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ISYteq Controls

DATA & FACTS



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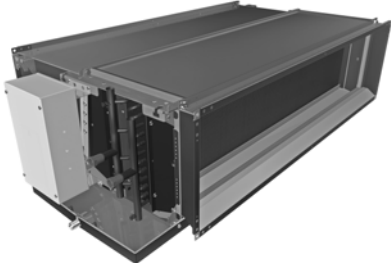


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1 Overview of Units and Packaged Content

1.1 Overview of FläktGroup Units in scope

	
<p>Flex-Geko</p>	<p>HyPower-Geko</p>
	
<p>Cassette-Geko</p>	<p>HyCassette-Geko</p>

1.2 ISYteq control panels

	
<p>CET.ACEC</p>	<p>ISYteq LCD IW</p>
	
<p>ISYteq Touch 4.0</p>	

2 Technical Description

2.1 Product features and functions

The ISYteq controller is a microprocessor-based, programmable electronic controller, featuring a multitasking operating system, compatible with the FläktGroup controls family of devices, which includes programmable controllers, user terminals, gateways, communication devices and remote management devices.

These devices represent a powerful control system that can be easily interfaced with most Building Management Systems (BMS) available on the market.

ISYteq has been developed to provide solutions for several applications in air-conditioning, refrigeration and HVAC/R in general.

ISYteq controllers can be connected in an Ethernet LAN to other FläktGroup family controllers.

Each device in the LAN can exchange digital or analogue variables with all the others, based on the application program used.

The built-in web server, completely customisable, supports HTML standard and JavaScript.

The 90Mbyte memory can be used to store pages created using the most common website development tools. Dynamic methods (CGI, Common Gateway Interface) are available to read and write the application program variables.

Other innovative functions include the possibility to display the contents of the pGD1 terminal in the browser, display graphs of data recorded by the data logger and plot data from probes and energy meters in real time.

The Integrated USB peripheral can be used to update the controller and save web pages, documents and applications in the flash memory. Also used to download the logs from the controller.

The host and device USB ports are managed directly by the operating system.

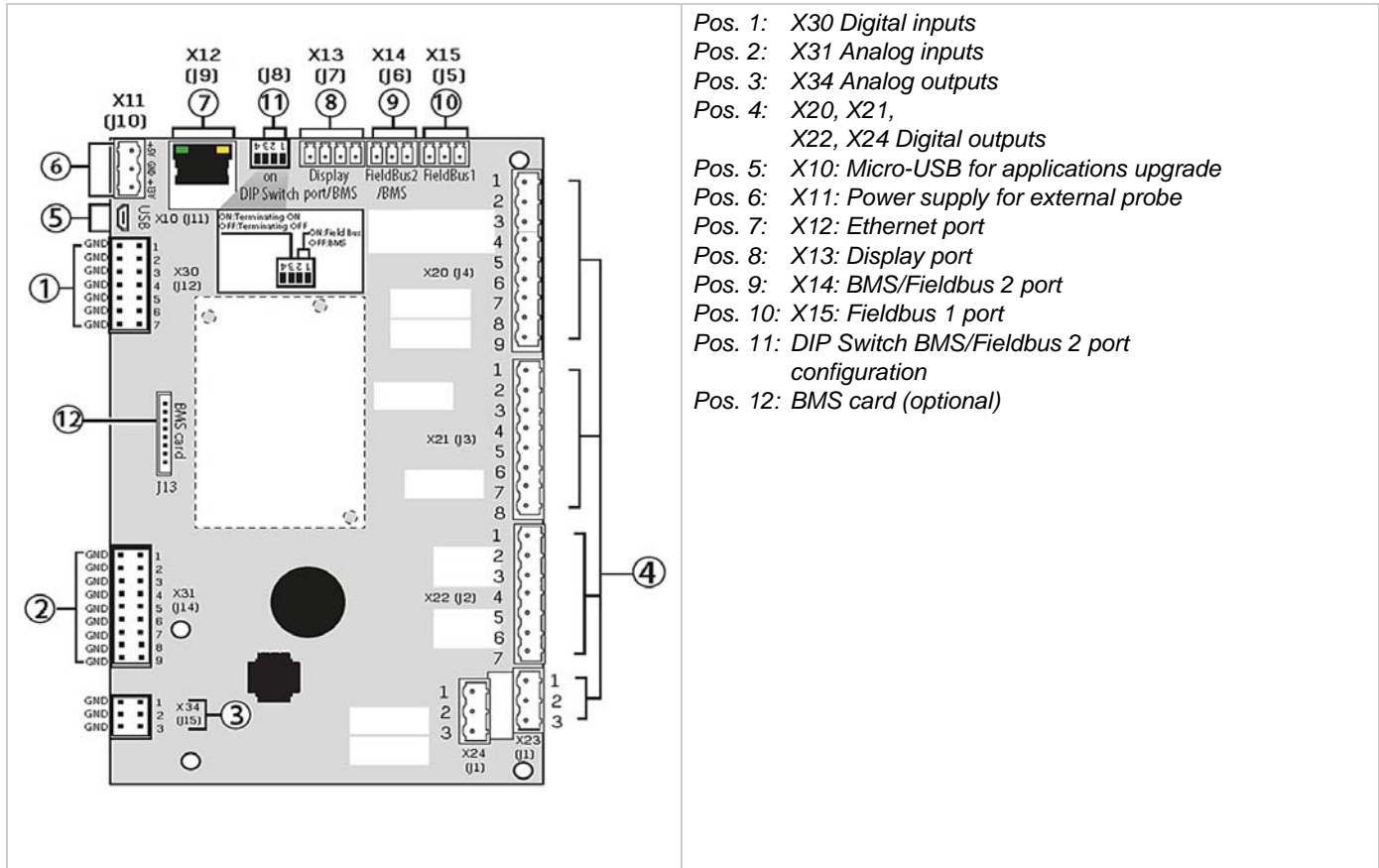
The USB host (top) allows a USB flash drive to be used to load updates (operating system/application program) on the controller.

The USB device port (bottom) allows connecting the ISYteq controller to a personal computer, and its memory is made available as a removable drive, and at the same time a communication channel is established that can be used for programming and online debugging.

2.2 ISYteq Controller models

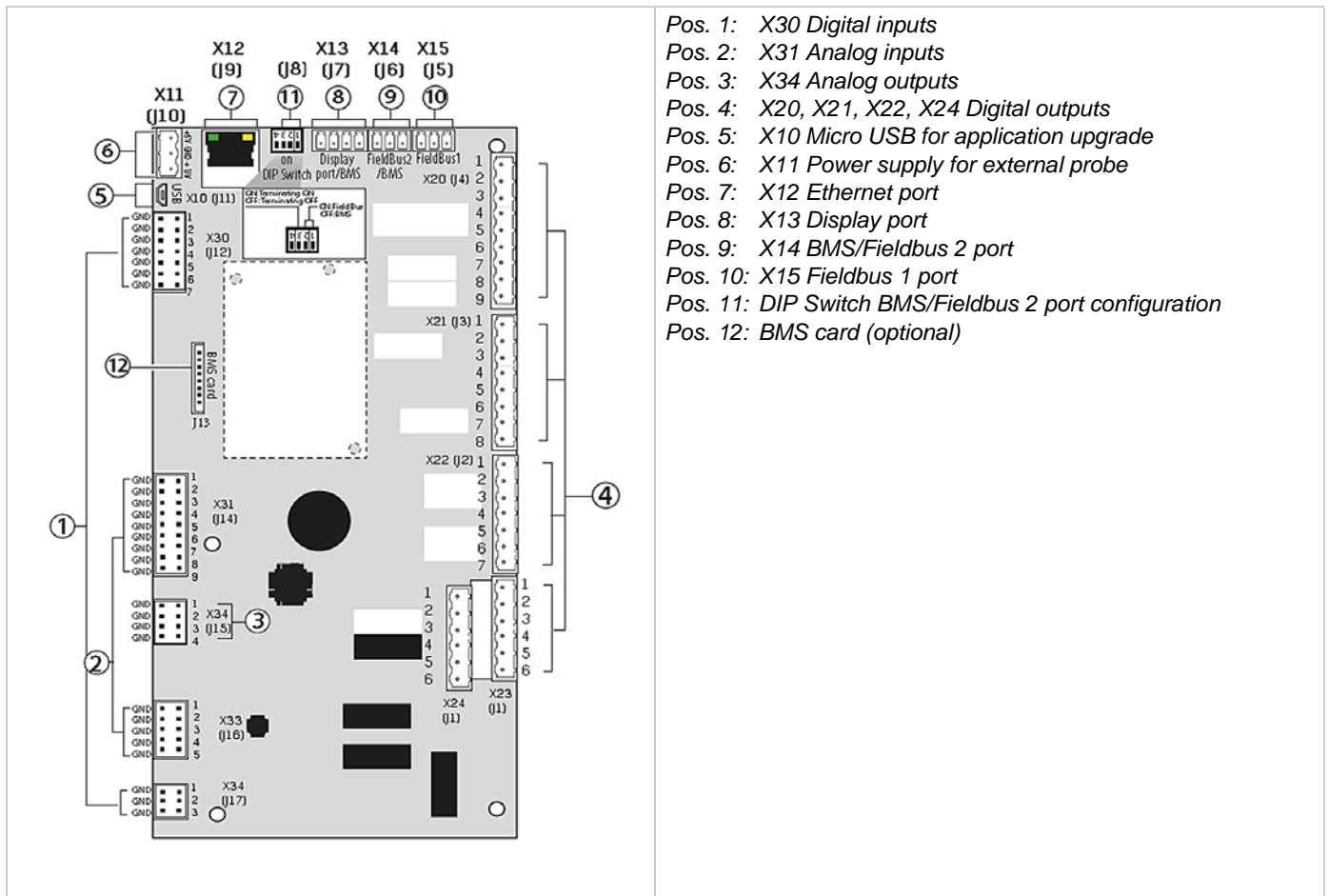
2.2.1 Controller Models ISYteq for Decentral Systems

ISYteq 3010



2.2.2 Controller Models ISYteq 3020

ISYteq 3020

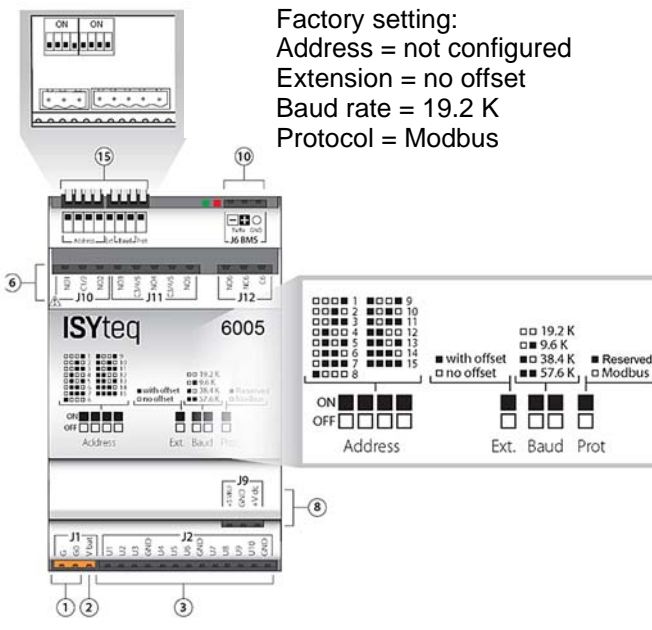


- Pos. 1: X30 Digital inputs
- Pos. 2: X31 Analog inputs
- Pos. 3: X34 Analog outputs
- Pos. 4: X20, X21, X22, X24 Digital outputs
- Pos. 5: X10 Micro USB for application upgrade
- Pos. 6: X11 Power supply for external probe
- Pos. 7: X12 Ethernet port
- Pos. 8: X13 Display port
- Pos. 9: X14 BMS/Fieldbus 2 port
- Pos. 10: X15 Fieldbus 1 port
- Pos. 11: DIP Switch BMS/Fieldbus 2 port configuration
- Pos. 12: BMS card (optional)

2.3 Expansion card

Used to increase the number of inputs/outputs on the controller and the number of relays

ISYteq 6005



Factory setting:
 Address = not configured
 Extension = no offset
 Baud rate = 19.2 K
 Protocol = Modbus

Pos. 1: Power connection (G[+], G0[-]), power supply for voltage A(*)

Pos. 2: Power supply from external Ultracap module

Pos. 3: Universal inputs/outputs (U1-U10)

Pos. 4: +VDC: power supply for active probes

Pos. 6: Normally open contact, relay

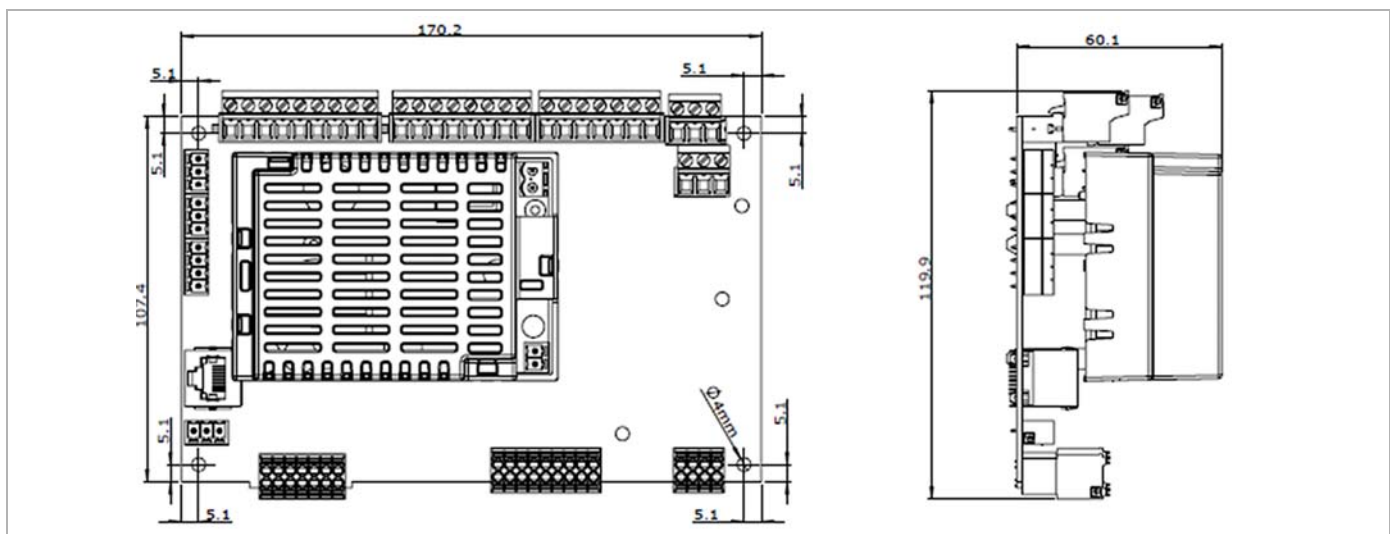
Pos. 8: Power supply for ratiometric probes 0 to 5 V, GND: Common power supply, +VDC: Power supply for active probes, +VDC: Power supply for active probes

Pos. 10: BMS RS485 port Tx-Rx
 BMS RS485 port Tx+ Rx+
 BMS RS485 port GND

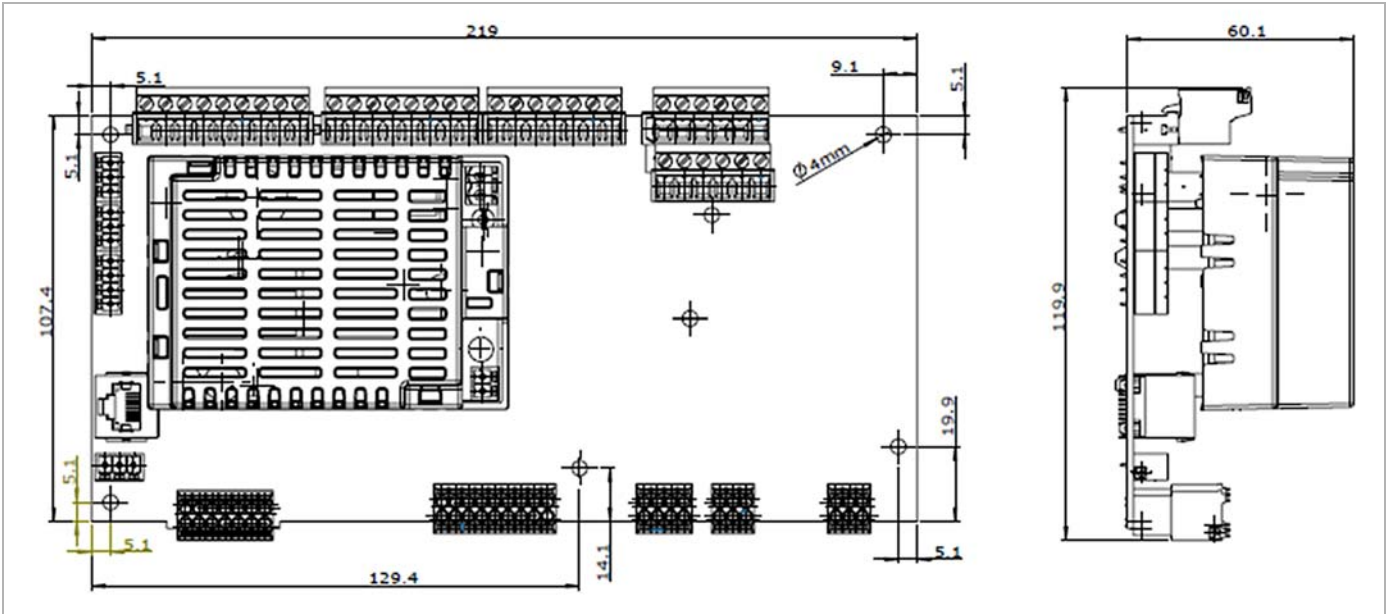
Pos. 15: DIP switch for address and communication settings

2.4 FläktGroup Controller Dimensions [mm]

ISYteq 3010



ISYteq 3020



Type	Length	width	Height
ISYteq 3010	170	119.9	60.1
ISYteq 3020	219	119.9	60.1

2.5 Models of ISYteq Display Panels

2.5.1 ISYteq Touch 4.3" display

The Touch display terminal is designed to make user interface with the ISYteq controllers easily and intuitively. The electronic technology used and the new 64K colours display allows high quality images and advanced functionality to obtain a high aesthetic standard.

The touch screen panel also facilitates human-machine interaction making it easier to navigate between the various screens.



Fig. 2-1: ISYteq Touch 4.0 with white cover (ISYteq Touch 4.0 WF)

The information in the tiles displayed will vary in type and position depending on the specific unit configuration.

FläktGroup ISYteq 4.3" display

Touch display	
Display size	4.3"
Length/width (mm)	151.5/87.7
Power supply	12-33 VDC
Background lighting	LED
Protection class	IP40 (front)
Working temperature	0°C to + 50°C
Storage temperature	-30°C to + 70°C
Integrated temperature sensor	Yes
Integrated humidity sensor	Yes

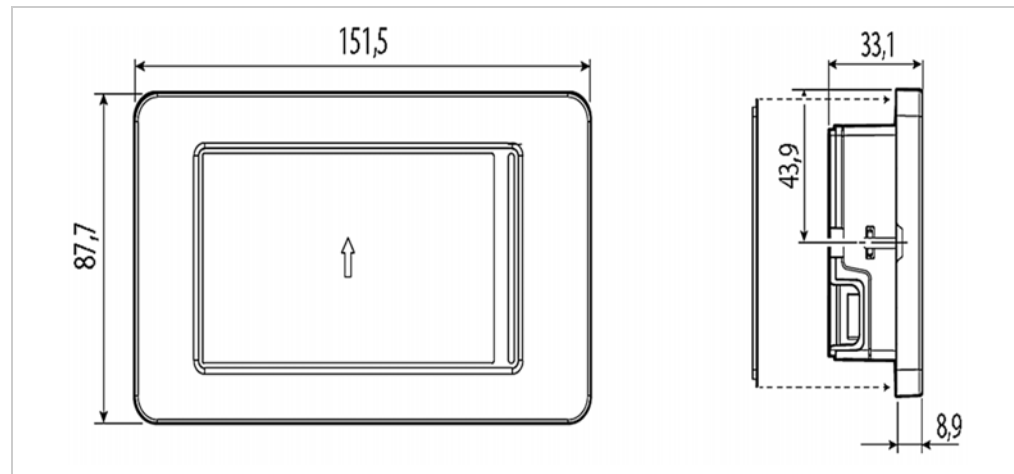


Fig 2-2: Front and side view ISYteq Touch 4.0 (dimensions in mm)

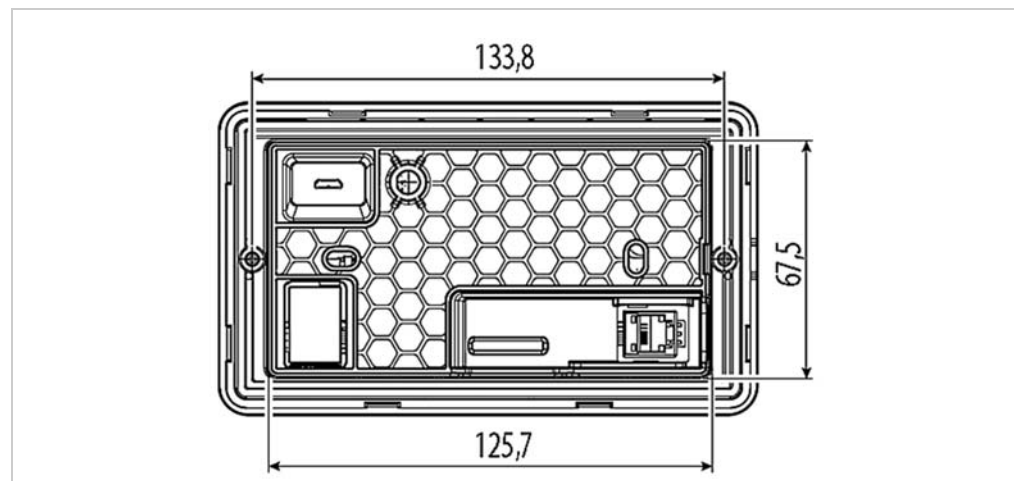


Fig 2-3: Rear view ISYteq Touch 4.0 (dimensions in mm)

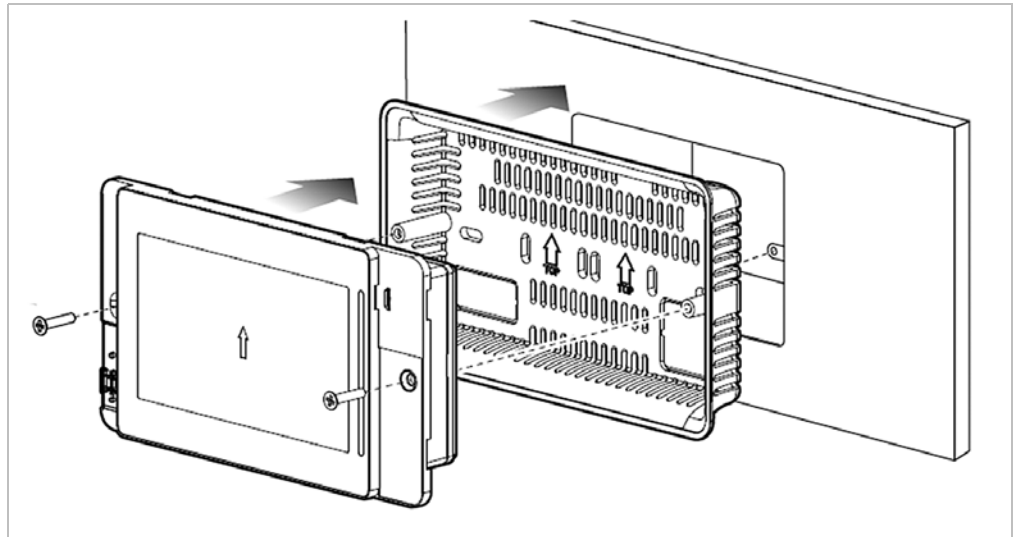


Fig. 2-4: On-wall frame (ISYteq Touch 4.0 OC)

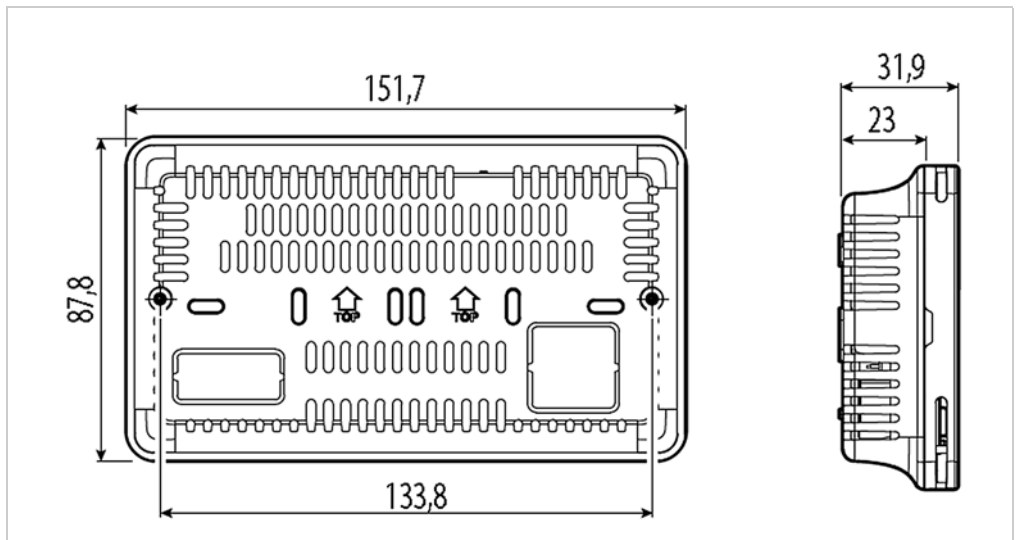


Fig 2-5: Front and side view ISYteq Touch 4.0 OC (dimensions in mm)

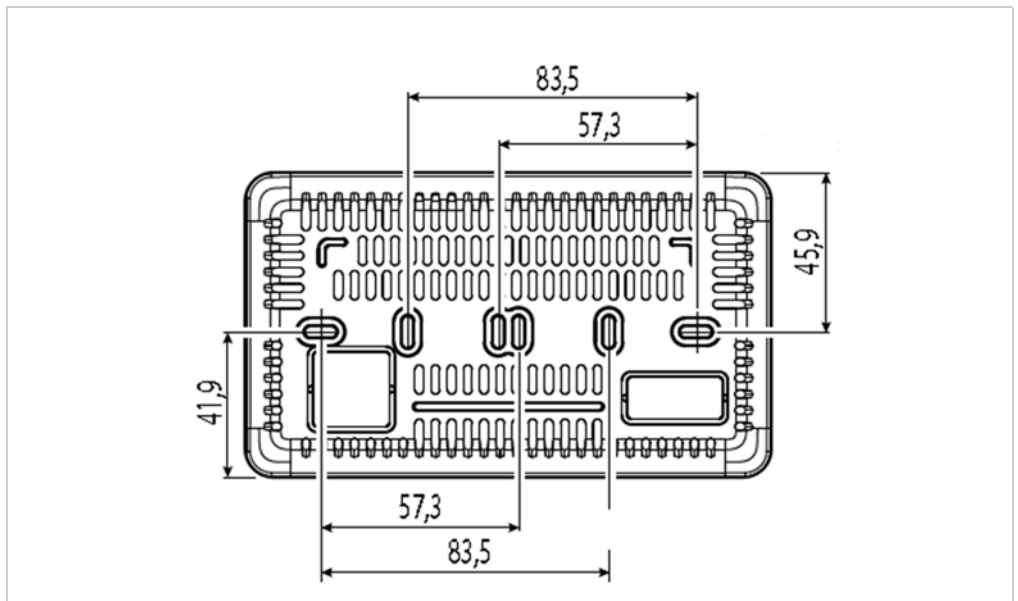


Fig 2-6: Rear view ISYteq Touch 4.0 OC with drill hole spacing (dimensions in mm)

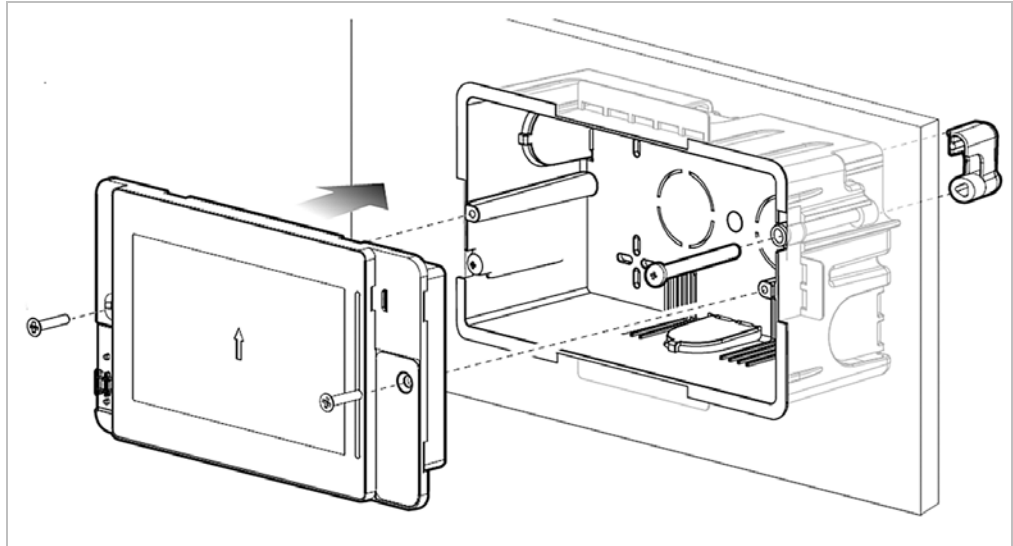


Fig. 2-7: UP frame (ISYteq Touch 4.0 IC)

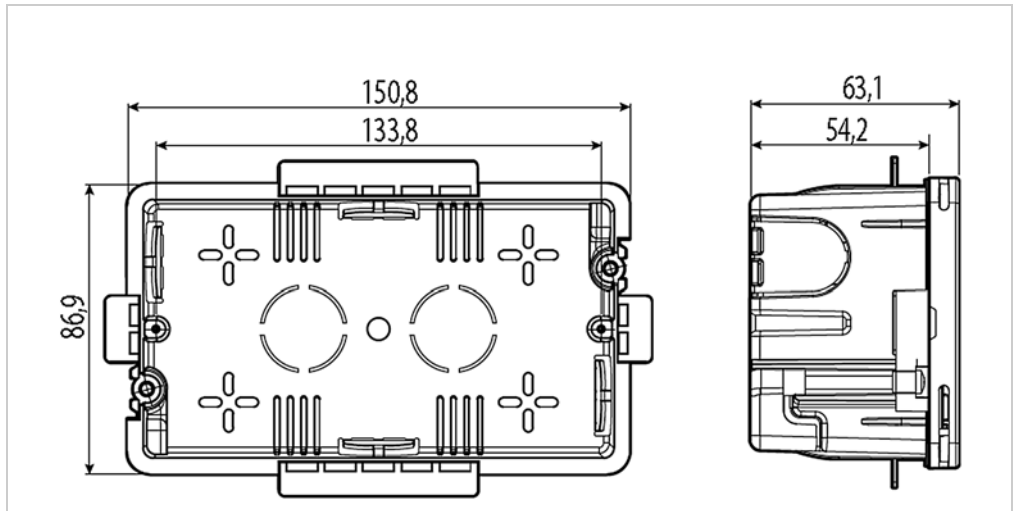


Fig 2-8: Front and side view ISYteq Touch 4.0 IC (dimensions in mm)

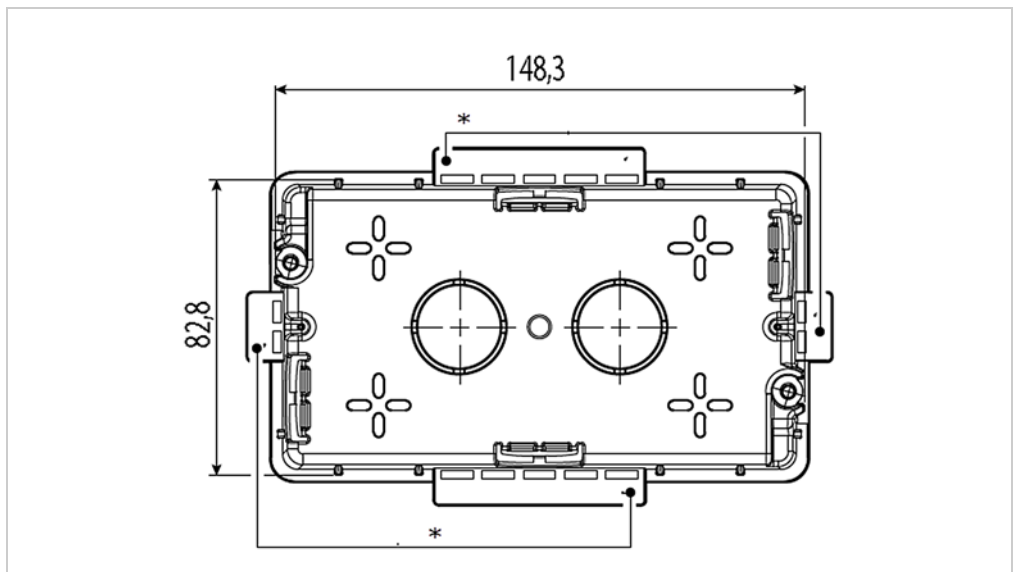


Fig 2-9: Rear view ISYteq Touch 4.0 IC with drill hole spacing (dimensions in mm)

* To remove for plasterboard installation

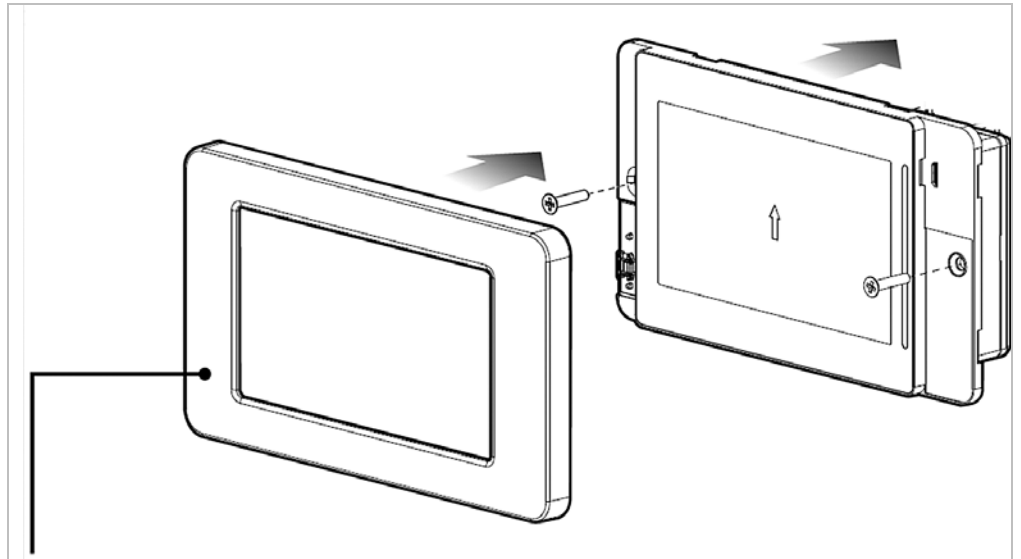
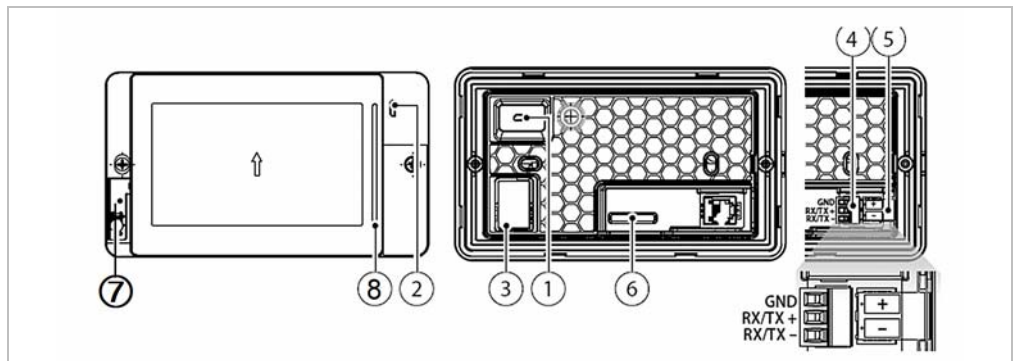


Fig. 2-10: ISYteq Touch 4.0 cover in white (ISYteq Touch 4.0 WC) and black (ISYteq Touch 4.0 BC)

Control panel is powered directly from the controller board.

- Connect the control cables in accordance with the wiring diagram (connect same numbers).
- Two cores with the same diameter can be placed under one terminal.



Ref.	Description
1	MicroUSB rear
2	MicroUSB front
3	Ethernet port
4	RS485 port
5	Power supply portpage 13
6	External keypad connector
7	Temperature/Humidity sensor
8	Notification bar



Notice!

The maximum allowed distance between the controller and the display is 10 m. If the distance is exceeded an external transformer (24 VDC) must be used to power the Touch Panel. Failures and overload cannot be excluded

2.5.2 ISYteq LCD

FläktGroup ISYteq LCD IW

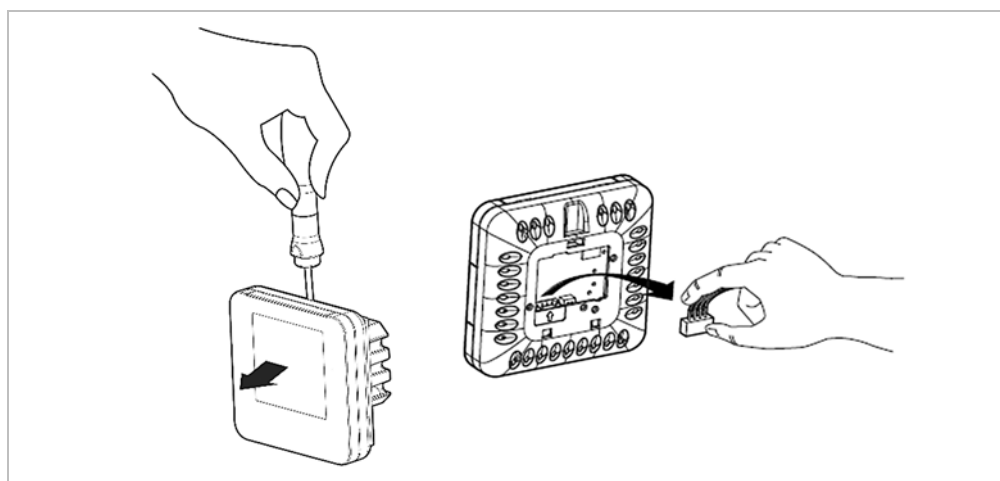


Touch display

Length/width (mm)	86 x 86
Power supply	230 VAC (+10/-15%) 50/60 Hz
Maximum Current	2 VA
Protection class	IP20
Working temperature	-10°C to +60°C
Storage temperature	-20°C to +70°C

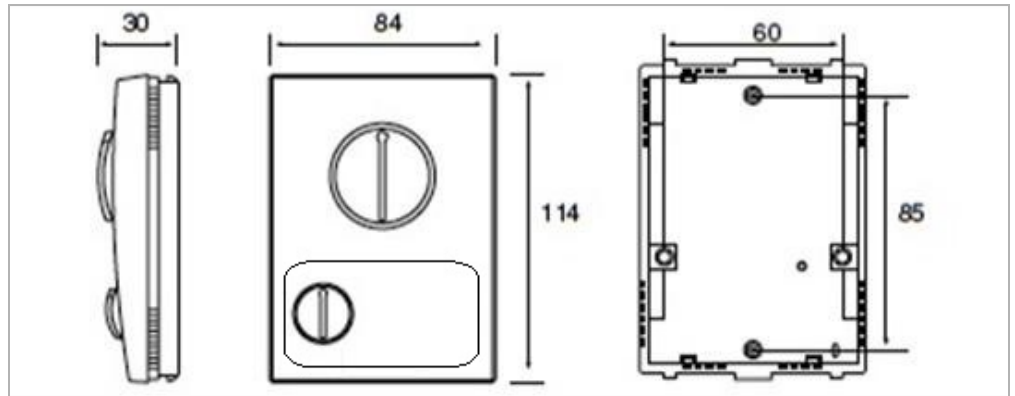
Control panel is directly connected to a 230 VAC power supply.

- Connect the control lines according to the circuit diagram (connect at the same number).
- Two cores with the same diameter can be placed under one terminal.



- Easy installation using with snap in connection.

2.5.3 CET.ACEC



LCD display	
Length/width (mm)	84 x 114
Power supply	230 VAC 50/60 Hz
Protection class	IP30
Working temperature	0°C to + 50°C
Storage temperature	-15°C to +50°C

Control panel is directly connected to a 230 VAC power supply.

- Connect the control cables in accordance with the Wiring diagram (connect same numbers).
- Two cores with the same diameter can be placed under one terminal.



- Easy opening of cover to mount and connect the operator panel.

3 Operation ISYteq-Web

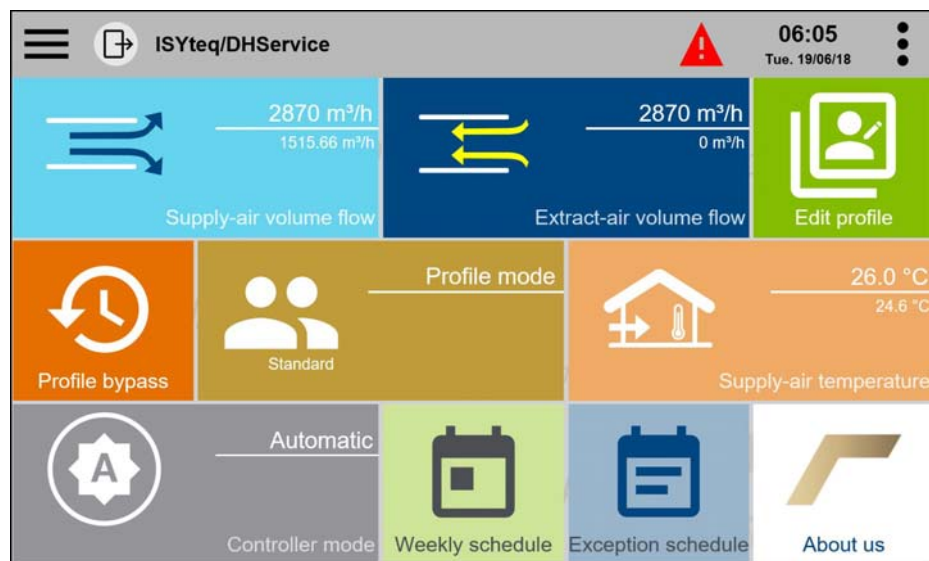
Every FläktGroup plant comes furnished with a full-graphics multilingual visual display system. This visualization is provided with the WEB server integrated in the control.

The visualization provides the following access options:

- With a PC via internet browser access possible directly at the plant as well as via on-site intranet or internet
- With a smartphone and a commercially available app that serves both the IOS as well as the Android operating systems

The visualization allows the following activities:

- Configuration and parameterization of the plant
- Observation and operation of the plant
- Set-point values
- Viewing the archived measured values
- Display of fault, event, and maintenance messages
- Display of the plant documentation
- Export of the measuring and messages archive for external examination e. g. in Excel
- Backing up and loading the plant parameters
- Monitoring and pre-setting the inputs and outputs.



- You need to enter the old password and then set the new password!

4 Electrical Connection – Network connections

4.1 ISYteq network and Building Management connections

This section contains information about the ISYteq network and the correct network setup. The ISYteq network is a network based on BAC-Net for connecting various components of the ISYteq control system (network users) in one data bus. The bus enables the exchange of all information required for control and regulation between the users.

4.2 Group Structure for BACnet MSTP (RS485)

A network can consist of a minimum of 2 and a maximum of 64 units (ISYteq controllers).

The maximum number of units in one room should not exceed 16 units.

The maximum number of groups depends on the size of the largest group.

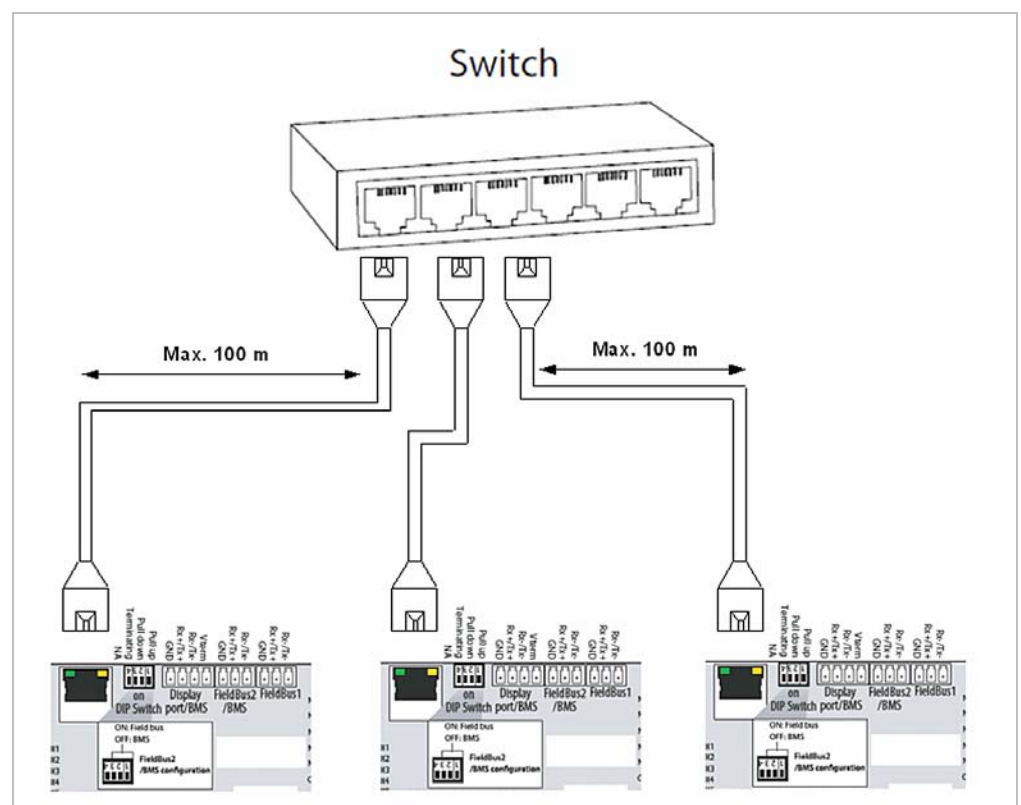
This network is constructed so that there are no real master or slave units, they can work independently. It can be set up so that one controller passes information on to the other controllers, i.e. in the classic master/slave constellation. But if the communication is somehow lost, they can run independently, provided they have enough information (e.g. the room temperature etc.).

4.3 Ethernet Network Connections

Connection via Ethernet port using a switch

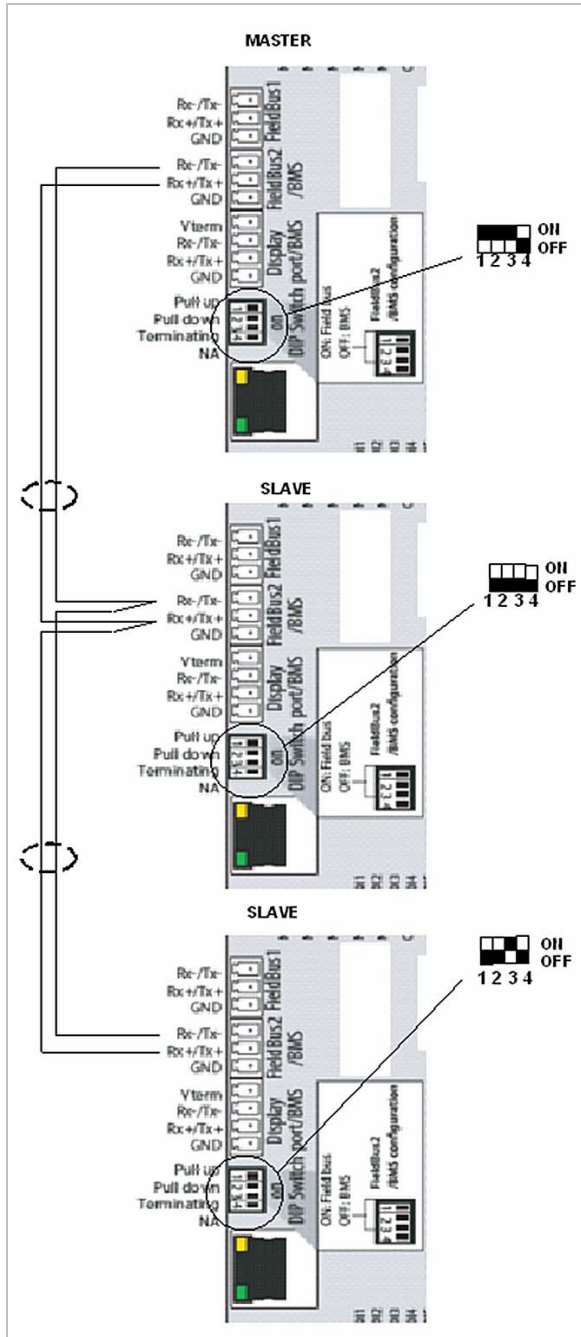
The built-in Ethernet ports on the ISYteq controller can be used to create multimaster and multiprotocol networks, with transmission speeds up to 100 Mbps.

The controllers can be connected together via an external switch (see the figure below).



4.4 RS485 Network

4.4.1 Connecting master unit with slave units using a serial connection



A master/slave network of ISYteq controllers can be created by using the RS485 serial ports.

Such networks comprise:

- One ISYteq controller (Master) that communicates via the Fieldbus RS485 serial port using the BACnet MSTP protocol
- One or more FläktGroup controllers (Slaves) connected to the point-to-point network via the BMS RS485 serial port using BACnet MSTP protocol
- Connect the control cables in accordance with the wiring diagram.
- The max. length allowed for the network is 1000 m. If the network is longer than 100 m, apply the 120 Ohm, 1/4 W terminating resistors to the first and last devices in the network.

The following cable is recommended for the bus line:

- Type: Li2YCYC TP flexible 2 x 2 x 0,5 mm²:

4.5 Structure and topologies of ISYteq network with BACnet MSTP

A serial network can consist of one or several (up to 32) groups and can be set in a line structure with branch feeder. All ISYteq controllers can access this data bus. With serial communication the data bus must be terminated at both physical ends to avoid reflections which can interfere with data transfer. Switchable bus terminating resistors are integrated on the respective boards enabling safe termination.

The maximum possible number of groups depends on the largest group in the network. 64 serial nodes should be divided by the number of units in the largest group. This is the maximum possible number of groups.

Example calculation: Largest group consist of 6 units.

64 nodes 6 units = 10.67 → maximum number of groups 10

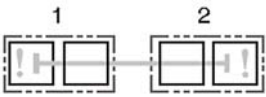
The following table provides a short overview of the maximum number of groups per room with the size of the biggest group per room.

Largest group size	Maximum amount of groups (BACnet MSTP only!)
1	32
2	32
3	21
4	16
5	12
6	10
7	9
8	8
9	7
10	6
11	5
12	5
13	4
14	4
15	4
!&	4

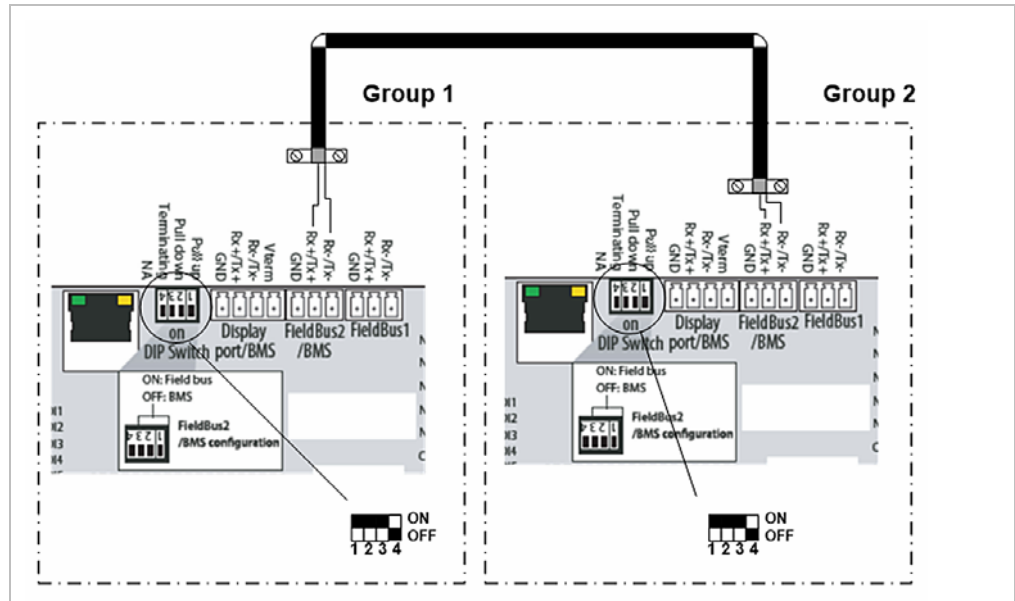
4.5.1 Structure and topologies of ISYteq network with BACnet TCP/IP

An Ethernet network doesn't have any limitations in the number of groups and doesn't need any terminations.

4.5.2 Line structure for serial ISYteq network



The illustration shows the setup of the ISYteq network with line structure. As an example, two groups are networked, each consisting of one ISYteq controller.



Notice!

The data transfer cable must be run as demonstrated in the above illustration, so that only one side of the respective shielding is applied.

4.5.3 Terminating resistors



Notice!

Only necessary when using the ISYteq serial communication for the network.

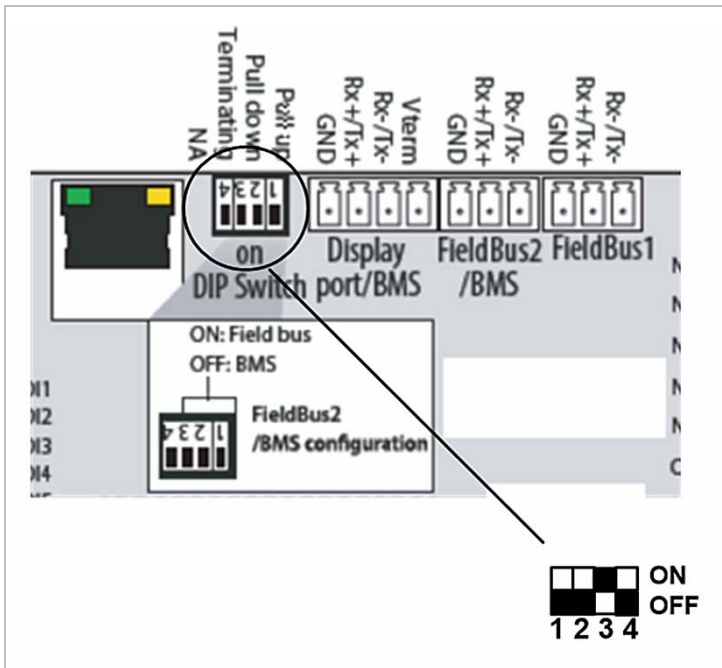
Unit printed circuit boards of the ISYteq control system are equipped with terminating resistors & BIAS Resistors.

Terminating resistors are placed at line start and end.

- Set the DIP switch 3 to “ON” position.

The BIAS Resistors should be activated on the Master unit.

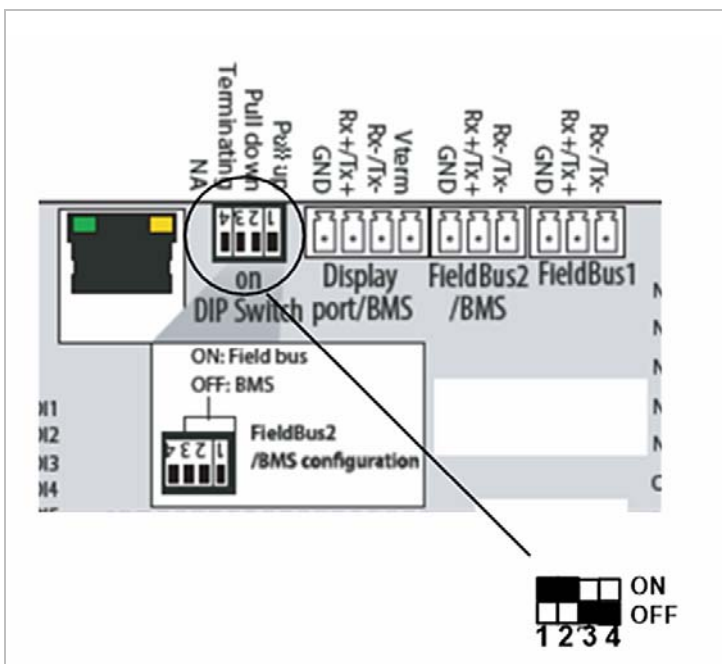
- Switch on terminating resistors for stand-alone units.



The line beginning and line end correspond to the start and end of the bus cable.
The terminating resistors must also be switched on for stand-alone units.

The BIAS resistors should be activated on the Master unit.

- Set the DIP switches 1 & 2 to “ON” position.



4.5.4 Connection of external sensors

Following external sensors can be optionally connected to the ISYteq control PCB. For the exact connection to the PCB, see the wiring diagram that is available for every unit or the wiring diagram printed on a sticker on the inside of the cover of the switch cabinet.

- External room temperature sensor
- Return temperature sensor*
- Change over temperature sensor*
- Supply-air temperature sensor
- Outdoor-air temperature sensor
- CO² sensor

* These sensors can be ordered to be mounted inside the unit.

4.5.5 Connecting status and fault signals

The controller PCB enables to tap status and alarm messages using a volt free contact. The contact loads at 230 V AC amounts to a maximum of 4 A resistant load/2 A inductive load.

For the exact connection to the PCB and the function of the contact see the wiring diagram that is available for every unit or the wiring diagram printed on a sticker on the inside of the cover of the electrical box.

4.5.6 Connecting input for profile operation mode

There are 4 profiles available in the software which can be set up for different operation modes. These modes can be activated externally using 2 digital inputs on the controller PCB.

The function of these inputs and the configuration of the operation mode can be done using the internal Webserver. Please see the operation manual for the controller for further explanation.

For the exact connection to the PCB see the wiring diagram that is available for every unit or the wiring diagram printed on a sticker on the inside of the cover of the electrical box.

5 Operation ISYteq Touch 4.0

The ISYteq Touch 4.0 is a high end operation panel with an easy and intuitive tile design in the ISYteq style.

This touch panel allows the following activities:

- Temperature setpoint change
- Fan stage setting
- Operation mode change (day/night)
- HVAC mode change
- Sleep mode
- Unit on/off
- Outside air damper
- Swirl operation
- Week calendar
- Day operation extension
- Air quality setpoint (ppm/%)

5.1 Screen layout „home screen“

There are 3 slightly different Home Screens:

- Business standard Version: The Business Version is used in an office environment and allows a more customizable user experience. The user can set a schedule for the controller to fit his/her working hours. When a swirl outlet is present this business standard version is automatically adapted.
- Hotel Version Horizontal: the Hotel version is a light variant of the visualization trimmed down to only show the most needed functions.
- Hotel Version Vertical: the Hotel version in a vertical layout.



Fig. 1: Home screen: Business Standard

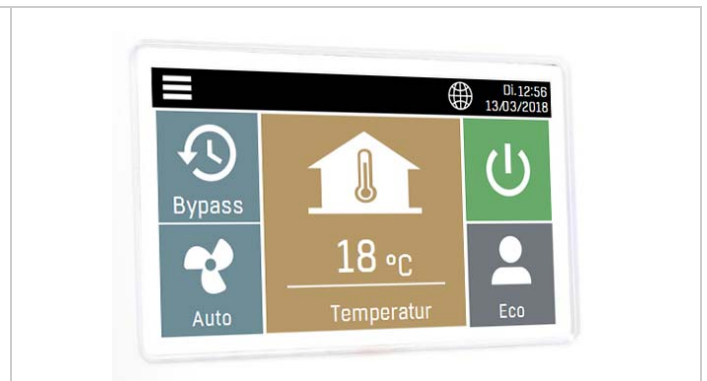


Fig. 3: Home screen: Business Standard (Swirl)



Fig. 2: Home screen: Hotel Horizontal



Fig. 4: Home screen: Hotel Vertical

6 Operation CET.ACEC

The CET.ACEC is a basic operation panel with a dial for the required room temperature setpoint and one for the setting of the fan operation mode. This operator panel can also be used as a stand alone fan coil controller which is described in the operation manual of the CET.ACEC

The CET.ACEC allows the following activities:

- Temperature setpoint change
- Fan stage setting
- Unit on/off

6.1 Overview of the operating elements

There are 2 cover versions for the CET.ACEC. As a standard the operator panel is delivered with a temperature scale from 10 to 30 °C. Optionally an additional cover can be supplied with a scale that runs from - to +. In combination with the ISYteq controller this can be used for relative temperature setting



CET.ACEC with standard cover



CET.ACEC optional cover

The CET.ACEC compact controller is operated via the operating elements.



Notice!

If the user wants to change the fan setpoint from speed 1, 2, or 3 to 'Auto', he must turn the rotary switch to the position "Unit off". To prevent the unit from switching off each time, a delay time is programmed in the software if the user wants to change the fan mode to "Auto". The event "Unit off" is set if the rotary switch stays 2 seconds in the "Unit off" position.

7 Operation ISYteq LCD IW

The ISYteq LCD IW is an operation panel designed with a modern look and feel.

This LCD panel allows the following activities:

- Temperature setpoint change
- Fan stage setting
- Operation mode change (day/night)
- HVAC mode change
- Unit on/off
- Outside air damper
- Air quality setpoint (ppm/%)
- Show a general alarm message (with an alarmcode as integer)
- The actual temperature
- An icon for heating active
- An icon for cooling active
- An icon for fan in operation

7.1 LCD Screen layout

The LCD screen has 7 different buttons to operate the LCD screen which functions are described in the ISYteq operation manual.



8 Performance characteristics

Following performance characteristics are included	
Unit Type	2 pipe system: only heating, only cooling, heating or cooling
	4 pipe system: heating and cooling
Fan	Up to 3 speeds
	Continuous (EC motor)
	Temperature related fan speed control
	Air quality related fan speed control (fresh air units)
	Minimum speed 1
	Motor protection/EC motor alarm
	Auto mute function (limited maximum fan speed)
Valve control	2 and 4 pipe system: 2 point valve actuators (on/off)
	2 and 4 pipe system: 3 point modulating valve actuators
	Silent valve control (semi-conductor relay)
	External heating or cooling valve control with fan off
Electrical heater	1 step control
	2 step control
	Safety temperature limitation (supply air)
	Delayed fan stop
	Modulating control (0-10V)
	Safety temperature alarm
Frost protection	Room frost protection
	Auto wake up function
	Frost protection thermostat
Control mode	Room temperature control
	Supply temperature control
	Min./Max. supply temperature limitation
	Outside air temperature curve
	Summer/Winter compensation
	Room-Supply cascade temperature control
Sensors	Supply temperature sensor
	Room temperature sensor
	Return temperature sensor
	Outside temperature sensor
	CO2 air quality sensor
	VOC air quality sensor
	Filter differential pressure switch
	Filter differential pressure sensor

Following performance characteristics are included	
External signals/messages	Unit on/off
	Profile mode input (configurable unit mode)
	Alarm message output
	Unit operation message output
	Cooling demand (digital/analog)
	Heating demand (digital/analog)
Condensate	Condensate high level alarm
	Start condensate pump
	Anti-condensate monitoring
Chiller/Heatpump	Chiller control (2 stage)
	Inverter heatpump control (2 units)
BMS connections	Modbus RS485/TCP-IP (Standard)
	BACnet MSTP/TCP-IP (Standard)
	LON (optional)
	KNX (optional)
Special functions	Geko Drive control
	Swirl control
	Secondary air louvre control
Mixing air control	Mixing air damper control (on/off)
	Mixing air damper control (modulating)

9 Controls sales key

Sales key ISYteq

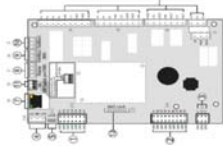
A 1 . 1 0 1 . 1 A

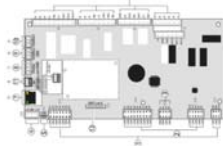
Controller board

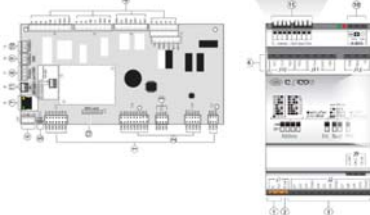
Control package number

Controls

A 0 No ISYteq controller board

A 1  ISYteq 3010

A 2  ISYteq 3020

A 3  ISYteq 3020 + 6005

Control package number

1 #  CET.ACEC

A #  ISYteq LCD IW

B #  ISYteq Touch 4.0

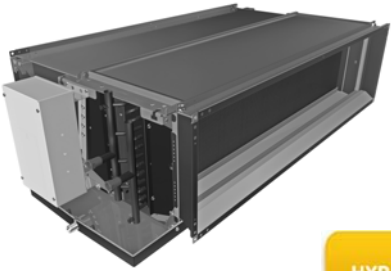


A Delivered Loose, control panel is not included in the package

B Mounted on switch cabinet, control panel is included in the package

10 Functions

To highlight which software function is valid for which unit type, the different chapters are marked with a symbol as shown below.

10.1 Accessories

 <p>FLX</p>	 <p>HYP</p>
<p>Flex-Geko</p>	<p>HyPower-Geko</p>
 <p>CAS</p>	 <p>HYC</p>
<p>Cassette-Geko</p>	<p>HyCassette-Geko</p>

10.2 Valve



10.2.1 Lime protection

When the valve is not used for a longer time lime (Calcium) particles could collect itself on the spindle of the valve and endanger the function. For these reason a lime protection function is implemented with which the valve is opened for a settable percentage and after a settable delay closed again. How often this function is executed ca be configured by Service level.

10.2.2 Valve synchronization

This function is only activated when a 3 point modulating valve is selected. Because the integrated actuators is pulsed and has no feedback of the actual position it is necessary to make a valve synchronization to reduce large deviations of the requested valve position. Depending on the run time the valve is opened or closed at with this period and then controlled back to the requested position. This function can be enabled or disabled with Service level.

10.3 Pump Anti-Blocking Function



When a pump is not running for an extended time period it can happen that the weight of the rotor presses into the bearing what could result in damages if the pump is started again, to prevent this an anti-blocking function is used.

To prevent that this function is executed at a time of day that is not wished for, it is possible that this anti-blocking function is executed at a fixed time of the day when necessary the settings are possible with Service level.

A secondary heating pump can always run and will not cause problems with medium that is blocked and the pump is heating up because of this

10.4 Fan Control



A fan can be controlled by

- temperature
- air quality
- manual input

10.4.1 Temperature Control

Temperature control can be used to use the fans sparingly to control the temperature in a room and therefore save energy when a lower heating/cooling demand is present.

For a 2 and 3 stage fan: based on a temperature setpoint and an actual temperature the stages of the fan can be changed to distribute more air when necessary.

10.4.2 Air Quality Control

With Air quality control often a CO₂ (ppm) measurement in the room or return air is used to control the required fresh air needed. When a mixing air damper is installed this can be combined with the control system for the fan.

10.4.3 Predefined speed setting (Manual Speed Setting)

Predefined speed settings are used when it is feasible to determine the control signal of the fans exactly and always let them turn on this value. Of course it is always possible to change this value but the fans are not controlled automatically.

10.5 Damper



10.5.1 2-Point damper actuator control

The damper request input signal (0-100%) is transferred in an open signal. Standard setting is that the damper will first open when the signal reaches 100%. It is possible to configure at what percentage the damper will open (setting by Service level).

10.5.2 Modulating damper actuator control

The damper request input signal (0-100%) is directly transferred to the output and used to control the modulating valve. This signal will be available as a 0-100% signal that can be transferred to a 0-10 V signal at the output.

It is possible to define an operating mode for the dampers in addition to the hardware configuration. The following operating modes are available:

- Outside/outgoing-air damper
- Controlled damper
- Controlled by fresh air volume
- Controlled by sequences

10.5.3 Controlled damper

In this operating mode it is assumed that a mixing air damper is available for the system in addition to the outside/outgoing-air flap. After switching on the system, the outside/outgoing-air flap is moved to the fixed position. The mixing air damper runs counter to the outside/outgoing-air flap and therefore has the position 100%.

10.5.4 Temperature controlled mixing air damper.

The potential heating or cooling capacity of the outside air is used to calculate the position of the dampers depending on the return air or supply air temperature.

10.5.5 Humidity controlled mixing air damper

The potential dehumidification capacity of the outside air is used to calculate the position of the dampers depending on the return air or supply air humidity.

10.5.6 Air quality controlled mixing air damper

The air quality of the outside air is used to control the air quality in the room/return air and to calculate the position of the dampers depending on the used CO₂ (ppm) value of the air or VOC value. For this purpose there is an air quality sensor mounted in the return air duct or in the room when only one needs to be controlled.

10.5.7 Mixing air damper controlled with outside air temperature curve.

The position of the damper is based on the outside air quality. For this there must be at least 4 different reference points that can be set with a parameter. This is necessary because in the winter the outside air amount should be reduced when the temperature is dropping. In the summer however this amount also needs to be reduced when the temperature is rising.

This is visualized in the following diagram:

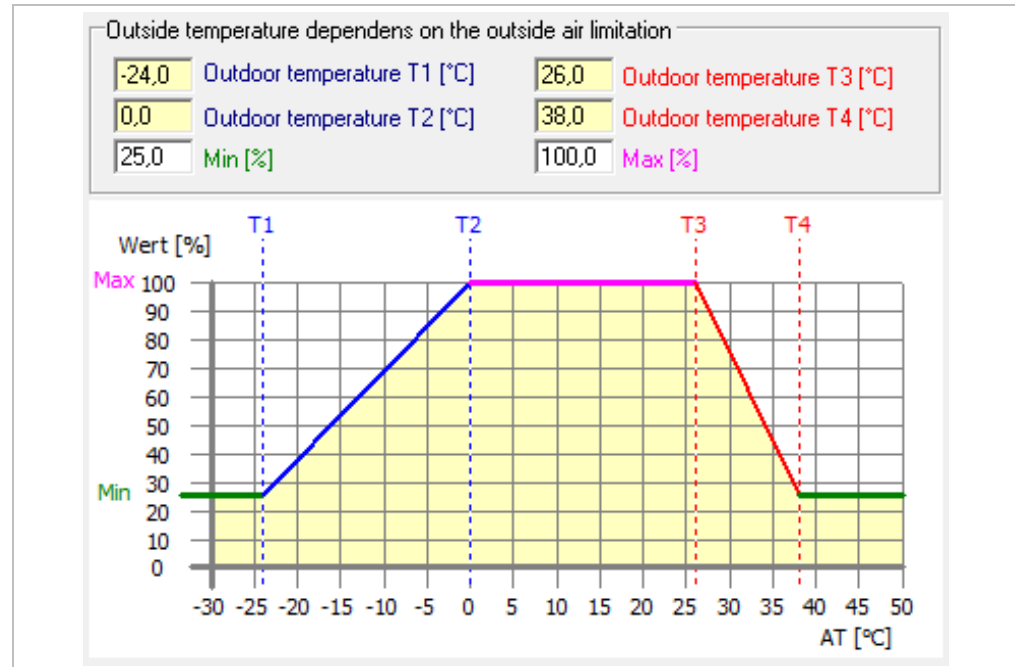


Fig. 10-1: Diagram for setting outside air damper based on outside air temperature

10.5.8 Minimum fresh air amount

This is a single setting that is used to determine the minimum air flow amount that is necessary for the ventilation of the room/rooms. This must be a double setting, one for day and one for night operation.

10.6 Air quality



The air quality regulation influences the position of the Damper and the Fan speed.

For air quality control, the actual value is compared with the setpoint. If the setpoint is exceeded, the air quality is controlled either by increasing outside air amount (passive sequence) or by increasing the volume flow (active sequence).

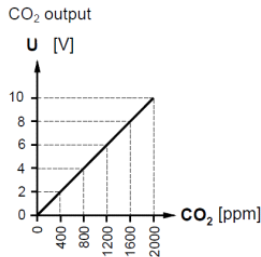
An air handling unit has several possibilities to control the air quality in a room. Therefore there are different modes available:

- Passive
- Active
- Passive/Active (the controlling starts with passive sequence, if it reached the maximum value the active sequences will be started)
- Active/Passive (the controlling starts with active sequence, if it reached the maximum value the passive sequence will be started)

There are two type of quality sensors:

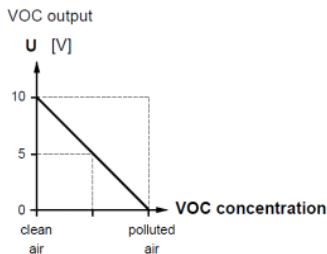
- CO₂ Sensor:

Is an air quality sensor that measures the amount of Carbon Di-Oxide in the air. The amount of CO₂ is defined by the ppm (parts per million). The concentration of the air is linearly transferred to a 0-10 V in the air. The range of CO₂ Sensor can be adjusted by the Service level. (Factory default 2000ppm)



- VOC Sensor:

Is an air quality sensor that measures the amount of Volatile Organic Compounds in the air. There are for example Body odors, tobacco smoke, exhalations emitted by materials (furniture, carpets, paint, glue ...) and transferred to the controller using a 0-10 V signal



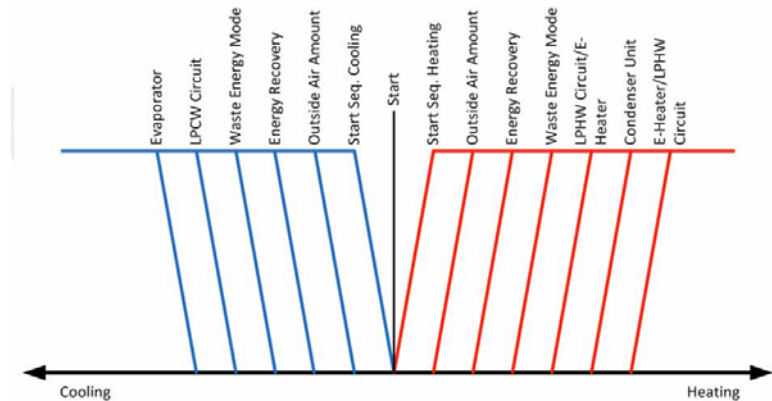
10.7 Temperature Control Mode



An air handling unit has several possibilities to control the temperature in a room. Therefore there are different types and modes available:

- Extract air temp controlled
- Supply air temp controlled
- Extract air cascade
- Outside air Curve
- Room temperature controlled
- Room air cascade

Depending on the control type, the control setpoint and actual value are compared. At the start of the system, the sequence control begins with the heating/cooling start-up and then the other sequence controllers are available for heating or cooling.



10.7.1 Extract air temp controlled

With an extract air temperature control the extract air temperature is used as the actual value as a reference for the temperature setpoint. So that the extract air temperature is controlled using the available aggregates. (Heater, cooler, energy recovery etc.)

Extract air temperature control is a slow process as it takes a longer time to raise or drop the temperature in a room or several rooms.

10.7.2 Supply Air Controlled

With a supply air temperature control the supply air temperature is used as the actual value as a reference for the temperature setpoint. So that the supply air temperature is controlled using the available aggregates. (Heater, cooler, energy recovery etc.)

Supply air temperature control is relatively fast as the aggregates have a direct influence on the air.

To prevent the supply air temperature to raise too high or drop to low a supply air temperature limiter is used:

- In heating mode there is a maximum and a minimum supply air (supply air temp. min and supply temp. max which are configurable)
- In cooling mode there is only a minimum supply air temperature (configurable)

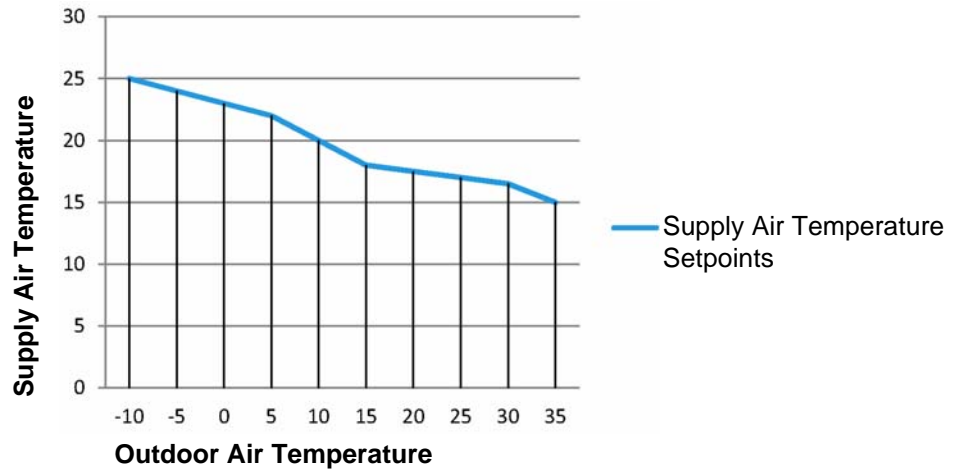
10.7.3 Extract Air Cascade

With a cascade temperature control the primary function is to control the extract air temperature. This primary control signal is used to determine the supply air setpoint.

This system is used for example when the extract air is a mixture of air coming out of different rooms, but need to have a variable supply temperature that fits every room as much as possible.

10.7.4 Supply/Outside Air Curve

With this control it is possible to define 10 different supply air temperature setpoints directly linked to an outside air temperature. In this way a curve will be made that gives the customer more flexibility to define the exact right supply temperature with the outdoor air temperature as a reference.



10.7.5 Room Air Cascade

With a cascade temperature control the primary function is to control the room air temperature. This primary control signal is used to determine the supply air setpoint.

This system is used for example when the air is a mixture of air coming out of different rooms, but need to have a variable supply temperature that fits every room as much as possible.

10.7.6 Room/Return air Temperature Controlled

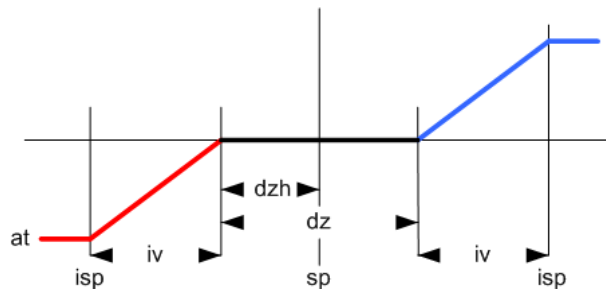
With a room air temperature control the room temperature is used as the actual value as a reference for the temperature setpoint. So that the room temperature is controlled using the available aggregates. (Heater, cooler, energy recovery etc.)

Return/Room air temperature control with a single setpoint

The automatic changeover between heating and cooling occurs according several evaluation criteria. A first criterion is the difference between the temperature setpoint and the actual temperature.

When in cooling mode and this difference is higher than x K the controller will switch over after some time. If the difference rises above z K the controller will change over immediately.

In heating mode same procedure but with negative x.



Return/Room air temperature control with a double setpoint

It is possible to use 2 setpoints instead of 1 setpoint for the Return/Room temperature. In that case there is a heating and a cooling setpoint.

When the air temperature rises above the cooling setpoint, the controller switches over from heating to cooling mode. If the air temperature drops below the heating setpoint the controller switches back to heating mode.

After the configuration of 2 setpoints, there is an offset for cooling, so this offset refers to the setpoint heating.

10.8 Frost Protection



In case of an emergency (Frost Protection Alarm) the pump can be started even if there is a malfunction.

This prevents heating coils from freezing up because of an internal control malfunction where the pump is maybe still able to run.



Notice!

Even if the air handling system is switched off, the room-frost protection function is active.

10.9 Frost protection function heater coil



A water heater in an air handling unit that has to treat the outside air directly needs to be protected against freezing up.

There are two ways of doing this. First is to use a frost protection thermostat that is mounted in the air outlet of the coil. As soon as the outside air after the heater coil is lower than 4°C it triggers an alarm. This 4 °C needs to be set directly on the thermostat and the setting can be changed if necessary.

Second way is to use a water outlet temperature sensor. This sensor should be mounted at the lowest possible position in or near the heat exchanger. As soon as this water temperature is below 15 °C (for example) the pump needs to be started and the valve opened for 100 %. If the water temperature drops below 10 °C, an alarm should be generated

10.10 Room Frost Protection



The room frost protection assures that in a controlled room with a switched off unit there will be no frost. The following procedure is used:

At room temperatures $< 4^{\circ}\text{C}$, the heating valve is fully opened for PWW heaters and the fan is switched on in the smallest stage. With a changeover valve heating or cooling, the valve is opened independently of the flow temperature.

The function remains active until a room temperature $\geq 6^{\circ}\text{C}$ is reached. After this, all aggregates are closed and the controller switches back to normal mode.

10.11 Controller mode "Passive"



Notice!

Passive temperature control can only work when the unit has a primary fresh air connection or a direct outside air connection with a mixing air damper.

For units with an outdoor air connection it is possible to cool or heat the room passively.

The objective of this function is to cool down or heat up the room and therefore to save energy. Mainly this function will be activated in the night when the outdoor temperature is lower than the room temperature and the room temperature is above the required setpoint.

Important for this functionality is that a room temperature value is present as the unit will be in stand-by mode and a return air sensor will not represent the actual temperature level in the room.

With the passive cooling the operating mode attempts to reach the current setpoint exclusively with the passive cooling stages. When the setpoint is reached, the device switches off automatically.

With a passive heating mode, which can also be used at night (in normal areas of application, the room cannot be heated with outside air). When the setpoint is reached, the device switches off automatically.

10.11.1 Passive cooling mode

If the outdoor temperature > room temperature the device is deactivated.

As soon as the following conditions are reached, the device switches on and cools with the available passive stages:

- Outdoor-Temperature < (Room-Temperature -1K)
- Room-Temperature > Release value for cooling

The device switches off again if one of the above conditions no longer true.

If the passive cooling is not sufficient to maintain the room temperature in a desired range, the active cooling (if available) is released after the cooling point has been exceeded so that the room temperature does not rise further.

10.11.2 Passive heating mode

If the outdoor temperature < room temperature the device is deactivated.

As soon as the following conditions are reached, the device switches on and heats with the available passive stages:

- Outdoor-Temperature > (Room-Temperature +1K)
- Room-Temperature < Release value for heating

The device switches off again if one of the above conditions no longer true.

If the passive heating is not sufficient to maintain the room temperature in a desired range, the active heating (if available) is released after the heating point has been exceeded so that the room temperature does not rise further (see the diagram above).

10.12 Electrical heater



Notice!

Air quality control can only work when the unit has a primary fresh air connection or a direct outside air connection with a mixing air damper.

ISYteq control system is able to control a single electrical heater instance either with:

- stages (up to 5) or
- analog (0-10V) + optional stages

Depending on the input temperature and the setpoint temperature the demand signal (0 - 100 %) is calculated which is used to control the thyristor and release the fixed stages.

10.12.1 Electrical Heater with fixed stages (max. 2)

The heating signal is used to release the different stages depending on the number of stages that has been selected. With an electrical heater with only fixed stages it is not possible to control on a stable supply air temperature.

To prevent the stages are stopped too often every stage has a minimum stopping time of 15 seconds.

10.12.2 Electrical Heater with one modulating stage and a maximum of 2 fixed stages

If for the first stage of the electrical heater a thyristor is used, the electrical heater can be controlled stage less over the complete capacity range.

The modulating stage is controlled to 100% using the heating signal before the next stage is activated. In this case the modulating stage is controlled back to 0 % and is controlled again to 100% in which the next stage can be released.

To prevent the stages are stopped too often every stage has a minimum stopping time of 15 seconds.

10.12.3 Maximum supply temperature limitation

When the airflow is reduced in an air handling unit it can be possible that the available capacity of the heater is too big and so too high outlet temperatures can be achieved, that's why a max. supply temperature limitation can be adjusted (with service level).

To prevent that the supply air temperature exceeds the maximum a supply air temperature limiter reduces the signal for the electrical heater.

10.12.4 Maximum supply temperature alarm.

With a max. supply temperature alarm is an extra protection in the case that the supply air temperatures rises above a certain level an alarm will be generated.

If this temperature is exceeded an alarm is generated and the unit will run for a cooling down period.

10.12.5 Delayed shut down of the air handling unit

When the air handling unit should be shut down and the electrical heater is still active, the unit will run for a certain amount of time to cool down the heater. Otherwise there is the danger that the remaining energy in the electrical heater can damage the air handling unit.

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