e Active limitation of compressor power to match with solar production (0 injection into grid)
f Compressor power is held at minimum capacity level (= minimum power at which the compressor can be kept running)
g Grace time (5 minutes)
h Electrical heater steps, only as compressor limit has been reached
i Buffering setpoint
j Compressor limit
k Normal (eco/comfort) setpoint

The figure above shows an example of the power consumption profile of the unit when buffering solar energy into the tank. For clarity reasons, the power profiles in this example have been simplified. The unit has two electrical heater steps to assist the compressor in heat generation.

The PV solar production has to exceed the house load (household appliances, excluding the heat pump) with a certain amount before buffering can start. This level of PV excess power is defined by the minimum PV power, which can be configured through the user interface of the Daikin Altherma. The lowest possible

value corresponds to the minimum power required for a safe start-up of the compressor. In this example, the minimum PV power is about 50% higher than the minimum start-up power.

At **time t0**, the tank is cold and the compressor starts up to heat the tank towards the setpoint, showing an initial power peak at start-up (a). It is assumed that the compressor power rises slowly with increasing tank temperature. As long as the normal setpoint is not reached, the unit will not take the PV solar production into account. The compressor power consumption can exceed the PV excess power during its initial start-up and during the displayed dip in PV solar production.

At **time t1**, the tank setpoint is reached and the unit is ready to buffer solar energy into the tank. As the PV excess power exceeds the minimum PV power setting, the compressor continues with tank heating to buffer energy into the tank. The area between the PV solar production curve and the compressor energy area is energy that is still injected into the grid.

At **time t2**, there is enough PV solar production to switch on the first step of the electrical heater. The heater has a constant power consumption.

At **time t3**, the house load increases (for example when a microwave is switched on). The PV excess power is not enough anymore to support both the compressor and electrical heater step 1, so the electrical heater is switched off. Furthermore, the compressor power is actively limited to match with the PV solar production. As such, power injection into the grid is controlled to zero.

At **time t4**, an additional household appliance (for example a hair dryer) is switched on. The PV excess power is not enough anymore to support the compressor, as the PV excess power is lower than the minimum power at which the compressor can still run before switching off (operation at minimum capacity). The algorithm keeps the compressor running at minimum capacity, at the expense of some power being consumed from the grid. If this condition pertains for 5 minutes, the compressor is switched off. The goal of the 5-minute grace period is to prevent frequent on/off behaviour of the compressor when fast fluctuations in PV solar power or house load would occur.

At **time t5**, the grace period expires and the compressor is switched off.

At **time t6**, the microwave and hair dryer are switched off and the house load returns to its base value. There is a large PV excess power (much bigger than the minimum PV power setting) and the compressor and both electrical heater steps are switched on.

At **time t7**, the PV excess power is not enough anymore to support the compressor and the two electrical heater steps. Electrical heater step 2 is switched off.

At **time t8**, the PV excess power has dropped further and the electrical heater step 1 is also switched off.

At **time t9**, the PV excess power has dropped even further and the compressor power is actively limited in order to match it with the PV solar production.

At **time t10**, another household appliance is switched on. There is no PV excess power anymore, power is being consumed from the grid. The algorithm keeps the compressor running at minimum capacity during the grace period.

At **time t11**, the grace period expires and the compressor is switched off.[(1)]

At **time t12**, the PV excess power rises above the minimum PV power level again. The compressor is switched on. The compressor power is actively limited to match with the PV solar production.

[(1)] If tank buffering is interrupted (for example at time t11), it will only resume (for example at time t12) if the tank temperature is below the tank buffering setpoint minus a hysteresis threshold.

At **time t13**, the limit for compressor operation has been reached. The compressor is switched off. The electrical heater step 1 is switched on.

At **time t14**, there is enough PV excess power to also switch on electrical heater step 2.

At **time t15**, the tank temperature reaches the buffering setpoint and tank buffering ends.

INFORMATION

If the tank temperature exceeds the limit above which the heat pump can operate, the completion of tank buffering relies on the electrical heater(s). If there's not enough PV excess power (for example in winter or on cloudy days) to activate the first electrical heater step, tank buffering cannot be completed. As tank buffering has priority on space buffering, this can lead to space buffering not starting as long as tank buffering is not completed.

On warm and cloudy summer days, there is a risk the tank temperature will drop by a small amount. When the PV excess power frequently drops below the minimum PV power for longer than the grace period and subsequently exceeds the minimum PV power again, the unit will frequently start/stop during buffering. At each start-up, the internal water circuit of the unit (i.e. the plate heat exchanger) needs to heat up again for some time. During this time, slightly colder water flows towards the tank which can cause a small drop in tank temperature.

If between the buffering start/stops the unit switches to space cooling, the drop in tank temperature can be bigger because the internal water circuits (i.e. the plate heat exchanger) will be colder due to the space cooling operation.

7.2.1 Schedules

To optimally benefit from the PV optimisation performed by the Daikin HomeHub, while ensuring sufficient availability of domestic hot water, your schedule must be set correctly. By setting your schedule at the end of the day, slightly before you need domestic hot water, you allow the tank to heat up during the day based on solar energy. If there was not enough solar energy available (for example during a cloudy day), the schedule will ensure there is sufficient hot water.

7.3 Energy buffering

Depending on user settings, energy buffering either happens in the domestic hot water tank only, or in the domestic hot water tank and in the room. You can choose whether or not to have the electrical heaters assist with the buffering of energy in the domestic hot water tank.

Energy buffering	System requirements	Description
Domestic hot water tank	▪ Make sure a domestic hot water tank is part of the system. On the user interface, make sure to set field settings: - [E-05]=1 - [E-06]=1 ▪ Unit control method (user interface setting [C-07]): no requirements, but mind the information below.	The system produces domestic hot water. The tank heats up the water up to the maximum tank temperature, depending on the tank type and set by [6-0E]. If tank buffering is done without electrical heaters, the target temperature is the highest temperature achievable by the heat pump.
Room (heating)	▪ Allow for buffering in the room. ▪ Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system heats up the room up to the comfort setpoint.[(a)]
Room (cooling)	▪ Allow for buffering in the room. ▪ Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system cools down the room down to the comfort setpoint.[(b)]

[(a)] In case the actual room temperature is below the comfort heating setpoint.
[(b)] In case the actual room temperature is above the comfort cooling setpoint.

NOTICE

In case of removing the DHW tank from a wall-mounted unit set-up, you MUST reinstall the MMI software.

INFORMATION

Room buffering is ONLY possible if the unit control method [C-07]=2 (room thermostat control). This means that if an external room thermostat (Daikin or third party) is configured for the main zone, room buffering is ONLY possible in the additional zone.

INFORMATION

- The system will ONLY buffer energy when the indoor unit is NOT in normal operation. Normal operation has priority over energy buffering.
- Normal operation CAN be any of the following: `Space heating/cooling` (setpoint is not reached), `Domestic hot water` operation (setpoint is not reached during a scheduled operation or a reheat operation), or safety functions (e.g. `Antifrost` or `Disinfection`).
- The space heating/cooling setpoint during room buffering is the buffering setpoint for the room.
- The system will ONLY buffer energy during space heating if the space heating setpoint is lower than the space heating comfort setpoint. The system will ONLY buffer energy during space cooling if the space cooling setpoint is higher than the space cooling comfort setpoint.

INFORMATION

Tank/room buffering priority:

- The system starts tank buffering first. When tank buffering is at its maximum capacity, then the system switches to room buffering (if enabled).
- Tank buffering can switch to room buffering prior to reaching the maximal capacity because of internal unit logic. In normal operation, the maximum running time for domestic hot water is applicable. See the installer reference guide of the indoor unit for more details.
- When room buffering is ongoing and the tank drops below its maximum capacity (e.g. someone takes a shower), then the system stays at room buffering for a certain amount of time before it switches back to tank buffering.

INFORMATION

Tank buffering:

- When **Reheat only** or **Reheat + scheduled** is used, the boiler can use energy from the grid until the setpoint is reached. If **Schedule only** is used, a cold boiler can be the result if the schedule is NOT well set.
- Due to the nature of the system, the tank CAN cool down in some cases because of a too short reheat cycle.

INFORMATION

To avoid undesired grid consumption and frequent start/stops of the electrical heater due to variations on the voltage tolerance of the grid, several countermeasures were implemented. As a result, the electrical heater will not be used for space heating, even if this is allowed via the user interface.

INFORMATION

Because of cloudy weather circumstances or sudden peaks in household consumption, the excess PV power CAN fluctuate. To avoid frequent switching of the unit operation, a timer is implemented so that buffering will ONLY stop when the excess PV power drops below the threshold for at least 5 minutes. Due to this, the unit CAN temporarily consume energy from the grid to continue buffering.

7.3.1 Buffering in case [C-07] = 0 [LWT control]

When, on the user interface, [C-07] = 0 (the unit control method is leaving water temperature control), then the system can only buffer energy in the domestic hot water tank, and only in the following two separate cases:

- Space heating/cooling operation is turned OFF

OR

- During space heating operation:
  - Outdoor temperature > space heating setting [4-02]
  - Room frost protection is not active
- During space cooling operation:
  - Outdoor temperature < space cooling setting [F-01]

8 Use case 2 - PV self-consumption for Multi+(DHW)

8.1 Energy sensor

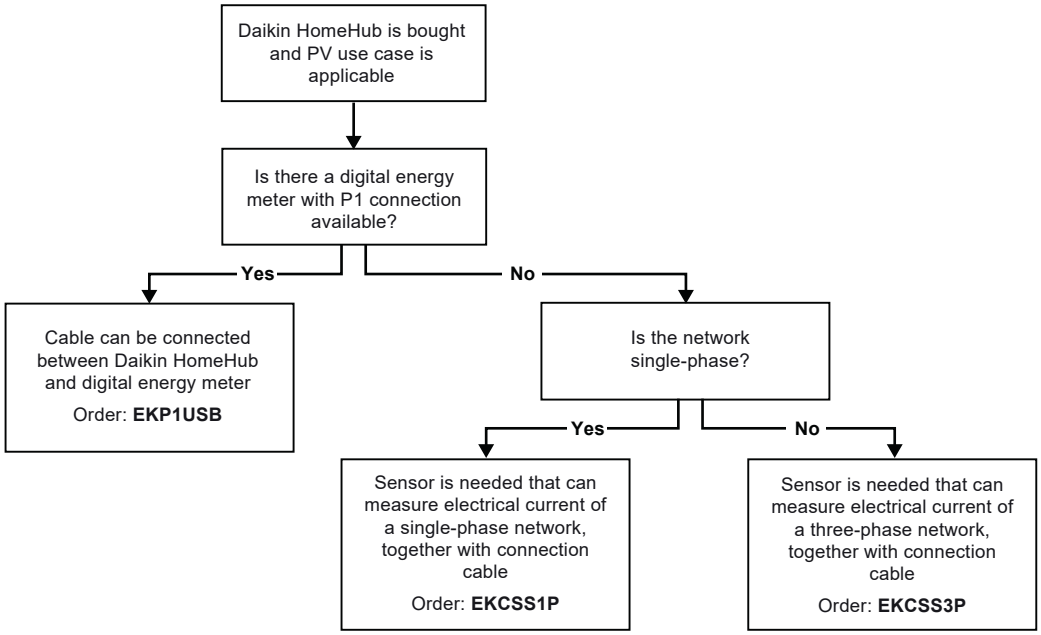
There are 2 possible ways of measuring the electrical consumption on the circuit:

- With a digital energy meter with P1 port[1], or
- with a current sensor, for single-phase or three-phase (both 3×230 V and 3×400 V+N) installations.

INFORMATION

The current sensor measures with a precision of 1 W. The user interface displays the power values in 0.1 kW steps.

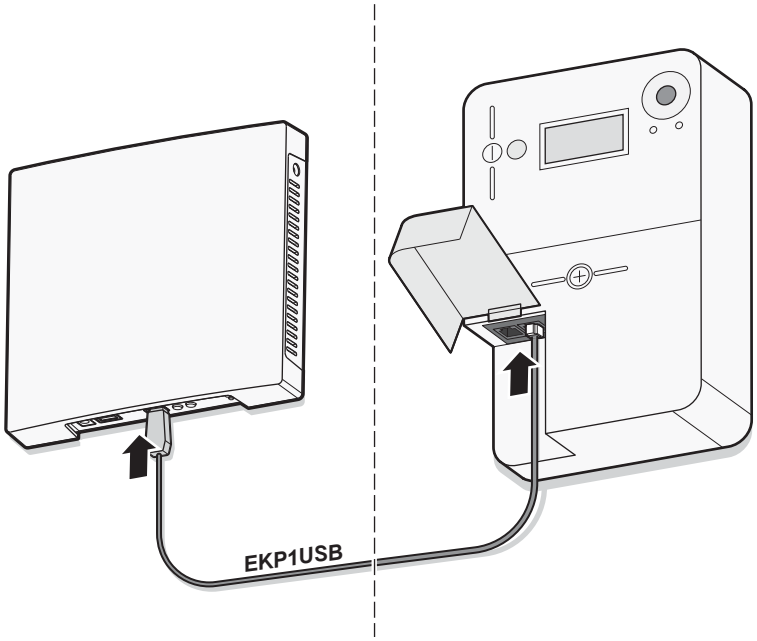
See the following flowchart to check which solution you need:



Connections

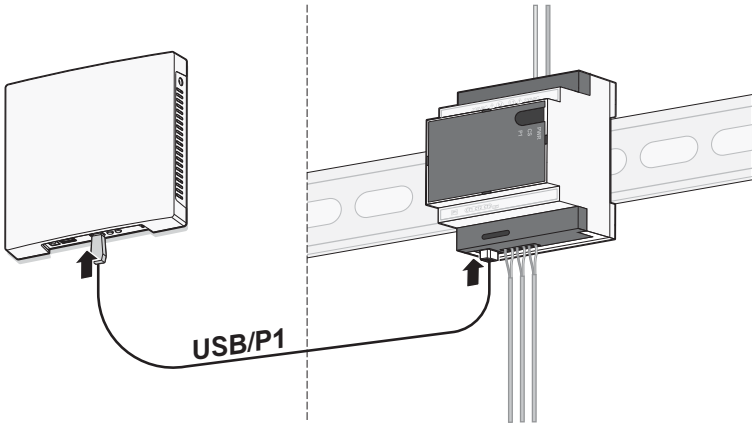
The digital energy meter and current sensor can be directly connected to the Daikin HomeHub with a USB/P1 cable.

[1] Currently only supported in Belgium. Contact your energy utility company to get detailed information about your digital energy meter.



NOTICE

When using a digital energy meter, check in the service portal of your energy utility company if the P1 port is activated. If NOT, send a request to your energy utility company to enable power.



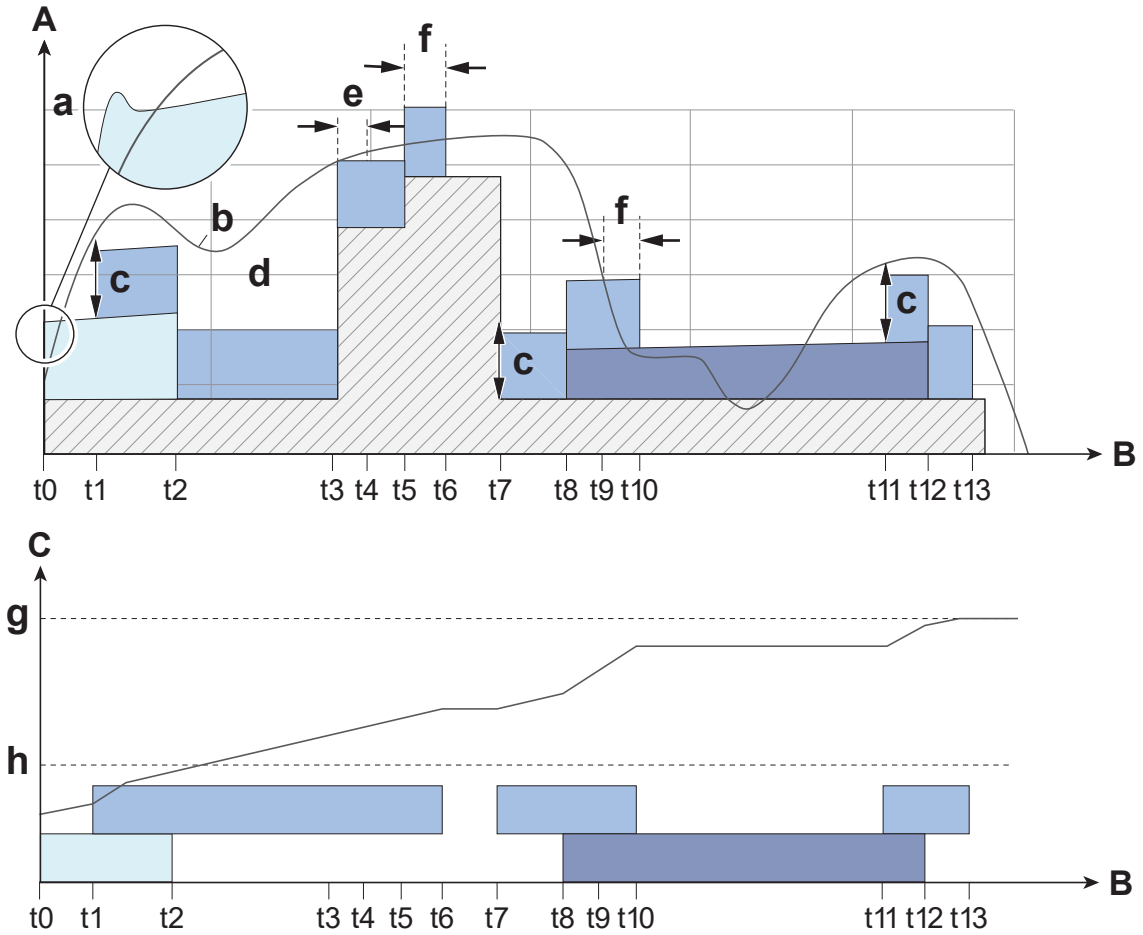
NOTICE

To ensure correct power measurement, make sure that the clamps are attached to the correct corresponding phase, depending on the grid configuration. See the installation manual of the current sensor for detailed instructions.

INFORMATION

- The maximum installation distance between the Daikin HomeHub and the digital energy meter or current sensor depends on the length of the USB/P1 cable.
- Make sure to install the devices so that the cable reaches both ports.
- Length of the supplied USB/P1 cable is 2.5 m.
- For field supplied USB/P1 cables, correct operation CANNOT be guaranteed.

8.2 About PV optimisation



A Power
B Time
C Tank temperature
Heat pump compressor power for tank heating
Immersed heater tank (electrical heater)
Heat pump compressor power for space cooling (DX)
Household power (excl. heat pump)
a Initial power peak at start-up
b PV solar production
c Minimum PV power
d PV excess power (injected into the grid)
e Less than 5 minutes
f Grace time (5 minutes)
g Buffering setpoint
h Normal (eco/comfort) setpoint

The figure above shows an example of the power consumption profile of the unit when buffering solar energy into the tank. For clarity reasons, the power profiles in this example have been simplified. The unit has an electrical heater to assist the tank heating. The unit has priority for DX operation (space cooling).

The PV solar production has to exceed the house load (household appliances, including the heat pump) with a certain amount before buffering can start. This level of PV excess power is set to the rated power consumption of the electrical heater, increased with 21% to take a 10% grid voltage increase into account.

At **time t0**, the tank temperature is below its setpoint and the compressor is working to heat up the tank towards the setpoint. It is assumed that the compressor power rises slowly with increasing tank temperature.

At **time t1**, the PV excess power equals the minimum PV power setting and the electrical heater is switched on. As such, the electrical heater helps in maximising the self-consumption of available PV excess power. The area between the PV solar production curve and the electrical heater energy area is energy that is still injected into the grid.

At **time t2**, the tank temperature reaches the normal setpoint and the compressor is switched off. As there is still power being injected into the grid, the electrical heater remains on.

At **time t3**, the house load increases (for example when a microwave is switched on). Between t3 and t4, the total consumption exceeds the PV solar production, leading to net power consumption from the grid. As long as this period with grid consumption does not exceed 5 minutes, the algorithm will keep the electrical heater on. The goal of the 5-minute grace period is to prevent frequent on/off behaviour of the electrical heater when fast fluctuations in PV solar power or house load would occur.

At **time t4**, there is enough PV excess power again.

At **time t5**, an additional household appliance (for example a hair dryer) is switched on. The PV excess power is not enough anymore to support the electrical heater. The algorithm keeps the electrical heater on, at the expense of power being consumed from the grid.

At **time t6**, the grace period expires and the electrical heater is switched off.

At **time t7**, the microwave and hair dryer are switched off and the house load returns to its base value. There is a large PV excess power (much bigger than the minimum PV power setting) and the electrical heater is switched on.

At **time t8**, the compressor starts operating for DX operation (space cooling).

At **time t9**, the PV excess power is not enough anymore to support the electrical heater. The algorithm keeps the electrical heater on, at the expense of some power being consumed from the grid.

At **time t10**, the grace period expires and the electrical heater is switched off. The compressor operation for DX (space cooling) is not affected (energy buffering of excess PV solar power is only done by the electrical heater).

At **time t11**, the PV excess power equals the minimum PV power setting and the electrical heater is switched on.

At **time t12**, the compressor stops operating for DX operation (space cooling).

At **time t13**, the tank temperature reached the buffering setpoint and tank buffering ends.

8.2.1 Schedules

To optimally benefit from the PV optimisation performed by the Daikin HomeHub, while ensuring sufficient availability of domestic hot water, your schedule must be set correctly. By setting your schedule at the end of the day, slightly before you need domestic hot water, you allow the tank to heat up during the day based on solar energy. If there was not enough solar energy available (for example during a cloudy day), the schedule will ensure there is sufficient hot water.

8.3 Energy buffering

Energy buffering happens in the domestic hot water tank only.

Energy buffering	System requirements	Description
Domestic hot water tank	▪ Make sure a domestic hot water tank is part of the system. On the user interface, make sure to set field settings: - [E-05]=1 - [E-06]=1	The system produces domestic hot water. The tank heats up the water up to the maximum tank temperature, depending on the tank type and set by [6-0E].

INFORMATION

- The system will ONLY buffer energy when the indoor unit is NOT in normal operation. Normal operation has priority over energy buffering.
- Normal operation CAN be either: `Domestic hot water` operation (setpoint is not reached during a scheduled operation or a reheat operation), or safety functions (e.g. `Antifrost` or `Disinfection`).
- The maximum temperature during domestic hot water tank buffering is the maximum tank temperature for the applicable tank type.

INFORMATION

Energy buffering in the domestic hot water tank will ONLY happen when the excess PV power, which is the difference between the generated solar power and the household power consumption, exceeds the fixed threshold of 1.45 kW. This value ensures there is enough grid injection to operate the immersed heater and includes a safety margin to allow for 10% grid variation.

INFORMATION

Because of cloudy weather circumstances or sudden peaks in household consumption, the excess PV power CAN fluctuate. To avoid frequent switching of the unit operation, a timer is implemented so that buffering will ONLY stop when the excess PV power drops below the threshold for at least 5 minutes. Due to this, the unit CAN temporarily consume energy from the grid to continue buffering.

9 Use case 3 - Modbus TCP/IP or RTU for Daikin Altherma

9.1 Modbus protocol

The following Modbus protocols can be used:

- Modbus RTU
- Modbus TCP/IP

Modbus RTU

Parameter	Value
Network	3 wire RS-485
Baud rate	9600
Parity	None
Stop bits	1
Data bits	8
RTU slave address	1~247

Modbus TCP/IP

Parameter	Value
Network	Ethernet
Port	▪ No encryption: 502 ▪ TLS encryption: 802
IP address	IP address of Daikin HomeHub

Modbus configuration can be done via the ONECTA app. See "12.2 ONECTA app settings" [▸ 51].

The Modbus algorithm is change based. This means the unit is only updated if a change in configuration is detected. To prevent changes being lost due to communication outages, it is recommended to periodically refresh the state from client side.

9.2 Modbus registers

There are 2 types of registers: holding registers and input registers.

Register type	Access
Holding register	Read/Write
Input register	Read-only

The Daikin HomeHub conforms to the Modbus addressing model. Data model numbering (register offset) is 1-based while PDU addressing is 0-based. For example, to access register 1, you have to use PDU address 0.

The Daikin HomeHub Modbus registers return data in the following formats:

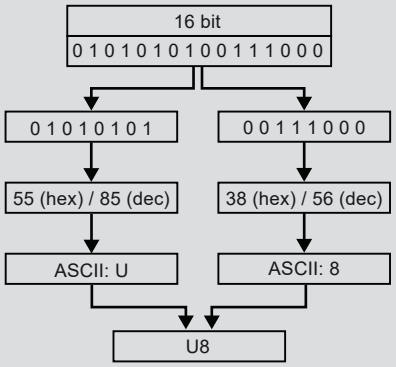
Data type	Signed	Bits	Scaling	Range
Temp16	Signed, two's complement	16	/100	–327.68~327.67°C
Int16			—	–32768~32767
Text16	Unsigned			2 ASCII characters
Pow16	Signed, two's complement		/100	–327.68~327.67 kW

INFORMATION

- Temperature sensor values are returned in Modbus using the Temp16 data format. To convert the value to centigrade, read the Modbus register as a signed 16-bit value and then divide by 100.
- Power values are returned in Modbus using the Pow16 data format. To convert the value to kilowatts (kW), read the Modbus register as a signed 16-bit value and then divide by 100. To write a value in the Modbus register, first multiply your power value in kW with 100.

INFORMATION

Unit error codes are returned in Modbus using the Text16 data format. The 16-bit register value MUST be converted to an error code consisting of 2 ASCII characters. Both the high byte value and the low byte value of the 16-bit value represent an ASCII character. Combined, the 2 ASCII characters form the unit error code.



9.2.1 Holding registers

Register offset	Name	Type	Range
1	Leaving water Main Heating setpoint	Int16	Depending on field settings
2	Leaving water Main Cooling setpoint		Depending on field settings
3[(a)]	Operation mode		▪ 0: Auto ▪ 1: Heating ▪ 2: Cooling
4	Space heating/cooling ON/OFF		▪ 0: OFF ▪ 1: ON
6	Room thermostat control Heating setpoint		12~30°C
7	Room thermostat control Cooling setpoint		15~35°C
9	Quiet mode operation		▪ 0: OFF ▪ 1: ON
10	DHW setpoint[(b)]		30~60°C
12	DHW reheat ON/OFF		▪ 0: OFF ▪ 1: ON
13	DHW booster mode ON/OFF		▪ 0: OFF ▪ 1: ON
53	Weather dependent mode Main		▪ 0: Fixed ▪ 1: Weather dependent ▪ 2: Fixed + scheduled ▪ 3: Weather dependent + scheduled
54	Weather dependent mode Main LWT Heating setpoint offset		–10~10°C
55	Weather dependent mode Main LWT Cooling setpoint offset		–10~10°C
56	Smart Grid operation mode		▪ 0: Free ▪ 1: Forced off ▪ 2: Recommended on ▪ 3: Forced on
57	Power limit during Recommended on / buffering	Pow16	0~20 kW
58	General power limit		0~20 kW

Register offset	Name	Type	Range
59[c]	Thermostat Main Input A[d]	Int16	▪ 0: OFF ▪ 1: ON
61[c]	Thermostat Add Input A[d]		▪ 0: OFF ▪ 1: ON
63	Leaving water Add Heating setpoint		Depending on field settings
64	Leaving water Add Cooling setpoint		Depending on field settings
65	Weather dependent mode Add		▪ 0: Fixed ▪ 1: Weather dependent ▪ 2: Fixed + scheduled ▪ 3: Weather dependent + scheduled
66	Weather dependent mode Add LWT Heating setpoint offset		–10~10°C
67	Weather dependent mode Add LWT Cooling setpoint offset		–10~10°C

[a] For heating only units, the register will show 32766.
[b] The DHW setpoint register is only propagated when the following conditions apply:
- `Tank` operation is enabled
- Heat pump mode is set to `Reheat only`
- `Setpoint mode` is set to `Fixed`

[c] In case the unit control method is set to external room thermostat control ([C-07]=1), this register is only valid when the external thermostat type [C-05] is set to 0:SW Contact. If another external thermostat type is configured, these registers will show 0: OFF.
[d] Feature not available on Daikin Altherma 3 R indoor units with Micon ID 20002203, and Daikin Altherma 3 M units with Micon ID 20002203. See "2.3 Compatibility" [▸ 6].

INFORMATION

The available range for setpoint registers is determined by the Minimum and Maximum Setpoint of the function defined in the Daikin Altherma system field settings. See the operation manual of the Daikin Altherma for the setpoint ranges.

INFORMATION

If a write to a setpoint register is outside of the configured range of the register, the setpoint will be set to the nearest valid minimum or maximum value. For all other registers, if a value outside of the register range is written, then the register value is NOT updated.

9.2.2 Input registers

Register offset	Name	Type	Range
21	Unit error	Int16	▪ 0: No error ▪ 1: Fault ▪ 2: Warning
22	Unit error code	Text16	2 ASCII characters

Register offset	Name	Type	Range
23	Unit error sub code	Int16	▪ If no error: 32766 ▪ If unit error: 0~99
30	Circulation pump running		▪ 0: OFF ▪ 1: ON
31	Compressor run		▪ 0: OFF ▪ 1: ON
32	Booster heater run		▪ 0: OFF ▪ 1: ON
33	Disinfection operation		▪ 0: OFF ▪ 1: ON
35	Defrost/Startup		▪ 0: OFF ▪ 1: ON
36	Hot Start		▪ 0: OFF ▪ 1: ON
37	3-way valve		▪ 0: Space heating ▪ 1: DHW
38	Operation mode		▪ 1: Heating ▪ 2: Cooling
40	Leaving water temperature plate heat exchanger	Temp16	–100.00~100.00°C
41	Leaving water temperature backup heater		–100.00~100.00°C
42	Return water temperature		–100.00~100.00°C
43	Domestic Hot Water temperature		–100.00~100.00°C
44	Outside air temperature		–100.00~100.00°C
45	Liquid refrigerant temperature		–100.00~100.00°C
49	Flow rate	Int16	Litres/minute×100
50	Remote controller room temperature	Temp16	–100.00~100.00°C
51	Heat pump power consumption	Pow16	0~20 kW
52	DHW normal operation	Int16	▪ 0: Idle/buffering ▪ 1: Operating
53	Space heating/cooling normal operation		▪ 0: Idle/buffering ▪ 1: Operating

Register offset	Name	Type	Range
54	Leaving water Main Heating setpoint Lower limit	Temp16	Field setting range
55	Leaving water Main Heating setpoint Upper limit		Field setting range
56	Leaving water Main Coolin setpoint Lower limit		Field setting range
57	Leaving water Main Cooling setpoint Upper limit		Field setting range
58	Leaving water Add Heating setpoint Lower limit		Field setting range
59	Leaving water Add Heating setpoint Upper limit		Field setting range
60	Leaving water Add Cooling setpoint Lower limit		Field setting range
61	Leaving water Add Cooling setpoint Upper limit		Field setting range

9.3 Energy buffering with Smart Grid

The Daikin HomeHub allows a third party (e.g. an energy utility) to set a Smart Grid operation mode. In parallel, the power of the heat pump can be adjusted by increasing or decreasing the power limit. Both actions help to balance the grid and avoid peaks.

There are 4 possible Smart Grid operation mode requests. Depending on Smart Grid operation mode, energy buffering either happens in the domestic hot water only, or in the domestic hot water tank and in the room.

`Free running` (normal operation)

There is no interference with the normal operation of the unit, except that the power consumption is limited to the Modbus general power limit (register 58).

`Forced off` (blocked operation)

The unit is forced to stop (except during protective functions).

`Forced on`

If the unit is operating in normal space heating/cooling or DHW mode, it continues in this mode. If the unit is idle, it is activated to store energy (either in the DHW storage tank or the room). The rate at which the unit consumes energy (both during buffering and normal operation) is limited to the Modbus general power limit (register 58).

Energy buffering	System requirements	Description
Domestic hot water tank	▪ Make sure a domestic hot water tank is part of the system. On the user interface, make sure to set field settings: - [E-05]=1 - [E-06]=1 ▪ Unit control method (user interface setting [C-07]): no requirements, but mind the information below.	The system produces domestic hot water. The tank heats up the water up to the maximum tank temperature (depending on the tank type and set by [6-0E]). The electrical heaters will assist with the buffering of energy in the domestic hot water tank.
Room (heating)	Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system heats up the room up to the comfort setpoint.[a]
Room (cooling)	Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system cools down the room down to the comfort setpoint.[b]

[a] In case the actual room temperature is below the comfort heating setpoint.
[b] In case the actual room temperature is above the comfort cooling setpoint.

Recommended on

If the unit is operating in normal space heating/cooling or DHW mode, it continues in this mode. If the unit is idle, it is activated to store energy. Contrary to **Forced on**, the energy storage during **Recommended on** can be controlled with the allowance flags for room buffering and electrical heaters (see "12.1.5 Settings for Use case 3" [▸ 51]). The rate at which the unit consumes energy during normal operation is limited to the Modbus general power limit (register 58). During buffering operation, it is limited to the lowest value of the Modbus buffering power limit (register 57) and the Modbus general power limit (register 58).

Energy buffering	System requirements	Description
Domestic hot water tank	▪ Make sure a domestic hot water tank is part of the system. On the user interface, make sure to set field settings: - [E-05]=1 - [E-06]=1 ▪ Unit control method (user interface setting [C-07]): no requirements, but mind the information below.	The system produces domestic hot water. The tank heats up the water up to the maximum tank temperature, depending on the tank type and set by [6-0E]. If tank buffering is done without electrical heaters, the target temperature is the highest temperature achievable by the heat pump.

Energy buffering	System requirements	Description
Room (heating)	▪ Allow for buffering in the room ▪ Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system heats up the room up to the comfort setpoint.[(a)]
Room (cooling)	▪ Allow for buffering in the room ▪ Unit control method: on the user interface, make sure [C-07]=2 (room thermostat control)	The system cools down the room down to the comfort setpoint.[(b)]

[(a)] In case the actual room temperature is below the comfort heating setpoint.
[(b)] In case the actual room temperature is above the comfort cooling setpoint.

NOTICE

In case of removing the DHW tank from a wall-mounted unit set-up, you MUST reinstall the MMI software.

INFORMATION

Room buffering is ONLY possible if the unit control method [C-07]=2 (room thermostat control). This means that if an external room thermostat (Daikin or third party) is configured for the main zone, room buffering is ONLY possible in the additional zone.

INFORMATION

- The system will ONLY buffer energy when the indoor unit is NOT in normal operation. Normal operation has priority over energy buffering.
- Normal operation CAN be any of the following: `Space heating/cooling` (setpoint is not reached), `Domestic hot water` operation (setpoint is not reached during a scheduled operation or a reheat operation), or safety functions (e.g. `Antifrost` or `Disinfection`).
- The space heating/cooling setpoint during room buffering is the buffering setpoint for the room.
- The system will ONLY buffer energy during space heating if the space heating setpoint is lower than the space heating comfort setpoint. The system will ONLY buffer energy during space cooling if the space cooling setpoint is higher than the space cooling comfort setpoint.

INFORMATION

Tank/room buffering priority:

- The system starts tank buffering first. When tank buffering is at its maximum capacity, then the system switches to room buffering (if enabled).
- Tank buffering can switch to room buffering prior to reaching the maximal capacity because of internal unit logic. In normal operation, the maximum running time for domestic hot water is applicable. See the installer reference guide of the indoor unit for more details.
- When room buffering is ongoing and the tank drops below its maximum capacity (e.g. someone takes a shower), then the system stays at room buffering for a certain amount of time before it switches back to tank buffering.

9.3.1 Buffering in case [C-07] = 0 [LWT control]

When, on the user interface, [C-07] = 0 (the unit control method is leaving water temperature control), then the system can only buffer energy in the domestic hot water tank, and only in the following two separate cases:

- Space heating/cooling operation is turned OFF

OR

- During space heating operation:
  - Outdoor temperature > space heating setting [4-02]
  - Room frost protection is not active
- During space cooling operation:
  - Outdoor temperature < space cooling setting [F-01]

10 Use case 4 - Modbus TCP/IP or RTU for air-to-air heat pump

10.1 Modbus protocol

The following Modbus protocols can be used:

- Modbus RTU
- Modbus TCP/IP

Modbus RTU

Parameter	Value
Network	3 wire RS-485
Baud rate	9600
Parity	None
Stop bits	1
Data bits	8
RTU slave address	1~247

Modbus TCP/IP

Parameter	Value
Network	Ethernet
Port	▪ No encryption: 502 ▪ TLS encryption: 802
IP address	IP address of Daikin HomeHub

Modbus configuration can be done via the ONECTA app. See "12.2 ONECTA app settings" [▸ 51].

The Modbus algorithm is change based. This means the unit is only updated if a change in configuration is detected. To prevent changes being lost due to communication outages, it is recommended to periodically refresh the state from client side.

10.2 Modbus registers

There are 2 types of registers: holding registers and input registers.

Register type	Access
Holding register	Read/Write
Input register	Read-only

The Daikin HomeHub conforms to the Modbus addressing model. Data model numbering (register offset) is 1-based while PDU addressing is 0-based. For example, to access register 1, you have to use PDU address 0.

The Daikin HomeHub Modbus registers return data in the following formats:

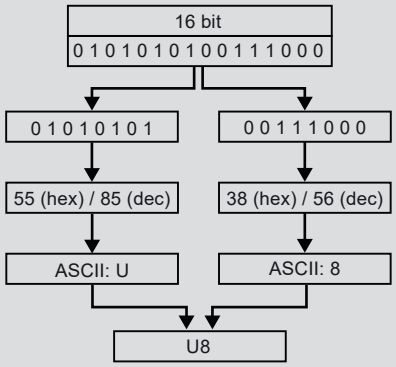
Data type	Signed	Bits	Scaling	Range
Temp16	Signed, two's complement	16	/100	–327.68~327.67°C
Int16			—	–32768~32767
Text16	Unsigned			2 ASCII characters
Pow16	Signed, two's complement		/100	–327.68~327.67 kW

INFORMATION

- Temperature sensor values are returned in Modbus using the Temp16 data format. To convert the value to centigrade, read the Modbus register as a signed 16-bit value and then divide by 100.
- Power values are returned in Modbus using the Pow16 data format. To convert the value to kilowatts (kW), read the Modbus register as a signed 16-bit value and then divide by 100. To write a value in the Modbus register, first multiply your power value in kW with 100.

INFORMATION

Unit error codes are returned in Modbus using the Text16 data format. The 16-bit register value MUST be converted to an error code consisting of 2 ASCII characters. Both the high byte value and the low byte value of the 16-bit value represent an ASCII character. Combined, the 2 ASCII characters form the unit error code.



10.2.1 Holding registers

Register offset	Name	Type	Range
1001	Smart Grid operation mode		▪ 0: Free ▪ 1: Forced off ▪ 2: Recommended on ▪ 3: Forced on
1002	Power limit for Demand Control	Pow16	0~20 kW

10.3 Smart Grid & Demand control

10.3.1 Smart Grid for air-to-air heat pump

The Daikin HomeHub allows the air-to-air heat pump installation to receive Smart Grid requests from a third party to control the power consumption of the system. There are 4 possible Smart Grid operation mode requests:

`Free running` (normal operation)

There is no Smart Grid intervention. The unit operates normally, respecting any local and scheduled configuration.

At the moment a `Forced off`, `Recommended on` or `Forced on` request is received during `Free running`, the state of the unit is saved. When `Free running` is requested again, the air-to-air heat pump installation restores the saved state from the previous `Free running` operation.

`Forced off` (blocked operation)

There is a Smart Grid request to switch the unit OFF. The request aims to stop and prevent any operation of the air-to-air heat pump installation. This request can last maximum 2 hours.

`Forced on`

There is a Smart Grid request to increase the power consumption of the air-to-air heat pump installation. This occurs typically when there is an electrical energy excess on the grid.

- The unit is turned ON / stays ON.
- Temperature setpoint is
  - Increased by 2°C if unit operation mode is Heating at the request time,
  - Decreased by 2°C if unit operation mode is Cooling at the request time,
  - Unchanged if the current operation mode is Auto, Dry or Fan at the request time.
- The fan speed mode is unchanged.
  - **Note:** The fan speed mode is set to Auto in case the fan speed mode is not set due to internal unit logic.
- **Note:** The fan speed value is never changed.

`Recommended on`

There is a Smart Grid request to increase the power consumption of the air-to-air heat pump installation. This occurs typically when there is an electrical energy excess on the grid.

- The unit is turned ON / stays ON.
- Temperature setpoint is
  - Increased by 1°C if unit operation mode is Heating at the request time,
  - Decreased by 1°C if unit operation mode is Cooling at the request time,
  - Unchanged if the current operation mode is Auto, Dry or Fan at the request time.
- The fan speed mode is
  - Set to Quiet if the unit was OFF when the `Free running` state is left to enter one of the other states,
  - Unchanged if the unit was ON when the `Free running` state is left to enter one of the other states.
- **Note:** The fan speed value is never changed.

INFORMATION

The following exceptions apply:

- The `Recommended on` and `Forced on` requests CAN be overruled by a user interaction (any unit configuration, e.g. by remote controller, local schedule, app, ...). If `Free running` operation is again requested, the user settings will be kept instead of restoring the saved state. An exception applies for the cooling and heating setpoints. If they are NOT modified by the user interaction, they are restored to the setting saved during the last `Free running` request to avoid drifting of the setpoints. If one of them is modified by the user interaction, only the other one is restored to the setting saved during the last `Free running`.
- The `Forced off` request CANNOT be overruled by user interactions. When a user attempts to override the `Forced off` operation, the Daikin HomeHub will resend the `Forced off` request. This CAN take up to 2 minutes to take effect.
- When the setpoint increase of the heating setpoint goes beyond the maximum heating setpoint, it is set at the maximum heating setpoint instead. When the setpoint decrease of the cooling setpoint goes beyond the minimum cooling setpoint, it is set at the minimum cooling setpoint instead.

10.3.2 Demand control for air-to-air heat pump

In parallel to using the Smart Grid (SG) operation modes (see "10.3.1 Smart Grid for air-to-air heat pump" [▸ 44]), the power consumption can also be controlled by the Demand control functionality.

When the SG operation mode `Forced off` is active, Demand control is not enabled.

When one of the other SG operation modes is active, the Daikin HomeHub will enable Demand control in manual (fixed) mode. By enabling the Demand control, the maximum power consumption of the outdoor unit can be limited to save energy. Demand control will as such also restrict the capacity of the indoor unit.

The demand capacity (in %) is calculated based on the Demand control power limit written in Modbus holding register 1002 and on the Rated Cooling/Heating capacity of the outdoor unit. The value lies between 40 and 100%. Adjusting the power limit written in the Modbus register thus allows to control the power consumption of the system within this range. The minimum value of 40% ensures enough power is available for safe unit operation.

The demand capacity is individually calculated for each indoor unit (max. 5) controlled by the Daikin HomeHub. All indoor units connected to the same outdoor unit will be limited to the same demand capacity. Indoor units connected to different outdoor units can be subject to a different demand capacity, because of the possible difference of the outdoor unit's Rated Cooling/Heating capacity.

The Demand control settings calculated by the Daikin HomeHub are reflected in the ONECTA app via the Demand control menu of the unit(s).

11 Firmware updates

The Daikin HomeHub can be automatically updated over the internet to add features, solve security issues, or resolve bugs. To enable automatic updates, you must connect the Daikin HomeHub with the router or modem of your internet provider using a LAN cable. The Daikin HomeHub will automatically connect to the internet and receive firmware updates as soon as they become available. The Daikin HomeHub must be powered on to receive updates.

During an automatic update the LEDs will display mode 2 (normal operation).When the update is completed, mode 1 (normal operation) will be displayed again (see "14.2 LED indication" [▸ 55]).

To assure that an update was successfully installed, check the software version via the online user interface (see "12.4 WebUI settings" [▸ 52]).

12 Configuration

Configuration for use cases 1, 2 and 3 happens directly on the user interface (MMI) of the Daikin Altherma or Multi+(DHW). See "12.1 User interface settings" [▸ 48].

Configuration for use case 4 happens through the ONECTA app. See "12.2 ONECTA app settings" [▸ 51].

12.1 User interface settings

After connecting the Daikin HomeHub to the Daikin Altherma or Multi+(DHW), you first need to enable the Daikin HomeHub in the user interface settings before you can select a use case.

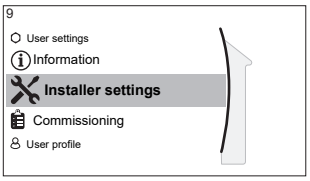
INFORMATION

`Heating comfort setpoint` and `Cooling comfort setpoint` can ONLY be set if Smart Grid and Room buffering are enabled. You MUST select a use case first before enabling these settings.

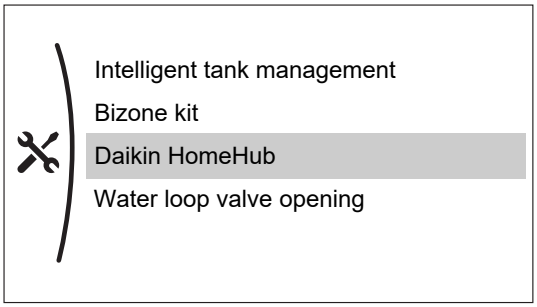
Once the Daikin HomeHub is enabled, Smart Grid and Room Buffering settings can be set in the `Daikin HomeHub` menu. No duplication is available elsewhere in the user interface settings.

12.1.1 To enable the Daikin HomeHub

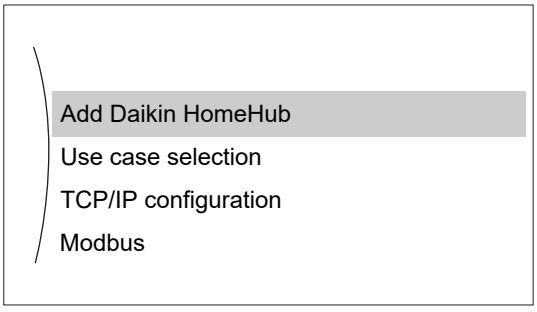
1 Select `Installer settings`.



2 Select `Daikin HomeHub`.



3 Select `Add Daikin HomeHub`.



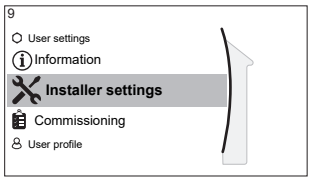
12.1.2 To select a use case

INFORMATION

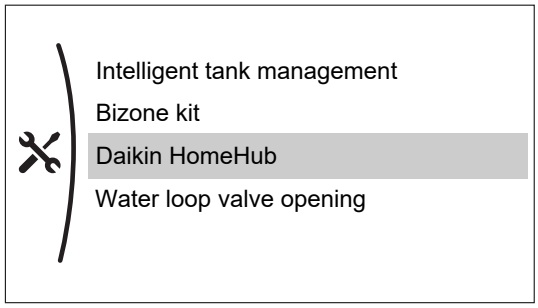
Selection of use case 1 and 2 is done automatically based on the connected unit.

Note: There is no visualisation for the use cases on the user interface. The homescreen only shows if the Daikin HomeHub is connected or not.

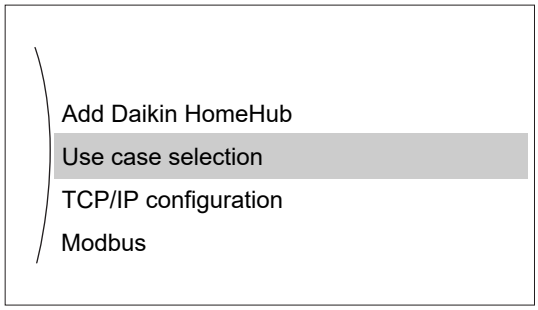
1 Select `Installer settings`.



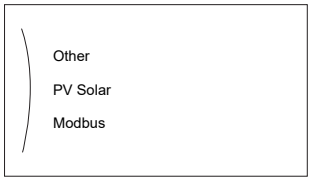
2 Select `Daikin HomeHub`.



3 Select `Use case selection`.



4 Select the desired use case.



12.1.3 Settings for Use case 1

After you have selected a `PV Solar` use case, set the following items in the `Installer settings` to the desired value for your situation:

Menu item (Daikin HomeHub > PV Solar)	Value
Minimum PV power	To ensure there is sufficient power available for the unit to remain operational, set the following: ▪ For units with a smaller capacity: 1 kW~10.0 kW ▪ For single-phase outdoor units with a higher capacity: 2 kW~10.0 kW[a] ▪ For three-phase outdoor units with a higher capacity: 2.5 kW~10.0 kW[a]
Allow electrical heaters	▪ No ▪ Yes
Enable room buffering	▪ No ▪ Yes
Grid configuration[b]	Set according to your grid connection: ▪ None ▪ 1x230V ▪ 3x230V ▪ 3x400V+N

[a] If there is no single-phase or three-phase information available, the range 2.5 kW~10.0 kW is used by default.

[b] Default is set to **None**. As long as it is set to **None**, no PV optimisation will happen. Ensure the setting is correct to guarantee a correct readout of power values.

You can also set the **Heating comfort setpoint** and **Cooling comfort setpoint** (Main menu > **Room** > **Room comfort setpoint**), but ONLY if [C-07]=2 and room buffering is enabled.

The excess PV power, which is the difference between the generated solar power and the household power consumption, must exceed the value set by **Minimum PV power** before a buffering operation can start. The value is a compromise between less frequent start/stops of the unit and starting buffering operation at lower injection values.

Make sure to set [4-08] Power Consumption Control to **0: No**. See "12.3 Field settings for Daikin Altherma or Multi+(DHW) tank" [▸ 52].

12.1.4 Settings for Use case 2

After you have selected a **PV Solar** use case, set the following items in the **Installer settings** to the desired value for your situation:

Menu item (Daikin HomeHub > PV Solar)	Value
Allow electrical heaters	Yes
Enable room buffering	No

Menu item (Daikin HomeHub > PV Solar)	Value
Grid configuration[a]	Set according to your grid connection: ▪ None ▪ 1x230V ▪ 3x230V ▪ 3x400V+N

[a] Default is set to **None**. As long as it is set to **None**, no PV optimisation will happen. Ensure the setting is correct to guarantee a correct readout of power values.

Make sure to set [4-08] Power Consumption Control to **0: No**. See "12.3 Field settings for Daikin Altherma or Multi+(DHW) tank" [▸ 52].

12.1.5 Settings for Use case 3

After you have selected a **Modbus** use case, set the following items in the **Installer settings** to the desired value for your situation:

Menu item (Daikin HomeHub > Modbus)	Value
Connection type	▪ In case of RS-485: **RTU** ▪ In case of LAN: **TCP/IP**
Smart Grid support	Modbus control
TCP security	▪ Not encrypted ▪ Encrypted
Allow electrical heaters	▪ No ▪ Yes
Enable room buffering	▪ No ▪ Yes

You can also set the **Heating comfort setpoint** and **Cooling comfort setpoint** (Main menu > **Room** > **Room comfort setpoint**), but ONLY if [C-07]=2 and room buffering is enabled.

Make sure to set [4-08] Power Consumption Control to **0: No**. See "12.3 Field settings for Daikin Altherma or Multi+(DHW) tank" [▸ 52].

12.2 ONECTA app settings

The following can be done in the ONECTA app:

- Add / remove the Daikin HomeHub to your home,
- Select a use case,
- Change the Modbus settings (for use case 3 and 4),
- Check demand control.

Modbus settings

It is possible to set:

- Modbus node address: 1~247 (default: 1)

- Modbus protocol: RTU or TCP/IP (default)

In case of TCP/IP protocol, set the following:

- Encryption: none (default) or TLS

12.3 Field settings for Daikin Altherma or Multi+(DHW) tank

All field settings are accessible and programmable through the user interface:

- Via a specific menu item (see the manual of the user interface), and/or
- Via the field settings overview: `Installer settings` > `Overview field settings`.

Setting	Description	Value[a]
[4-08][b]	Power Consumption Control (PCC) – Mode	▪ **0: No** ▪ 1: Continuous ▪ 2: Inputs ▪ 3: Current sensor
[C-07][c]	Unit control	▪ 0: Leaving Water Temperature (LWT) control ▪ 1: External Room Thermostat (RT) control ▪ **2: Room Thermostat (RT) control**
[E-05][c]	Allow production of DHW	▪ **0: No** ▪ 1: Yes
[E-06][c]	Indicates if DHW is supplied by a tank	▪ **0: No** ▪ 1: Yes
[6-0E]	Maximum tank temperature	Value range depends on unit type

[a] Default value in bold
[b] Always set to **0: No** in combination with the Daikin HomeHub.
[c] The field settings depend on the selected use case. See "7.3 Energy buffering" [▸ 26] for more information on which values to set.

12.4 WebUI settings

A limited online user interface is available to the user to check the EKRHH version information. It displays the device's unique cloud identifier and the software version (released & internal).

The interface can be reached by browsing from within the same (sub)network to:

- http://xxx:8080 (xxx = the IP address of the EKRHH)
- The hostname;
  - Can in some cases be found on the sticker on the back of the Daikin HomeHub
  - If not mentioned on the sticker, use the following dynamic hostname: http://homehub-524288-S/N (S/N = Serial number without leading zeros)

You only need a local network to reach the user interface, it is not required to be connected to the internet.

13 Hand-over to the user

After having installed and configured the Daikin HomeHub, hand over this installation manual to the user and make him/her aware of the safety precautions.

14 Troubleshooting

14.1 Buttons

Operation	Button	Action	Description
Reset	PB1	Short push	Software reset, no reboot
Restart		Press 10 seconds	Reboots the system
Factory reset	PB1+PB2	Press + power cycle	Restores the device to its original out-of-factory state

14.2 LED indication

Daikin HomeHub

The Daikin HomeHub has 2 LEDs that display information.

LED	Colour	Description
LED1	Green	Status LED 1
LED2	Blue	Status LED 2

Normal operation

Mode	Status	Description
0	▪ LED1 (green): OFF ▪ LED2 (blue): OFF	Power off
1	▪ LED1 (green): OFF ▪ LED2 (blue): Heart beat[a]	Operating system running
2	▪ LED1 (green): Blinking (5 s interval) ▪ LED2 (blue): OFF	Device updating

[a] Variable rate depending on system load

Troubleshooting states

Mode	Status	Description
0	▪ LED1 (green): ON ▪ LED2 (blue): OFF	System boot loading error
1	▪ LED1 (green): OFF ▪ LED2 (blue): ON	Linux boot error
2	▪ LED1 (green): ON ▪ LED2 (blue): OFF	Power on – not booted
3	▪ LED1 (green): OFF ▪ LED2 (blue): ON	Bootloader loading

Mode	Status	Description
4	▪ LED1 (green): OFF ▪ LED2 (blue): Heart beat[a]	Operating system / Application loading
5	▪ LED1 (green): Blinking (0.2 s interval) ▪ LED2 (blue): Heart beat[a]	PB1 pushed
6	▪ LED1 (green): Blinking (1 s interval) ▪ LED2 (blue): Heart beat[a]	PB2 pushed

[a] Variable rate depending on system load

Current sensor

The current sensor has 3 LEDs that display information.

Normal operation

LED	Colour	Status	Description
PWR	Yellow	OFF	CSP1 device is not powered
		ON	CSP1 device is powered
CS	Green	OFF	No current measured or no current sensor connected
		Blinking (1 second interval)	Cumulated measured current <50 A. The value determines how long the LED is on: 20 msec per cumulated current in ampere.
		ON	Cumulated measured current ≥50 A
P1	Red	OFF	USB/P1 cable not connected or no communication
		Blinking	USB/P1 cable not connected or no communication
		ON	Daikin HomeHub is receiving data through USB/P1 connection

If after installation, the PWR LED does not light up, check the connection with the mains power if you use a power adapter.

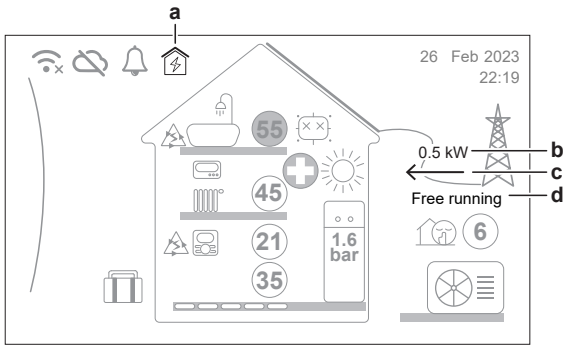
Troubleshooting states

LED	Status	Solution
PWR	OFF	Check power connections
CS		If power is used, check the clamp connection
P1		Check the USB/P1 cable connection to the Daikin HomeHub

14.3 User interface indications

Correct mounting and wiring of the clamps to the current sensor can be validated through the user interface of the Daikin Altherma or Multi+(DHW) to which the Daikin HomeHub is connected.

A correct or incorrect P1/P2 connection between the Daikin HomeHub and Daikin Altherma or Multi+(DHW) is indicated on the homescreen (a):



a	Daikin HomeHub connection: ▪ : Connected ▪ x: NOT connected ▪ : Error (U8-18~20. See "14.4 Error codes: Overview" [▶ 57])
b	Power flow – value (displayed as 0.1 kW steps)
c	Power flow – direction: ▪ ⟶: Injected into the grid ▪ ⟵: Taken from the grid
d	Smart Grid operation mode: ▪ `Free running` ▪ `Forced off` ▪ `Recommended on` ▪ `Forced on`

If the sun isn't shining and the consumption of the house is rather high (for example when the oven is switched on), the power flow (c) should always be taken from the grid (pointing to the left). If this is not the case, the mounting or wiring of the clamps is probably not correct.

14.4 Error codes: Overview

Code	Description	Solution
U8-15	`Connection with the Daikin HomeHub lost`[(a)]	▪ Reset and/or reboot ▪ Reconnect/replace P1/P2 cable ▪ Make sure there are not 2 Daikin HomeHub on the same P1/P2 ▪ See the manual of the indoor unit

Code	Description	Solution
U8-18	Daikin HomeHub internal error	▪ Reset and/or reboot ▪ Factory reset ▪ Check Ethernet cable ▪ Check RTU/TCP mode ▪ Check TCP mode (static or DHCP) ▪ Check IP address & port ▪ Check if TLS encryption is set properly
U8-19	Daikin HomeHub PV Solar Smart meter error	▪ Reset and/or reboot ▪ Reconnect/replace USB/P1 cable ▪ Check the troubleshooting options of the current sensor (see "Current sensor" [▸ 56])
U8-20	Daikin HomeHub modbus error	▪ Reset and/or reboot ▪ Check Ethernet cable ▪ Check RTU/TCP mode ▪ Check TCP mode (static or DHCP) ▪ Check IP address & port ▪ Check if TLS encryption is set properly

(a) It can take up to 3 minutes to restore connection with the Daikin HomeHub.

15 Glossary

DHW = Domestic hot water

Hot water used, in any type of building, for domestic purposes.

HEM = Home energy management

A home energy management system is a system of computer-aided tools to monitor, control and optimise the performance of your energy production, storage and consumption at home.

LWT = Leaving water temperature

Water temperature at the water outlet of the unit.

PDU = Protocol data unit

A single unit of information transmitted among peer entities of a computer network. It can contain control information, address information or data.

PV energy = Photovoltaic energy

Energy generated by photovoltaic (solar) panels. A photovoltaic system converts sunlight into electricity.

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