Heating, cooling, ventilation with KNX

Use cases

HVAC use cases with KNX

KNX covers all the heating, ventilation and air conditioning applications using the available products. In particular, demand-based controllers make a significant contribution to energy saving in buildings. The following pages describe examples of typical HVAC applications and systematically show how heat/cooling generators, individual room thermostats and visualisation systems interact via KNX.

The data determined via KNX by the heat / cooling generators and individual room thermostats can be displayed by the visualisation systems not only as values, diagrams or graphics but also:

- stored locally and in the cloud and displayed or evaluated at a later point
- evaluated and checked whether they exceed the limit values
- linked with events, states and times and trigger actions
- converted into Euro amounts and totalled up
- routed as status or fault signals via push messages or email

If the user would like to automatically access the data via the Internet, the use of KNX web services is offered. A gateway displays the KNX project so that the data can be accessed via existing web service implementations such as OBIX, OPC UA and BACnet-WS, without knowing the specifications of the KNX protocol. The KNX web service gateway can be operated in parallel to the visualisation system and is not displayed in the applications for reasons of clarity.

Control and monitoring of the system functions of an HVAC device

Display and remote control of operating modes

The display and remote control of the operating modes (comfort, standby, night reduction) for the system functions (heating, cooling, ventilation and hot water) of a generator are of particular interest for the user if he wishes to intervene in the system control outside of the standard operation.

Case A:

The user toggles the operating state via his smartphone.

Case B:

The user starts the one-time heating of the hot water before showering.

KNX solution for case A

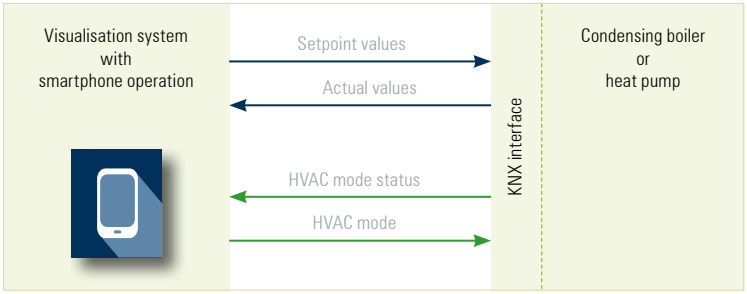
Selection of the operating mode

The user has different options depending on the system configuration:

1. To set the operating mode centrally on the power generation system. The system affects the respective heating circuit (e.g. one floor).
2. To set the operating mode separately for each room via the visualisation using individual room temperature control.

The setting under 1. has the primary function.

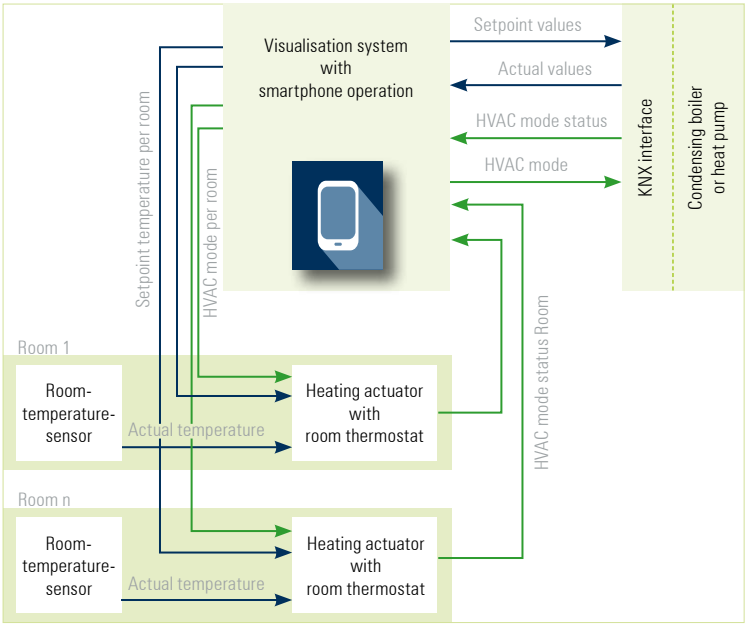
1. The default operating mode is only carried out on the heat / cooling generator per heating / cooling circuit with a corresponding feedback signal. The heating system is largely self-sufficient. The operating mode is only assigned via the KNX either manually, via a timer or a scene. A typical application is party mode in which the comfort mode should be maintained outside the programmed period. Another application is e. g. the integration in a presence scene which is activated if the occupants are not at home for several days.



Selection and feedback of operating modes over HVAC mode, 1 Byte / DPT 20.102 or 1 Bit / DPT 1.00x

For example for a heat pump control:
0: Auto
1: Comfort
2: Standby
3: Economy
4: Building Protection

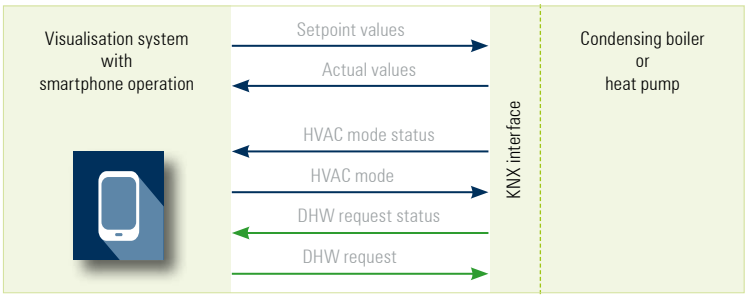
2. The default operating mode is carried out primarily at the heat / cooling generator as well as per room on the individual room thermostats. Both the room thermostats and the heat / cooling generators send a feedback signal to the visualisation about the respective status. In this constellation, the operating mode on the heat / cooling generator is typically set for the entire building or a large section of the building. In addition, individual rooms such as conference rooms, training rooms or canteens can be operated in an energetically low state.



KNX solution for case B

Domestic water heating

The one-time heating of the hot water e. g. via night mode, is triggered via a 1-bit command. The status can be queried at the same object or a separate status object. Alternatively, a temporary increase of the setpoint temperature of the hot water is possible.



one-time domestic hot water (DHW) 1 Bit / DTP 1.00x

Control and monitoring of temperatures

Display and remote control of setpoint and actual temperatures

The display of actual and setpoint temperatures of rooms, zones/heating circuits as well as the remote control of setpoint temperatures and the optional creation of setpoint temperature time profiles are among the standard functions of an individual room temperature controller.

Case A:
The user sets the setpoint temperature from 19°C to 21°C.

Case B:
The user would like the room temperatures to be displayed via a smartphone.

Case C:
An energy manager optimises the inlet temperature of a heating circuit / zone using the predefined room temperatures.

Case D:
The user configures time profiles so that the corresponding rooms have achieved the comfort temperature at the time of usage.

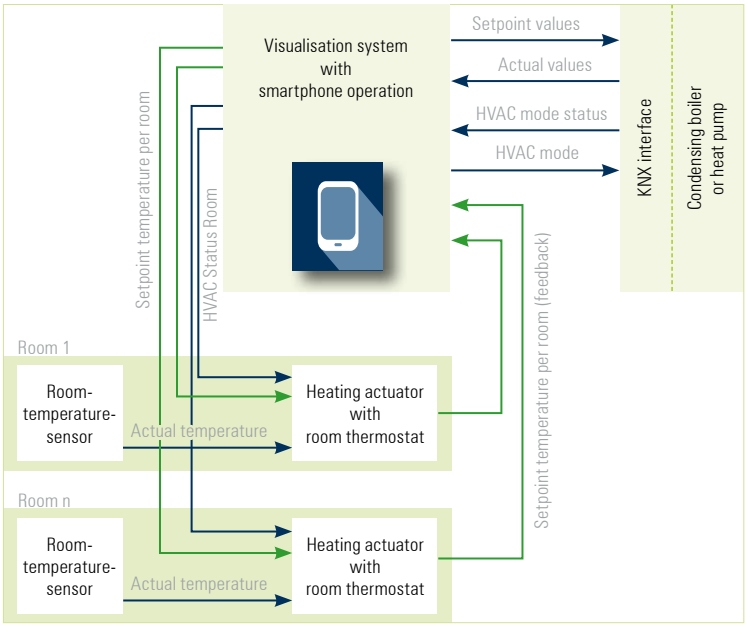
KNX solution for case A

Changing setpoint temperature from 19°C to 21°C

An individual setpoint value can be predefined for each room by the individual room thermostat via the visualisation.

The input is carried out either as a numerical value or via graphic elements (e. g. slide).

The room thermostat sends the respective setpoint value back to the visualisation as confirmation.

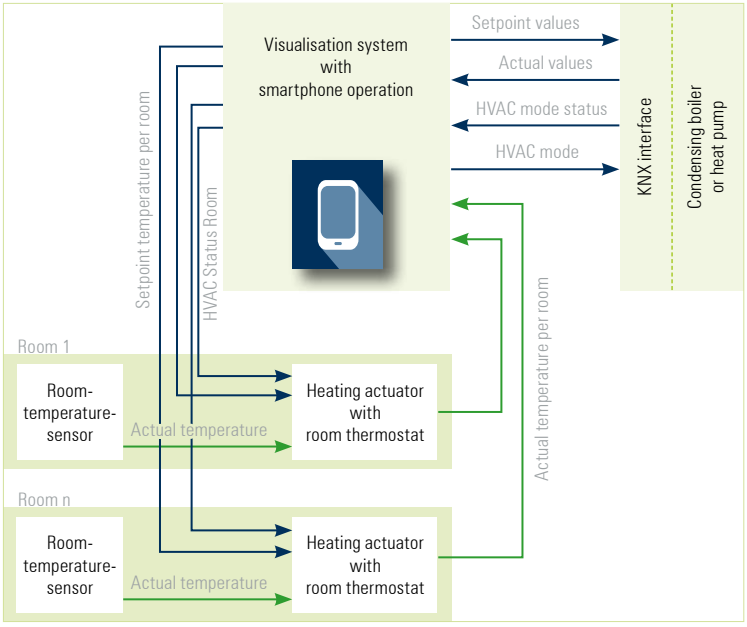


Actual-/Setpoint temperatures: 2 Byte Float / DPT 9.001

KNX solution for case B

Display of the room temperatures on a smartphone

A temperature sensor sends the respective actual value per room via KNX to the associated room thermostat which routes it for display on the visualisation.

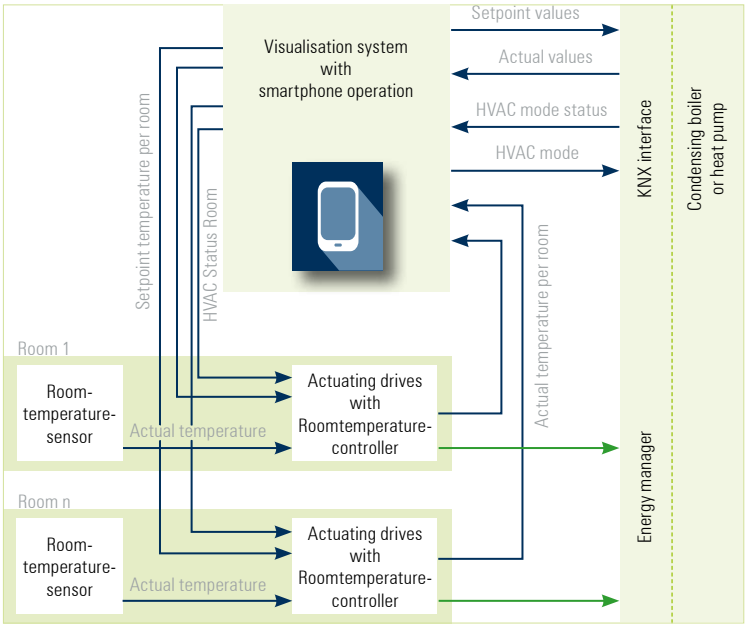


Actual-/Setpoint temperatures: 2 Byte Float / DPT 9.001

KNX solution for case C

For demand-based control, an energy manager optimises the energy consumption

The valve drives send the valve position per room to the energy manager which calculates the optimum inlet temperature on the basis of the current valve positions.

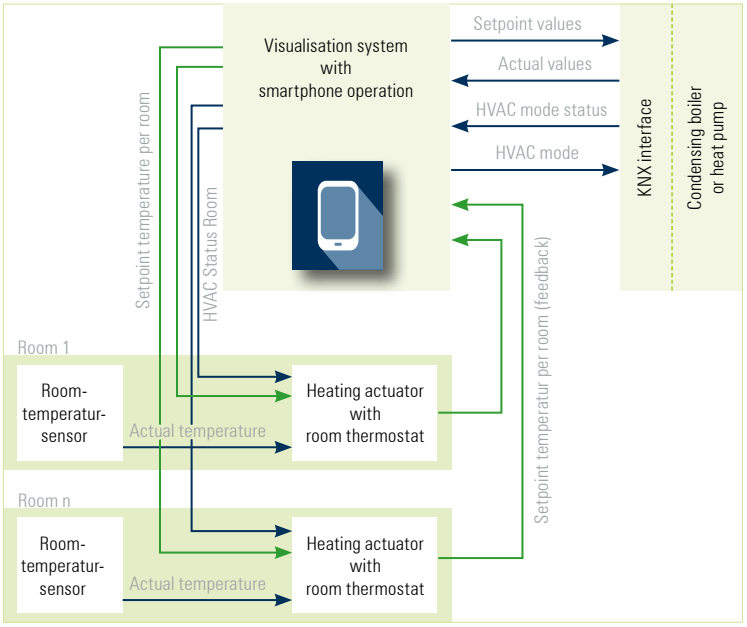


Actual-/Setpoint temperatures: Value_temp 2 Byte Float / DPT 9.001 • valve stroke: Percent (0 ... 100 %) / 1 Byte / DPT 5.001

KNX solution for case D

The user configures time profiles

Individual setpoint values can be preassigned for each room for individual room temperature control. The input of the setpoint values and times is generally carried out via graphic elements on the user interface of the visualisation. The profile data is stored in the visualisation system.



Actual-/Setpoint temperatures: 2 Byte Float / DPT 9.001

Visualisation of HVAC-related parameters

Display of HVAC-specific parameters

Current condensing boilers and heat pumps make far more available via KNX than the set-point and actual temperatures. Users can thus be fully informed via the KNX visualisation about the status of the system and the HVAC-specific parameters.

Case A:
The user would like the power consumption of HVAC devices to be displayed.

Case B:
The user would like the operating state (normal operation, faults, service requirements …) to be displayed via smartphone.

Case C:
The next service interval should be indicated to the user.

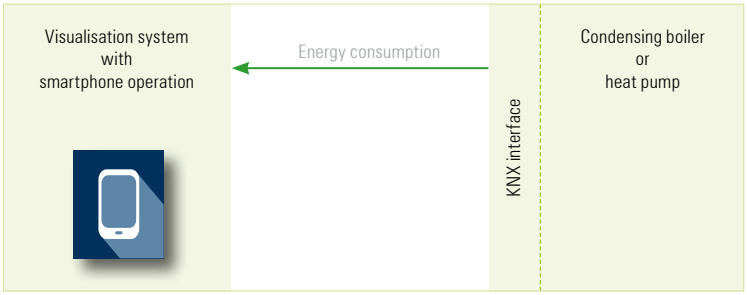
KNX solution for case A

Current heating controllers mainly make the energy consumption available as an absolute value on the KNX:

- electricity for heating
- electricity for hot water
- gas for heating
- gas for hot water

The energy consumption values are prepared in the visualisation system and displayed as:

- diagrams
- absolute values
- daily, weekly, monthly or annual values



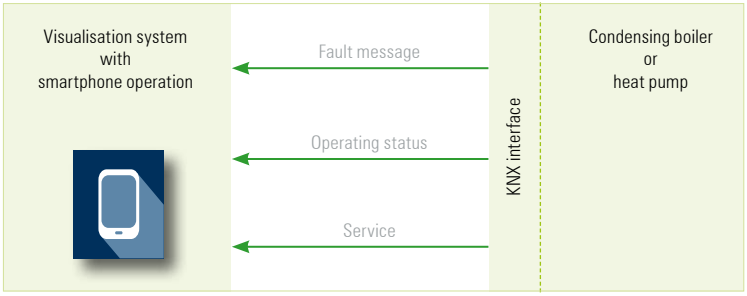
Energy consumption: real energy (kWh), 4 Byte / DPT 13.013

KNX solution for case B

Displaying operating states on the smartphone

Almost all the operating states can be queried via the KNX interface and displayed in the visualisation including: heating, cooling, active heating program, day / night mode, HV pumps, DHW heating, active electric night heating, service, etc.

When there are system errors, error messages are automatically sent to the visualisation via the KNX, either as individual fault messages or as group messages ("Faults of heat generator"). Both fault messages and states can be routed by the visualisation for immediate display and push message to a smartphone.



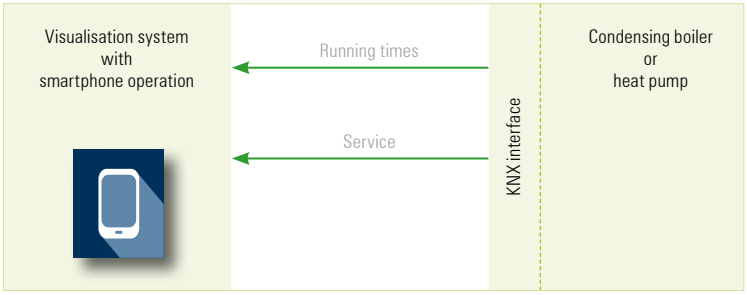
Fault message, Operating status: 1 Bit / DPT 1.00x; 1 Byte / DPT 6.020; 1 Byte / DPT 20.xxx

KNX solution for case C

Note about the next service interval

The note about the next service date can be carried out in different ways.

1. The heat / cooling generator determines the necessity of a service appointment itself and sends a request in the form of a yes / no telegram to the visualisation system.
2. The running times of the HV and storage pumps, compressors, electric heaters etc. are sent as absolute values to the visualisation, compared with the specified maintenance intervals and the next service period is calculated.



Running times: TimePeriodHrs / 2 Byte / DPT 7.007

Optimisation for optional power consumption of heat pumps

Integration of heat pumps in energy management

Heat pumps belong to the most energy-intensive devices in the building. There is therefore a high added value for the customer to integrate these systems in the energy management so that they can be operated cost-effectively.

Case A:
The service water is heated if the electricity is reasonable.

Case B:
The heating or cooling is carried out within a tolerance range defined by the customer if the electricity is reasonable.

Case C:
Further energy-intensive processes which exceed the domestic current of the PV system are prevented from starting during the heating cycles.

Case D:
The user can be shown when heating cycles take place and at what price.

KNX solution for case A/B
Heat pumps can represent optional processes (e.g. heating or cooling) on the communication interface, so that these processes can be started by an energy management system under favourable conditions.

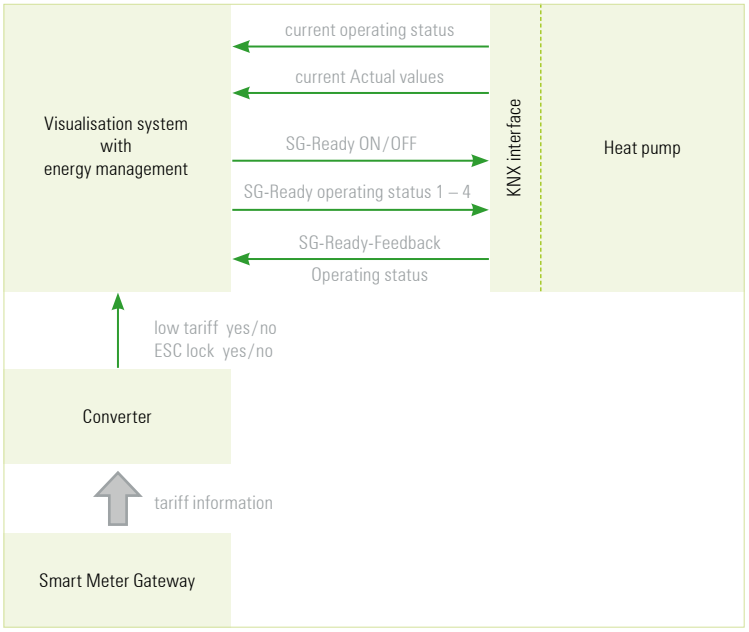
Use of SG ready functions for heat pumps with Smart Grid capability

Operating status 1
is backward compatible to utility lock, incorporates a maximum lockout period of two hours

Operating status 2
the energy-efficient normal operation with pro-rata filling of thermal store for the maximum lockout period of two hours

Operating status 3
is the controller mode for heating rooms and water

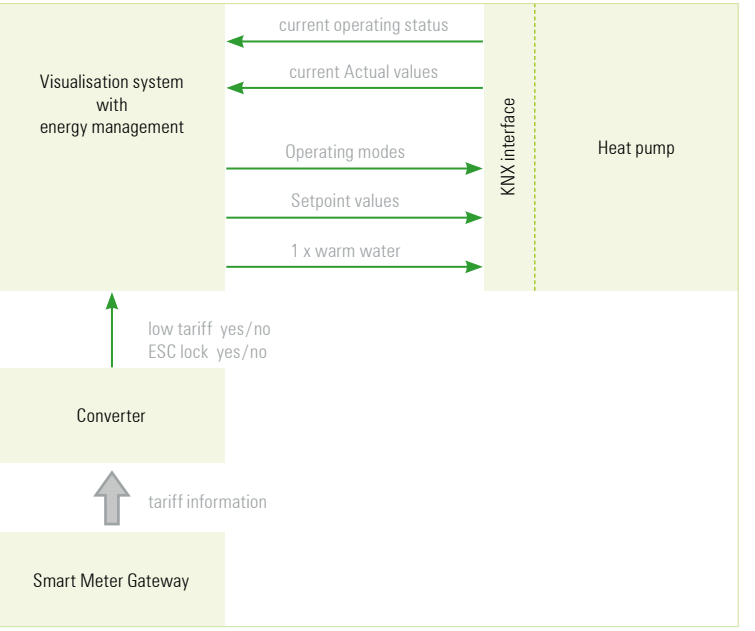
Operating status 4
is a definitive start-up command



SG-Ready-Operating-status: 1 Bit / DPT 1.00x
SG-Ready-Mode: 1 Byte / DPT 20.xxx
www.waermepumpe.de/waermepumpe/sg-ready/

KNX solution for case A/B

Control with a conventional heat pump via operating modes and set-point values.



KNX solution for case C/D

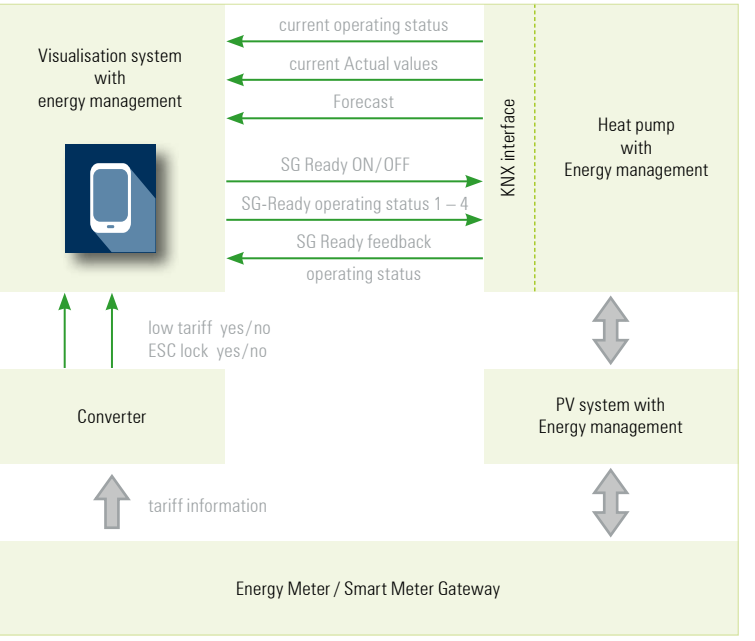
The heat pump determines the thermal energy demand of the building and communicates the power requirement to the PV system.

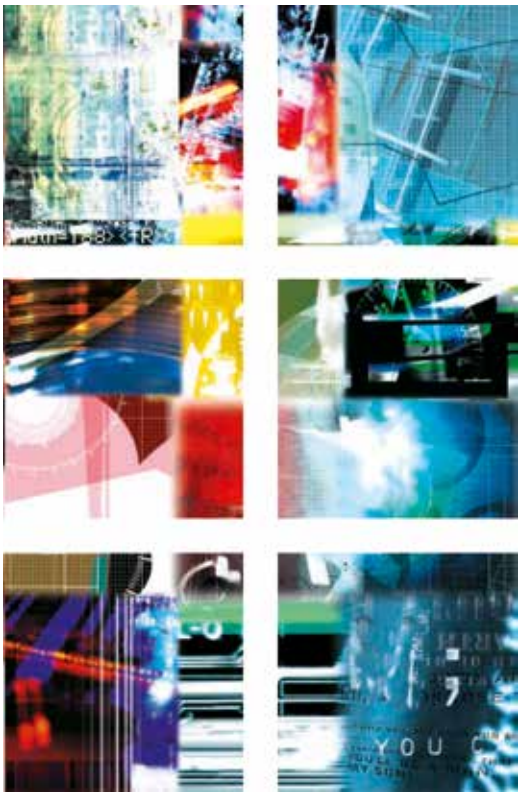
The PV system plans the operating time of the devices under consideration of a yield and consumption forecast so that the power consumption makes an optimum contribution to the domestic consumption.

The heat pump converts this proposal dependent on the operating state and thus increases the domestic consumption.

Electrical energy is converted into thermal energy cost-effectively and stored temporarily in the house.

Operating states and forecast data can be communicated by heat controllers to a visualisation program via the KNX and displayed as values, diagrams or graphics.





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