Access V4.1 Configuration manual

EN

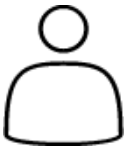
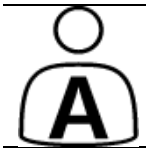
Preliminary 2020-03-03 (B004)

systemair

Basic settings

Access levels

The controller has four user access levels. The active user access level is indicated by icon.

	End user When logged out	Read /write — Home page. Possible actions in end user mode are to stop the air handling unit for maintenance (e.g. filter exchange), change the time for extended run and change the temperature setpoint.
	Operator mode (Log in with 1111)	Read and write privileges (except Configuration).
	Service mode (Log in with 0612)	Full read and write privileges.
	Admin mode	Manufacturer access level

Date and time

ACCESS controller has a year-base clock function. The clock has an automatic summertime/wintertime change-over.
Date and time can be set in

`Time settings > Date / Time`

Prefered units

Preferred units for temperature, flow and pressure can be set

`Configuration > System settings > Preference unit settings`

Save and restore

Commissioning settings can be stored in a local memory.

`Configuration > System Settings > Save and restore settings >`

Save commissioning settings – saves all recently made changes.
Restore to commissioning settings – restores to last saved commissioning settings.
Restore to factory settings – resets settings to state of delivered unit.

Configuration

The configuration of controller shall start with activation of necessary functions.
Configuration order of control system and menu

Description	Flow	The navigation path
Select function to activate: e.g. Heater 2, cooler 2, Support control, Free cooling, fire function etc.	**Activation**	Configuration ►Functions ► Function Activation
How the function should be designed: e.g. Electric, water, frost protection, fire damper etc.	**Configuration**	Configuration ►Functions
Select I/Os for activated function: e.g. AO2, DI4, DO6, UI4	**Allocation**	Configuration ► I/O allocation
How the function will work: e.g. Min limit value, max limit value, setpoint etc.	**Operation settings**	Data & Settings

Temperature control

Temperature controller is a closed loop system which includes measurement, processing and adjustment.
To maintain comfort temperature the controller constantly adjusts supply air temperature.

Temperature control settings allow selection of temperature sensors utilized by the system.

`Configuration > Functions > Temperature control >`

Temperature control type

Access controller has a choice of the following temperature control modes.

`Configuration > Functions > Function activation > Temperature control type >`

Supply air

The supply air temperature is kept at the setpoint value. The controller is reverse acting, i e. the output will increase for decreasing temperature.

`Data & Settings > Temperature control > Supply air controller >`

The settings for supply air controller include

- Setpoint supply air
- Min limit supply air
- Max limit supply air
- Neutral zone

The neutral zone is a delta value, evenly split around the setpoint. It is also active with cascade or other regulation selections.

*Example
If the setpoint is 18 °C and the neutral zone is 2 K, the cooling setpoint will be 19 °C and the heating setpoint will be 17 °C.
If the supply air temperature is in the neutral zone, the heating and cooling will be blocked. If the supply air temperature decreases below the setpoint –NZ/2 the heating signal will be active until setpoint is fulfilled. If the supply air temperature increases above the setpoint +NZ/2 the cooling signal will be active until setpoint is fulfilled.
The setpoint value is set using the NaviPad or alternatively using an external setpoint device.
Alarms which are activated when the supply air temperature is too high or too low are active. Alarm for control offset of the supply air temperature is active.

Supply air outdoor compensated

The supply air temperature setpoint is outdoor temperature compensated using a control curve with 4 node points.

`Data & Settings > Temperature control > Supply air controller > Setpoint outdoor curve >`

Room cascade

Cascade control of room temperature and supply air temperature to achieve a constant, settable room temperature. The room controller output signal generates the supply air controller’s setpoint value.

`Data & Settings > Temperature control > Room controller >`

The room controller uses its own PI loop

```
Configuration > PID controllers > Room >
```

1..4 room sensors can be connected. The average value of selected sensors is used in the control loop.

```
Configuration > Functions > Temperature control > Room temperature sensor
```

Extract air cascade

Cascade control of extract air temperature and supply air temperature to achieve a constant, settable room temperature.

The extract air controller output signal generates the supply air controller's setpoint value.

```
Data & Settings > Temperature control > Supply air controller >
> Actual setpoint supply air [...]
```

The extract controller used an own PI loop.

```
Configuration > PID controllers > Extract air >
```

Room (summer) else supply air

Outdoor temperature dependent switching between supply air temperature control and room temperature control.
When the outdoor temperature is lower than a settable limit (winter), outdoor compensated supply air temperature control will be active, otherwise (summer) cascaded room temperature control as in room cascade type.

```
Data & Settings > Temperature control > Room controller >
> Outdoor temp for switch between summer/winter

Data & Settings > Temperature control > Room controller >
> Outdoor temp hysteresis for switch between summer/winter
```

Extract air (summer) else supply air

Outdoor temperature dependent switching between supply air temperature control and extract air temperature control.
When the outdoor temperature is lower than a settable limit (winter), outdoor compensated supply air temperature control will be active, otherwise (summer) cascaded extract air temperature control as in extract air cascade type.

```
Data & Settings > Temperature control > Extract air controller >
> Outdoor temp for switch between summer/winter

Data & Settings > Temperature control > Extract air controller >
> Outdoor temp hysteresis for switch between summer/winter
```

Room outdoor compensated

The room temperature can be compensated when the outdoor temperature decreases or increases. One can, for instance, imagine accepting a slightly higher room temperature if it is warm outside or, conversely, a slightly lower temperature if it is chilly. This function is included to conserve energy.

```
Data & Settings > Temperature control > Room controller >
> Setpoint outdoor curve
```

Extract air outdoor compensated

The extract air temperature can be compensated when the outdoor temperature increases. One can, for instance, imagine accepting a slightly higher extract air temperature if it is warm outside or, conversely, a slightly lower extract air temperature if it is chilly. This function is included to conserve energy.

```
Data & Settings > Temperature control > Extract air controller >
> Setpoint outdoor curve
```

Extract air dependent supply air

A difference between extract air temperature and supply air temperature can be configured to maintain the supply air temperature setpoint to follow extract air temperature with this difference (+10°C to -10°C). Supply air temperature setpoint = extract air temperature + difference.

```
Data & Settings > Temperature control > Supply air controller >
> Setpoint delta T extract air - supply air
```

Summer / winter mode

In addition to normal temperature setpoint, the additional setpoint for summer time can be activated

```
Configuration > Functions > Temperature control > Summer/Winter mode >
"Yes"
```

Options for switching the modes include schedule, changeover, digital input or outdoor temperature setpoint.

```
Configuration > Functions > Temperature control > Summer/Winter mode >
Type of switch summer/winter
```

The second Supply, Extract or Room temperature setpoint then will be available (depends on temperature control type):

Supply:
```
Data & Settings > Temperature control > Supply air controller > Setpoint
summer supply air >
```

Extract:
```
Data & Settings > Temperature control > Extract air controller > Setpoint
summer extract air >
```

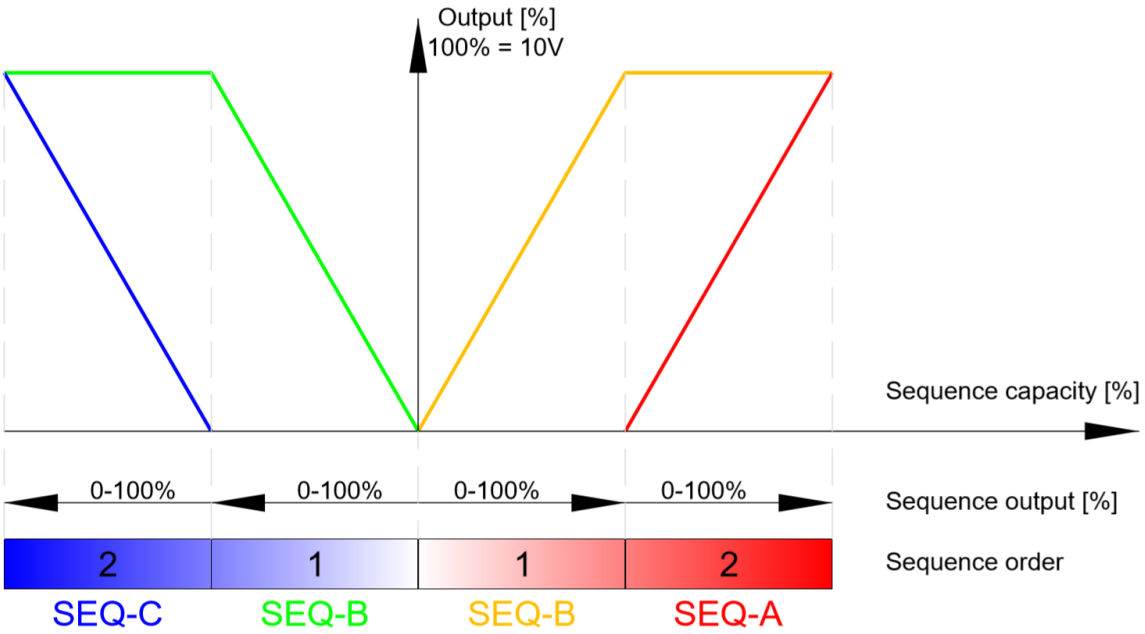
Room:
```
Data & Settings > Temperature control > Room controller > Setpoint summer
room >
```

Heating/Cooling sequences

The supply air temperature is adjusted by controlling the output signals for AHU's components by regulating sequences. Up to 10 sequences with separate PID control settings can be used. Each sequence can be set for Heating, Cooling, Exchanger, Damper, Pressure/flow compensation or set as Not used.
For standardization all 10 sequences have predefined names to cover the most frequent configurations of AHUs. The sequences are also identified by letter A to J.
The order of sequence activation is set by assigning order number for heating and cooling. As in configuration example bellow in case of heating demand, the Exchanger (SEQ-B) will start first and Heating (SEQ-A) will follow second.
In case of cooling demand, the Exchanger (SEQ-B) will start first and the Cooling (SEQ-C) will follow second.

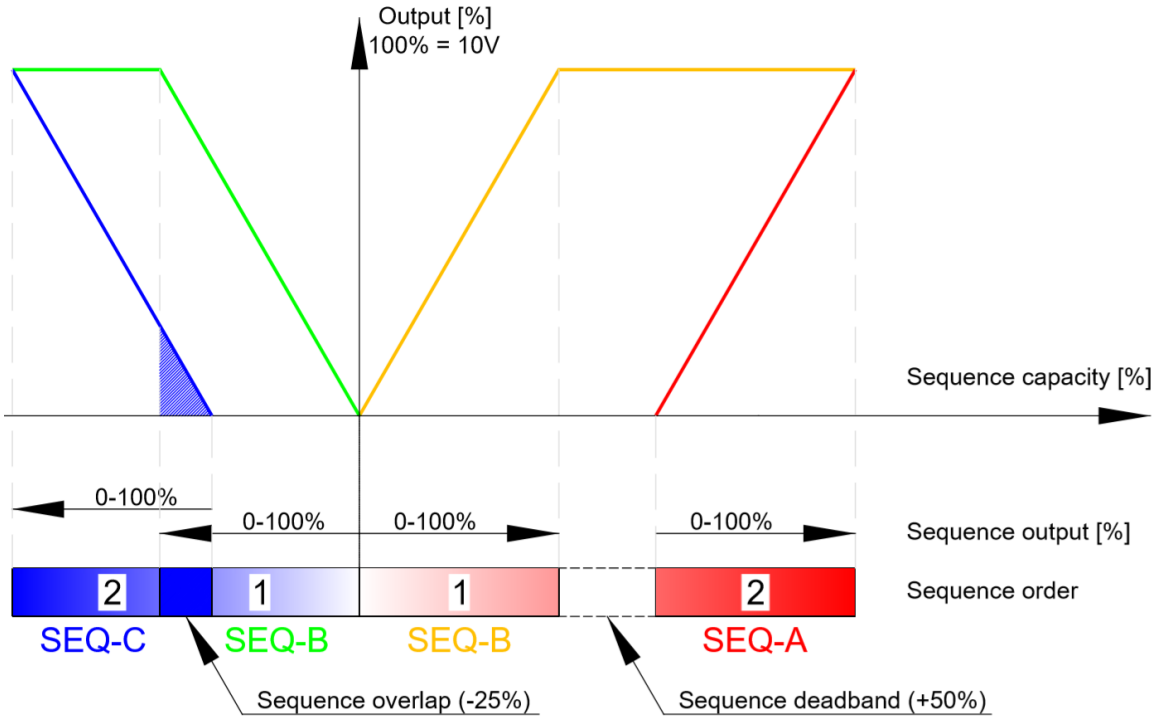
`Configuration > Functions > Function activation > Heating/Cooling sequences >`

Position	Heating	Cooling	Start Heating	Start Cooling	Name
SEQ-A	2	Off	0%	0%	Heating
SEQ-B	1	1	0%	0%	Exchanger
SEQ-C	Off	2	0%	0%	Cooling
SEQ-D	Off	Off	0%	0%	Recirculation 1
SEQ-E	Off	Off	0%	0%	Recirculation 2
SEQ-F	Off	Off	0%	0%	Fan heating/cooling
SEQ-G	Off	Off	0%	0%	Heating 2
SEQ-H	Off	Off	0%	0%	Cooling 2
SEQ-I	Off	Off	0%	0%	Exchanger extract
SEQ-J	Off	Off	0%	0%	Extra heating/cooling capacity



If required sequence overlapping or dead band can be set by adjusting “Start Heating” and “Start Cooling” sequence parameters. Adjustable range is -100% .. +100%. Negative starting point will create sequence overlap while positive starting point will delay start of the selected sequence.

Position	Heating	Cooling	Start Heating	Start Cooling	Name
SEQ-A	2	Off	50% ~~0%~~	0%	Heating
SEQ-B	1	1	0%	0%	Exchanger
SEQ-C	Off	2	0%	-25% ~~0%~~	Cooling
SEQ-D	Off	Off	0%	0%	Recirculation 1
SEQ-E	Off	Off	0%	0%	Recirculation 2
SEQ-F	Off	Off	0%	0%	Fan heating/cooling
SEQ-G	Off	Off	0%	0%	Heating 2
SEQ-H	Off	Off	0%	0%	Cooling 2
SEQ-I	Off	Off	0%	0%	Exchanger extract
SEQ-J	Off	Off	0%	0%	Extra heating/cooling capacity



Changeover settings

`Configuration > Functions > Function activation > Heating/Cooling sequence setup > Changeover settings >`

Changeover function combines controls of two sequences (heating type and cooling type) into single set of control signals:

- Analogue output signal is used for changeover capacity control.
- Digital output signal for starting the changeover sequence
- Digital input signal. Open contact gives heating control and closed contact gives cooling control.

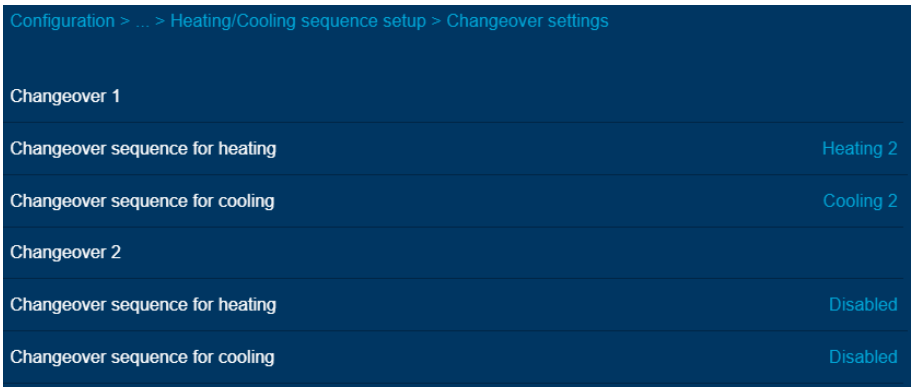
If the input has not been configured, change-over is handled by the internal controller signal. The changeover output signal will follow the two regular output signals of related Heating and Cooling sequences.

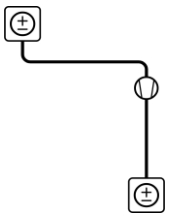
For heating control, the heating start digital output or heating pump start output is active.
For cooling control, the cooling start digital output or cooling pump start output is active.

If frost protection sensor has been configured, it will function in the usual way when heating is active. However, when cooling is active, it will only be used for indicating temperature.

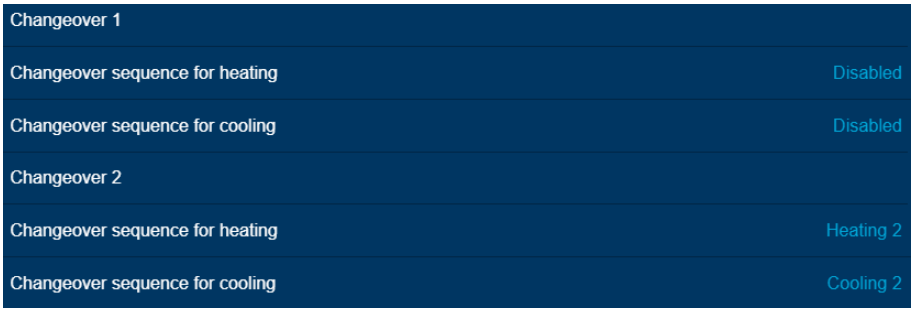
Application has two changeover sequences (Changeover 1 and Changeover 2). Both of them are similar in functionality, but displayed differently in the flowchart.

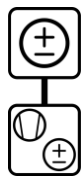
Changeover 1 (with SEQ-G for Heating 2 and SEQ-H for Cooling 2) is intended to be used for internal reversible heat pump. Icons of the reversible heat pump will be activated in the flowchart.





Changeover 2 (with SEQ-G for Heating 2 and SEQ-H for Cooling 2) is intended to be used for external changeover coils. Icons of the changeover coil and external heat pump will be activated in the flowchart.





Heating & Cooling

Exchangers

Rotary exchanger

Rotational speed of the rotary heat exchanger is controlled by output of the exchanger sequence (default SEQ-B).
Rotational speed setpoint is set either via internal data bus or analog signal (in hard wired rotary drive option).

Start delay or forced start at 100% of the exchanger can be set in

`Data & Settings > Temperature control > Exchanger`

Plate exchanger

The airflow through the exchanger is controlled by a shut-off damper and a by-pass damper. Both dampers are controlled by the same "Exchanger" type sequence.

Defrosting temperature monitoring

`Configuration > Functions > Temperature control > Defrosting temperature monitoring >`

Defrosting is activated either when the digital signal ”Defrosting” is activated or when the value of ”Defrosting temperature” falls below the defrosting limit (-3°C), or when the analogue signal ”Exchanger extract air pressure sensor” rises above the set value for the current pressure. It is deactivated when the digital signal is reset, or alternatively when the analogue signal exceeds/falls below the limit value plus a settable differential.
When defrosting:
A PID-controller compares the defrosting setpoint with the signal ”Defrosting exchanger”. The smallest of the output signal from this controller and the output from the ordinary controller is used as output to the dampers.
Defrosting pressure monitoring

Defrosting is activated by measuring the pressure difference over the exchanger's extract/exhaust side. The differential pressure transmitter is auto calibrated by the system to obtain the correct pressure in relation to the airflow.

Manual calibration is possible, e. g. after cleaning of exchanger. Defrosting is possible with by-pass or stop defrosting, adjustable in the display.
Defrosting is stopped when the desired, adjustable decrease in pressure over the heat exchanger is obtained.
If the decrease of pressure does not happen during defrost cycle, the air handling unit is stopped and an alarm is shown in the display.
Sectional defrosting

`Configuration > Functions > Temperature control > Sectional defrosting >`

Demand for defrosting is monitored by differential pressure drop over Extract and Exhaust sides of the plate heat exchanger.
The airflow through heat exchanger is controlled by separate controller (Section Defrosting Module = SDM) and dampers dividing the exchanger into sections. Maximum of 5 damper configuration (4 (exchanger) +1 (bypass)) can be implemented.
The SDM is controlled by the main controller’s signals Digital output (Defrosting start) and Analog output (Exchanger control). If defrosting is required, a digital output on the main controller is activated. The function ends if differential pressure drop decreases below preset limit.

Liquid exchanger

A mixing valve in the exchanger circulation system is controlled by the sequence ”Exchanger” and digital output (“SEQ-B pump”) for pump control and/or signal (“SEQ-B start”) for start heating.

Defrosting temperature monitoring
Deicing is activated either when the digital input sensor ”Defrosting temperature” is activated, when the value falls below the deicing limit (-3°C). It is deactivated when the digital input is reset or the analogue input rises above the limit value plus a settable differential.
On deicing: A PI-controller compares the deicing setpoint with the signal ”Defrosting Exchanger”. The lesser of the output signal from this controller and the output from the ordinary controller is used as output to the actuator.

Pump indication
A feedback from pump (“Pump SEQ-B”) can be used, running indication or alarm indication (“Feedback SEQ-B”).

Water heating

When the unit is in running mode the heating valve is controlled by the analogue output and digital output (“SEQ-A pump”) for pump control and/or signal (“SEQ-A start”) for start heating.

Pump indication

A feedback from pump (“Feedback SEQ-A”) can be used for running indication or alarm indication.
Frost protection temperature sensor
The heater return water temperature is measured using the analogue input (”Frost protection sensor”). Low temperatures will generate an internal, proportional signal that is used to force the heating valve open thereby preventing freeze-up of the heater.
The internal signal will begin to rise as the frost protection temperature falls below “Alarm limitation running mode” + “P-band running mode” in order to reach 100 % output when the signal has fallen to “Alarm limitation running mode”.

Frost guard

When ”Internal signal” reaches 100 % or the digital input (”Defrost switch”) is activated, the unit is shut down, the heating output is set to completely open mode and an alarm is activated. The unit is restarted when the alarm has been acknowledged and the temperature for the frost protection sensor has risen above “Alarm limit frost” + “P-Band”.
The frost protection alarm limits is set in the:

`Data & settings > Temperature control > Heating (Heating 2)`

Standby mode

If frost protection is activated, the controller will go into ”Standby mode” when the running mode switches to ”Off”. The “Standby mode” will control the heating output to maintain a constant settable temperature at the frost protection sensor “Setpoint Standby mode”.

Pump control

Pump control setting are available if water has been selected as heating medium for the sequence

Configuration options allow choice of Pump running mode ("Auto" or "Always running") and Type of feedback ("None" / "Alarm" / Run indication").

Setting for pump operation are available in

`Data & Settings > Temperature control > Heating >`

Settings include:

Pump stop delay. Option available if "Auto" has been selected as pump running mode. The value indicated time the pump will continue to run after switching off of the start signal of the related sequence

Pump-kick hour. The pump exercise start time. The pump will start and run for 1 minute or the stop delay whichever is longer.

Pump can be set to run when outdoor temperature is lower then set limit [default: 10°C].

Frost protection

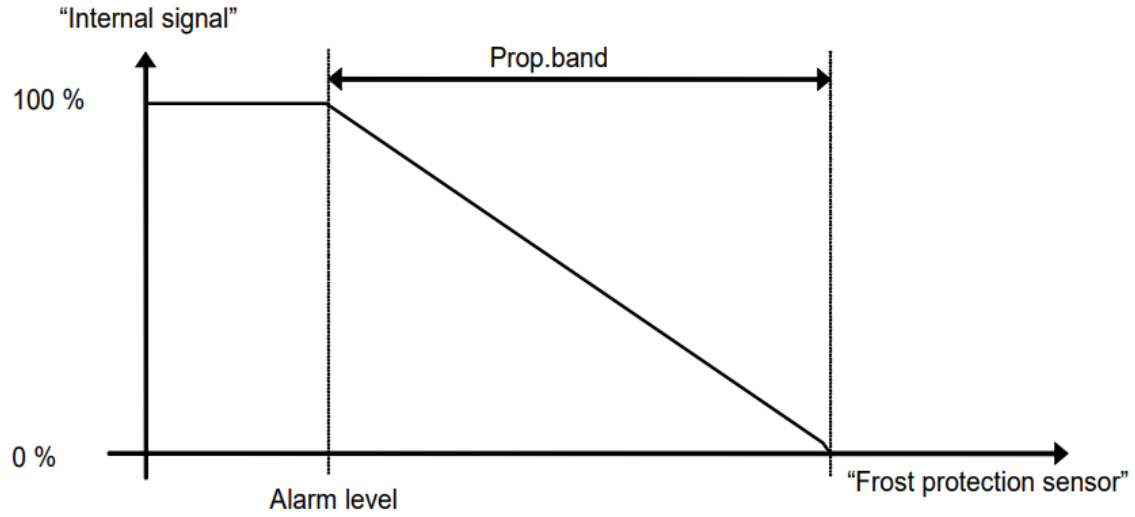
The heater return water temperature is measured by "freeze protection temperature 1 (2)" sensor. Low temperatures will generate an internal, proportional signal that is used to force the heating valve open thereby preventing freeze-up of the heater.

`Data & Settings > Temperature control > Heating > Freeze protection 1 >`

Different alarm levels can be set for unit in stanby and in running mode. Freezing protection signal will begin to rise if the freezing protection temperature falls below “Alarm level” + “Prop. Band”.

When ”Internal signal” reaches 100 % the unit is shut down, the heating output is set to completely open mode and an alarm is activated. The unit is restarted when the alarm has been acknowledged and the freezing protection temperature has risen above “Alarm limit” + “P-Band”.

Frost protection control is available for all heating sequences that are used for controlling water heaters



Electric heating

Control
The heating is controlled using the analogue output and/or signal for start heating or step controller to control 1..4 digital output steps.

Overheat protection
On Activate of the digital input “Overheated electric heater” the unit will be shut down, either according to the stop sequence described in section Start/stop of unit or as an emergency shutdown. The unit will restart after the alarm has been acknowledged and “Electric heating is overheated” has reset.

Flow switch
Note that activation of the input signal “Flow switch” will also stop the unit. Note: It is important that the high temperature thermostat is hardwired to disconnect the power to the heater. That is to ensure that the heating is shut down when the thermostat is activated even if the Access controller should be faulty.

Fast stop on overheating
If the function "Fast stop on overheating" is active, the fans will be immediately stopped when there is an overheating alarm, regardless of the set cool-down time.
Step controller heating

Water cooling

Control
When the unit is in running mode the coolin valve is controlled by the analogue output and digital output for pump control and/or signal for start cooling.

Pump indication
A feedback from pump can be used, running indication or alarm indication.

DX Cooling

DX cooling can be controlled as an external DX coil or integrated reversible heat pump unit.
In all cases performance of DX system is controller by a separate controller.

If DX cooling is used in conjunction with room cascade temperature control or extract air cascade temperature control, two options of DX cooling setup are available:

DX cooling without exchanger control

```
Configuration > Functions > Function activation > Heating/Cooling
sequences > Cooling > Type of cooler > DX
```

When running cascade control, the supply air controller setpoint is normally controlled by the room/extract air controller output signal.
When DX cooling is activated, the supply air controller setpoint is lowered to five degrees (adjustable) below the setpoint given by the room/extract air controller. This prevents the DX cooling from being activated/deactivated too often.

DX cooling with exchanger control

```
Configuration > Functions > Function activation > Heating/Cooling
sequences > Cooling > Type of cooler > DX with exchanger control
```

When running cascade control, the supply air controller setpoint is normally controlled by the room/extract air controller output signal.
When DX cooling is activated, the supply air controller setpoint is lowered to five degrees

(adjustable) below the setpoint given by the room/extract air controller. This prevents the DX cooling from being activated/deactivated too often. If the supply air temperature falls below the setpoint given by the room/extract air controller, the heat exchanger output will be activated in order to try to maintain the supply air setpoint given by the room/extract air controller. The output uses P-control with a P-band of half the setpoint lowering (adjustable, 2.5°C as default). The setpoint given by the room/extract air controller cannot drop below the set min limit. When there is no longer a cooling demand, the supply air controller setpoint will return to the value given by the room/extract air controller.

Note: The function cannot be used if the exchanger signal controls a mixing damper.

Example:
The room controller gives a supply air setpoint of 16°C. If there is a cooling demand, the supply air controller setpoint is lowered to 11°C (16 – 5) and DX cooling is activated. Should the supply air temperature fall below 16°C, the exchanger output will be activated and reach 100 % output when the supply air temperature has fallen to 13.5°C (16 - 2.5).

DX cooling can be blocked when the outdoor temperature is lower then settable limit
`Data & Settings > Temperature control > Cooling >`
`> Block DX-cooling if outdoor temperature <`

DX cooling can be blocked if the supply air fan control signal falls below a preset values
`Data & Settings > Temperature control > Cooling >`
`> Block DX-cooling if supply air fan output signal <`

Reversible heat pump

The air handling unit section with heat pump is a separate section in the air handling unit, containin g a fully integrated, complete standalone reversible heat pump system (heating and cooling). All ref rigerant system components are fully integrated into the unit. The refrigerant is evaporated and con densed directly in the integrated coils, and the capacity is controlled automatically and steeples bet ween 5 and 100 %.

Type of heater sequence is set to "DX"

Type of cooler sequence is set to either "DX" or "DX with exchanger control"

Both sequences are combined with changeover function

default:

SEQ-G Heating 2
SEQ-H Cooling 2 ⟹ Changeover 1

Inputs and outputs used for controlling the reversible heat pump:

DO: Changeover 1
DO: Cooling 2
AO: Changeover 1
DI: Feedback cooling 2
DI: Lock PID controller supply

Step controller

Two step controllers are available if electric heater, DX cooler or change-over is used for heating or cooling.

```
Configuration > Functions > Function activation > Heating/Cooling
sequence setup > Step controller
```

The control signal of the selected sequence or changeover is divided into steps and used to activate digital outputs of the controller.

Two operation modes for step controllers are available:

Sequential control
Each output step has individually settable on and off values in percent of the control signal.

```
Data & Settings > Temperature control > "Sequence" > Step ... start point
Data & Settings > Temperature control > "Sequence" > Step ... stop point
```

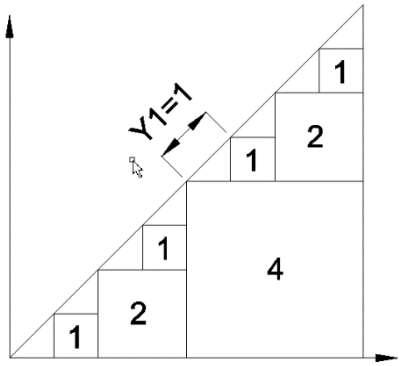
Minimal step switching time can be set (minimum time the step has to be inactive or active for a change to occur)

```
Data & Settings > Temperature control > "Sequence" > Min switch time
```

Minimal supply air fan signal for each step can be used as a step block condition:

```
Data & Settings > Temperature control > "Sequence" > Block step ... if
supply air fan output signal <
```

Binary control
The heater power outputs should be binary weighted (1:2:4:8 for 4 step controller). The number of loads to be controlled is set. Thereafter the program will automatically calculate the individual activation levels. Switching differential and minimum on/off times can be set. The number of heating steps will be: 2no. of groups-1. In binary mode, the analogue output signal may be used to fill out between the steps. The signal will go 0…100 % between the activation of each step. The load connected to the analogue signal should have the same size as the smallest of the binary groups. In the example below there are 4 heater groups (1:1:2:4) and the total number of heating steps is eight.



Support control

Activation: `Configuration > Functions > Function activation > Support control > "Yes"`
Configuration: `Configuration > Functions > Support control >`
Settings: `Data & Settings > Demand control > Support Control >`

Support control is normally used when room temperature control or extract air control has been configured. When extract air control is configured a room sensor must be installed. "Support control Heating" or "Support control Cooling" will run if Support control is configured, the running mode is in Off-state (timer control OFF and not in extended running) and if conditions call for support control (see below). Minimum run time is settable 0 to 720 minutes (FS= 20 minutes).
Support control can also be configured when supply air temperature control is used, if a room sensor is installed. The controller uses the configured min. (FS=15°C) and max. (FS=30°C) limitation values as support control setpoints. However, in this case the min. and max. limitation values cannot be changed. To change the values, temporarily configure room control, change the min. and max. values and then change back to supply air control.
Support control can also be configured to start only with the supply air fan. In this mode, the extract air fan is not active. This requires a digital output to be configured, which controls the recirculation damper to open completely so the supply air fan can circulate the air to and from the room. The digital output is called "recirculation damper".

Support control heating

Demand for support control heating is when the room temperature is lower than the start value which is settable 0 to 30°C. The fans will run at the preset speed, the heater and the heat exchanger are controlled by the supply air temperature controller with the configured max limitation for the supply air (FS=30°C) as setpoint and the cooling is shut off (0%). Support control heating stops when the room temperature rises to the stop value and the minimum run time has been exceeded or the running mode changes to "On".

Support control cooling

Demand for support control cooling is when the room temperature is higher than the start value which is settable 20 to 50°C. The fans will run at the preset speed, the heater and the heat exchanger are shut down (0 %) and the cooling is controlled by the supply air temperature controller with the configured minimum limitation (FS=15°C) as setpoint. Support control cooling stops when the temperature falls below the stop value and the minimum run time has been exceeded or the running mode changes to "On".

Free cooling

This function is used during the summer to cool the building night-time using cool outdoor air, thereby reducing the need for cooling during the day and saving energy.

`Configuration > Functions > Function Activation > Free cooling > "Yes"`

Free cooling requires an outdoor sensor (or an inlet temperature sensor) and either a room sensor or an extract air sensor. The outdoor sensor can be placed in the fresh air inlet duct. Free cooling is only activated when all the start conditions are fulfilled.
Start conditions:

- Less than four days have passed since the unit was last in running mode.
- The outdoor temperature during the previous running period exceeded a set limit (22°C).
- It is between 00:00 and 07:00 in the day (settable).
- The unit is stopped by schedule
- The unit is scheduled to run in next 24 hours.

`Data & Settings > Demand Control > Free cooling >`

If the outdoor sensor is located in the fresh air inlet duct and/or an extract air sensor is selected and ALL the start conditions are fulfilled, free cooling is activated and will run for 3 minutes to

ensure that the temperature measurement when using an extract air sensor reflects the corresponding room temperature and that the outdoor temperature sensor senses the outdoor temperature even if it is placed in the fresh air inlet duct. If the outdoor sensor is not located in the fresh air inlet duct and a room sensor is selected, the unit will not start free cooling as long as all the temperatures are not within the start and stop temperature intervals.
After three minutes, the stop conditions will be controlled. Stop conditions:

- Outdoor temp above the set max. value (18°C) or below the set min. value (condensation risk, 10°C).
- The room temp/extract air temp. is below the set stop value (18°C).
- The unit is running by schedule, extended running or is stopped by external switch..
- It is past 07:00 in the day.

If any stop condition is fulfilled after three minutes, the unit will stop again. Otherwise, operation will continue until a stop condition is fulfilled.
When free cooling is active, the fans run at normal speed or the set value for pressure/flow control. An offset can also be entered for the fan setpoints during free cooling. The digital output ”Free cool run” is active. The outputs Sequences (temperature) are interlocked.

After free cooling has been active, the heating output is blocked for 60 minutes (configurable time).

```
Data & Settings > Demand Control > Free cooling >
> Time to block heat output after free cooling >
```

Pretreatment

```
Configuration > Functions > Function Activation > Pretreatment > ”Yes”
```

Pretreatment activation during free cooling

```
Configuration > Functions > Pretreatment >
```

Control of dampers and pump for preheated or pre-cooled outdoor air via an underground intake channel. The digital output ”Pretreatment” is set to preheating when the unit is started and the outdoor temperature is below the set heating start limit (default 8°C) or to precooling when the outdoor temperature is above the set cooling start limit (default 19°C).
If the outdoor temperature exceeds the set heating start limit by more than 1°C (fixed), preheating will be aborted, as well as if the outdoor temperature falls below the cooling start limit by 1°C.
If a sensor is configured in the intake duct (”intaketemp”) this temperature will be compared with the outdoor temperature. If the temperature in the intake duct does not exceed the outdoor temperature by more than 1°C (adjustable) 5 minutes (adjustable) after start-up when using preheating, preheating will be aborted. The same conditions apply to precooling, i.e. if the intake temperature is not more than 1°C (adjustable) cooler than the outdoor temperature, precooling will be aborted.

Pretreatment always starts at start-up of the unit, if the outdoor temperature so permits. If pretreatment is aborted due to a small difference between the intake temperature and the outdoor temperature, pretreatment will be blocked for 6 hours. Then pretreatment will start (if the outdoor temperature so permits) and run for at least 5 minutes (adjustable)
Data & Settings > Temperature control > Pretreatment>

Cooling recovery mode

Activation of cooling recovery mode enables use of exchanger and damper sequences for reusing cool extract air.

```
Configuration > Functions > Temperature control > Cooling recovery mode >
”On”
```

The mode activates if there is a demand for cooling and the extract air temperature is a settable amount lower than the outdoor temperature.

`Configuration > Functions > Temperature control > Temperature difference to start cooling recovery >`

The function also activates the heating function “Free heating”. If there is demand for heating and the outdoor temperature is higher than the extract air temperature, outdoor air will primarily be used.

Extra controller

Activation: `Configuration > Functions > Function Activation > Extra controller > “Yes”`
Configuration: `Configuration > Functions > Extra controller`
Settings: `Data & settings > Temperature control > Supply air controller`

An independent temperature control circuit for control of for additional heater or cooler. It has an analogue input signal for temperature sensors and an analogue output signal 0…10 V. There is also a digital output signal which is activated when the analogue output signal is above 1 V and deactivated when the analogue signal is below 0.1 V. The circuit can be configured to be active all the time or to be active only when the main unit is running at normal speed.

The extra controller can also be used for humidity control. The cooling battery will be used for dehumidification if the room/extract air humidity is too high. The function uses the sensor “Extra unit temp” and is placed immediately after the cooling battery. The function also requires use of a room humidity or extract air humidity sensor.

Example:
If the room humidity exceeds the setpoint for the function, the cooling battery will be controlled by the external controller. The heater is controlled normally. When the room humidity falls below the setpoint once more, the cooling control will return to normal control. A hysteresis of 1 % is added to the function.
The function can be used for “Cascaded room temperature control”, “Cascade connected extract air temperature control”, “Outdoor compensated room temperature control” as well as “Outdoor compensated extract air control”.

An alarm will be triggered if “Extra controller” is in manual position or if a sensor error occurs.

Preheater

Preheater is used to maintain temperature or humidity of fresh air at preset level. The function prevents icing, over utilization of after heater and water condensation in filters by preheating incoming fresh air.

Activation: `Configuration > Functions > Function Activation > Preheater > “Yes”`
Configuration: `Configuration > Functions > Preheater >`

The function controls water or electric heating coil places on the intake of the unit. Configuration steps for each preheater type are similar to after-heater configuration

Preheater can be used either for low limiting temperature of intake air or for controlling intake air saturation with water vapor. Therefore one of two sub-functions can be selected - "Preheating" or "Filter drying".

Preheater output is adjusted by PID regulator.
PID regulation starting point can be set.

`Configuration > PID controller > Preheater > Start with output [default 0%]`

Changing of this value will set output to entered level and then regulate from it.

Preheater sub-function: Preheating

`Configuration > Functions > Preheater > "Preheating"`

The function is used to ensure optimal exchanger thermal efficiency by preventing frost formation; Preheater reduces the load on after heater while plate heat exchanger is in defrost mode with by-pass open.

It is required to select preheater temperature sensor.
Selection of start/stop function limits activation of preheater to specific running mode.

Preheater will activate in the selected running mode and regulate accordingly to preheater temperature sensor and preheating setpoint.
`Data & Setting > Temperature control > Preheater >`

Preheater sub-function: Filter drying

`Configuration > Functions > Preheater > "Filter drying"`

The pre-heating of intake air is used to reduce air saturation to acceptable level (default 65%).

It can be activated in certain running mode, temperature limit or by optional outdoor humidity sensor.
Combined options for activation are also possible.
Filter drying function works by adjusting temperature difference between two sensors of choice.
Preheater inlet and preheater outlet air temperature sensors must be selected.

Activation of the function is related to sum of start conditions. Filter drying is activated if all conditions are fulfilled.

It is possible to choose running mode then function is active:

- Starting up
- Starting up & Unit running
- Starting up & Unit running & Cooling down

Settable outdoor temperature and humidity can block function from activating:

- Stop filter drying if outdoor temperature < (default 0°C)
- Stop filter drying if outdoor temperature > (default 50°C)
- Stop filter drying if outdoor humidity < (default 65%)

Active period can be extended by setting "Stop delay" time. The preheater will be active for the set time after running mode changes

Preheater can be boosted to fixed output level for a settable time before entering "cooling down" and stopping.
The outdoor air temperature and humidity conditions shall be fulfilled for the activation of the boost.
Unit must also be in "Unit running" mode for boost to activate.

e.g.1 : it is needed to dry filter at startup for at least 10 minutes:

Function active during	Starting up
Stop delay	10 min

The total active period will be the sum of "Starting up" and "Stop delay" times.

e.g.2: it is needed to dry filter for 10 minutes before stopping at 50% of preheater capacity:

Preheater output when boost	50 %
Time in boost before unit is stopped	10 min

Fan control

Fan control type

`Configuration > Functions > Function activation > Fan control type >`

Pressure

During pressure control, two separate signals are used for supply and extract air and two separate analogue input signals for supply and extract air for pressure transmitters. The fan speeds are adjusted to maintaining constant pressure.

Flow

Instead of giving a pressure setpoint value, it is possible to use an airflow volume value. The value from the pressure transmitter is recalculated to a volume flow

Manual

Variable speed drive-controlled fans can be controlled at a fixed rotational speed. The rotational speed is selected by setting a fixed output signal (0 – 100%). Values for normal and reduced speed can be configured for each fan.
Fans that are run with a fixed output signal can also be compensated (see the section above). In this mode, pressure sensors are not needed.

External

Two 0…10 V input signals are used for direct control of variable speed drive-controlled fans. The signal is received from e.g. a VAV unit. The signal controls the fans 0…100% (0…10 V on the analogue output). Pressure transmitters are not used in this control mode.

Supply air pressure and extract air fan slave

The rotational speed of the supply air fan is controlled by a pressure transmitter (”Pressure supply air”) which is placed in the supply air duct. The extract air fan does not have a pressure transmitter, instead you let the output for the extract air fan follow the control signal for the supply air fan. A scaling factor can be added if the characteristics of the extract air fan are not the same as the characteristics of the supply air fan. (Only pressure control of the supply air fan is possible using this function.) The extract air fan will start directly at 50% after the start delay. Then the heating of the exchanger will work for this operating mode as well. When the supply air fan starts, the extract air fan will be slave controlled by the supply air flow.

Supply air pressure with extract air flow slave

The rotational speed of the supply air fan is controlled by a pressure transmitter (“Pressure supply air”) which is placed in the supply air duct. The extract air fan is controlled by the supply air flow, to achieve a balanced ventilation. A pressure transmitter ("Flow supply air") which is placed in the supply air fan cone gives a measured value of the present supply air flow. A corresponding pressure transmitter (”Flow extract air”) is placed in the extract air fan cone and gives a measured value of the extract air flow.
The supply air flow is the setpoint used for control of the extract air fan. A scaling factor can be added if the extract air fan does not have the same characteristics as the supply air fan.

Extract air pressure with supply air slave

The rotational speed of the extract air fan is controlled by a pressure transmitter (“Pressure extract air”) which is placed in the extract air duct. The supply air fan has no pressure transmitter. Instead, the supply air fan output is made to follow the extract air fan control signal. A scaling factor can be added if the supply air fan characteristics are not the same as the characteristics of the extract air fan (only pressure control of the extract air fan is possible using this function).

Extract air fan pressure with supply air flow slave

The rotational speed of the extract air fan is controlled by a pressure transmitter (”Pressure extract air”) which is placed in the extract air duct. The supply air fan is controlled by the extract air duct flow to achieve a balanced ventilation. A pressure transmitter (“Flow extract air”) placed in the

extract air fan cone provides a measurement of the current extract air flow. A corresponding pressure transmitter (“Flow supply air”) is placed in the supply air fan cone, providing a measurement of the supply air flow.
The supply air fan is controlled using the extract air flow as a setpoint. A scaling factor can be added if the supply air fan does not have the same characteristics as the extract air fan.

Fan configuration

`Configuration > Functions > Fan control >`

The controller supports number of Modbus communication capable fans. Such fans can be controlled over internal bus of the unit. Alternatively, the fans can be hardwired to signal terminals of the controller and controlled directly. Depending on preferred fan control type – several configuration options are available.

Fan

The air handling unit can be a single flow (Supply air or Extract air) or two flow (Supply air + Extract air).

Flow presentation

Flow presentation is active if flow control type has been chosen. As an option representation can be enabled to display flow of both fans even when pressure control or slave control is used.
If flow display is enabled by this option or by fan control type – right flow calculation settings should be entered.

Flow calculation

`Configuration > Functions > Fan control > Flow calculation supply (extract) air >`

k-factor describes the characteristics of fan’s impeller. It is usually provided on the informational sticker on the fan or in catalog data.
x-factor normally shouldn’t be changed.
The following formulas for calculation of flow:

$$Flow = [K - factor] * [Pressure]^{[X-factor]}$$
$$IF\ X = 0,5$$
$$Pressure^{0,5} = \sqrt{pressure}$$

Type of feedback Supply air fan (Extract air fan)

There are two fan monitoring options if digital inputs are used for fan operation feedback. They can be configured either for indication of the motor running or for monitoring of motor alarm contacts.

`Configuration > Functions > Fan control >`

An input configured for run indication should normally be closed during operation.
Open input when the motor is running, i.e. motor control output is activated, will generate an alarm.
For supply air fans and extract air fans, there is also a conflict alarm, i. e. an alarm if the run indication input is closed even though the motor control output is not activated.
An input configured as motor protection should be normally open, i. e. closed contact when the motor is running, i.e. motor control output is activated, will generate an alarm.

The controller supports simultaneous use of analog and digital fan operation watchdogs.
When running variable speed drive-controlled fans, the pressure signal from each respective fan’s pressure transmitter is normally used as run indication signal. If the pressure or flow falls below the set value during normal operation, a malfunction alarm is activated.

```
Data & Settings > Fan control > Supply air fan > Min pressure for supply
air fan indication

Data & Settings > Fan control > Supply air fan > Min flow for supply air
fan indication
```

Fan levels

The controller supports up to three operation speeds (Low, Normal and High):

```
Configuration > Functions > Function Activation > Fan levels >
```

After activating operation speed levels the setpoint for each fan and each level can be set:

```
Data & Settings > Fan control > Fan setpoints >
```

Changing between the fan operation levels is done using the schedule by activating extended operation function with digital input signals.

Fan compensation

Despite of active fan level, upon the need the actual fan speed can be adjusted by defining compensation curves.

```
Configuration > Functions > Function Activation > Fan compensation curves
> "Yes"
```

The function allows to set up to three independent curves. They can be used to set a compensation based on the configured analogue input signal (temperature, pressure, flow humidity, CO2).
The compensation can be selected to apply to both fan or only one of the fan, to low, normal, high or all speeds and only when defrosting.

```
Configuration > Functions > Fan compensation curves >
```

The curve has three parameter pairs which correspond to the value of the compensation at three different related sensor values.

```
Data & Settings > Fan control > Fan compensation curves >
```

Extra fan motor control

The controller can control start/stop of up to two additional fans.

```
Configuration > Functions > Function activation > Extra fan motor control
("Yes" / "1" / "2")
```

Extra fans can be set to run then digital input is active, unit is running or by time schedule

```
Configuration > Functions > Extra fan motor control > Start/Stop function
fan motor 1 (2) >

Stop delay time for the fans can be set
Data & Settings > Fan control > Extra fan motor control
```

Humidity control

Humidity control can be configured as Humidification, Dehumidification or both Humidification and Dehumidification.

Activation: `Configuration > Functions > Function Activation`
Configuration: `Configuration > Functions > Humidity/Dehumidify`
Settings: `Data & Settings > Humidity controller`

Two humidity sensors can be connected, a room sensor for control and an optional duct sensor for maximum limiting. The limit sensor can be omitted.
The humidity control is handled by a PI-controller.
The humidity sensors must give 0…10 V DC for 0…100 % RH.

Humidification

An analogue output is used to control a humidifier. The output will increase on decreasing humidity. A digital output can also be used to start a humidifier.
Maximum limitation function using duct humidity sensor:
If the maximum limitation is 80 % RH and the hysteresis is 20 % RH, the controller output signal will begin decreasing at 60 % RH. When halfway to 80 % RH (i.e. when at 70 % RH), half the output signal will be damped. If the humidity in the duct still reaches 80 % RH, the entire output signal will be damped.

Dehumidification

An analogue output is used to control a dehumidifier. The output will increase on increasing humidity. A digital output can also be used to start a dehumidifier.
Humidification/dehumidification
An analogue output is used to control a humidifier. The output will increase on decreasing humidity. The cooling output Y3 will be activated for dehumidification through condensation. The output will increase on increasing humidity. This signal overrides the cooling signal from the temperature controller so the output can be activated for dehumidification even if the temperature controller demand is zero.
For good temperature control when using cooling for dehumidification it is important that the cooler is placed first in the air stream so that the exchanger and heater can be used to reheat the air after dehumidification.
Digital humidity signal
A digital output signal, "Dehumidification/Humidification", can be used for on/off control of humidifiers/dehumidifiers. The output signal has an Activate value and a Deactivate value which are connected to the humidity controller output. The signal is activated when the humidity controller output rises above the set Activate value and is deactivated when the humidity controller output drops below the set Deactivate value.
If a start signal is needed for a cooling unit or a magnetic valve for DX dehumidification, the digital output signal “Start P1-Cooling” should be used. In this case, the “pump” stop delay should be set to 0 s.

CO2 control

In applications with varying occupancy the fan speeds, mixing damper or both can be controlled by the air quality as measured by a CO2 sensor.
With the CO2 function it's possible to start and stop the fans, compensate the fan speed and in combination with mixing damper let in more outdoor air depending on the CO2 value.

Fan start/stop

Activation: `Configuration > Functions > Function Activation > CO2 control > Fan start/stop function`
Configuration: `Configuration > Functions > CO2 control >`
Settings: `Data & Settings > Demand control > CO2 >`

When the function is activated with start/stop function and the CO2 value rises above settable start value the fans will start at configured speed, if they are not already running.
The fans will stop when the CO2 value falls to a settable hysteresis (default: 160 ppm) below the start value. and after minimal time for CO2 control has passed.

Mixing damper function

`Configuration > Functions > Function Activation > CO2 control > Mixing damper function`

Activation of recirculation function is required for visual representation of the mixing damper in the flowchart.

`Configuration > Functions > Function Activation > Recirculation > "Yes"`

CO2 control by mixing damper involves configuration of temperature control sequences "Recirculation 1" and "Recirculation 2".

Recirculation 1 is used as driving signal for Mixing damper.

Recirculation 2 is used as driving signal for Outdoor air (Fresh air) damper

Primary use for mixing function is to save energy by recirculating extracted air. Mixing damper would open first followed by closing of outdoor air damper. Increased ratio of recirculated air would save more energy but would also increase CO2. To keep CO2 at acceptable level the CO2 controller regulates back (close mixing and open outdoor air dampers) to reduce mixing ratio.

The CO2 control option must be activated to make sequence output CO2 dependent.
`Configuration > Functions > Function activation > Heating/Cooling sequences > Recirculation 1 > CO2 control > CO2 sequence 2`

`Configuration > Functions > Function activation > Heating/Cooling sequences > Recirculation 2 > CO2 control > CO2 sequence 1`

If just supply air fan is used for recirculating mixed air, the extract air fan should be slowed down to keep balance of fresh and exhaust air flows.
`Configuration > Functions > Fan control > Extract air fan slaved by exchanger supply air flow > "Yes"`

Parameters of flow calculation through the exchanger then can be adjusted
`Configuration > Functions > Fan control > Flow calculation exchanger supply air >`

The setpoint of acceptable CO2 level can be set
`Data & Settings > Demand Control > CO2 Control > Setpoint mixing damper >`

Enthalpy control

For the enthalpy calculation to be made the functions enthalpy control and cooling recovery must be active.

Measures and compares the energy content (enthalpy) of the outdoor air and the extract air.

Calculating the enthalpy means to calculate the energy content of the air, taking into consideration both the temperature and air humidity. The value is given in energy per kilogram air (kJ/kg).

If the enthalpy is higher outdoors than in the extract air, the recirculation damper function will be overridden to increase the recirculation.

The function is not active when using free cooling, in which case outdoor air is used for cooling the room instead.

If both outdoor sensor and intake sensor is configured it uses the intake sensor. In order for the enthalpy calculation to be made the functions enthalpy control and cooling recovery must be active, and four sensors are required:

- Outdoor temperature sensor/Intake temperature sensor
- Outdoor humidity sensor
- Room/Extract air temperature sensor
- Room humidity sensor

Dampers

Dampers in use can be selected

`Configuration > Functions > Function activation > Damper >`

If Extract air damper is used instead of Exhaust air or if they both are used in combination, the settings for flowchart can be changed

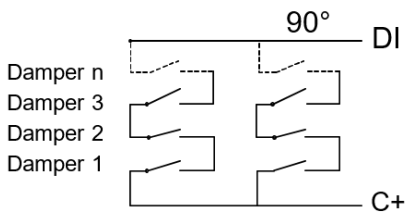
`Configuration > Functions > Flow chart setup >`

Fire dampers

Fire dampers are normally configured to open on fire alarm. However, they can be configured to be normally open instead via the display.

Fire damper exercising

Fire damper exercising can be configured. The exercise interval is settable. To be able to use this function, all the dampers must have end-position switches.
The digital input: "Fire damper end-switch monitoring" should be wired to all the fire damper end position switches.



When the test cycle is initiated, the output "Fire dampers" will be activated and the dampers will begin to move. Within the set time (90 sec) the signal on "Fire damper end-switch monitoring" must change to indicate that the dampers have left their normal positions. If not an alarm will be triggered.
Then, within the set time, ”Fire damper, end-switch monitoring” must change again to indicate that all the dampers have reached the other end position. If not an alarm will be triggered.
When all dampers have reached the end position the output "Fire dampers" will be reset to drive the dampers back to normal position. Again, within the set time (90 sec) the signal on the input "Fire damper end-switch monitoring" must change to indicate that the dampers have left the end positions. If not an alarm will be triggered.
Then, within the set time, "Fire damper end-switch monitoring" must change again to indicate that all the dampers are back to their normal positions. If not an alarm will be triggered.
The controller can be configured to stop the air handling unit during the damper testing.
All dampers must be wired to the same output in order to get correct results.
The fire alarm input can be configured as normally closed or normally open.
In- and outputs

DO	Outdoor air damper
DO	Exhaust air damper
DO	Fire damper
DI	Fire alarm
DI	Fire damper end switch monitoring

Fire function

Fire dampers are normally closed and configured to open if a fire takes place. However, it is possible to instead configure them to be normally open, as well as to configure the controller operating mode at a fire alarm. The following options are available: “Stopped", “Continuous run", “Run via normal start/stop conditions”, “Only extract air fan in operation”, “Only supply air fan, 100 % heating and alarm block” or “Continuous run, 100 % heating and alarm block”. “Alarm block” here means that all alarms will be blocked.
It is possible to configure which speed the fans should have when in fire mode – however, this is also possible when the fire function has been set to “Run via normal start/stop conditions”. See section “Configurable speed in different unit modes” for more information.
Fire alarm priority is for the unit to not stop for any other alarm (e.g. frost protection) when it has been configured for continued operation during fire alarms. However, the digital input ”external switch” will still stop the unit.

Smoke function

Smoke function has almost the same function as Fire function but it has lower priority than Fire function and it don’t’ control the fire dampers. It’s possible to configure controller operating mode at a smoke alarm. The following options are available: “Stopped", “Continuous run", “Run via normal start/stop conditions”, “Only extract air fan in operation”, “Only supply air fan, 100 % heating and alarm block” or “Continuous run, 100 % heating and alarm block”. “Alarm block” here means that all alarms will be blocked.
It is possible to configure which speed the fans should have when in smoke mode – however, this is also possible when the smoke function has been set to “Run via normal start/stop conditions”. See section “Configurable speed in different unit modes” for more information.
Smoke alarm priority is for the unit to not stop for any other alarm (e.g. frost protection) when it has been configured for continued operation during smoke alarms. However, the digital input ”external switch” will still stop the unit.

I/O allocation settings

I/O allocation settings show only sensors/signals that are activated in configuration. The allocation of inputs and outputs defines the routes for data exchange between controller and connected devices.

The actual devices (sensors, fans, transmitters, switches, pumps etc.) that are not connected over internal bus line should be hardwired directly to the controller‘s or expansion unit‘s terminals.

Analog inputs

`Configuration > I/O allocation settings > Analog inputs >`

Analog input	Description
Outdoor temperature	Temperature sensors
Intake air temperature	
Supply air temperature	
Exhaust air temperature	
Extract air temperature	
Room temperature 1	
Room temperature 2	
Room temperature 3	
Room temperature 4	
Frost protection temperature 1	
Frost protection temperature 2	
Frost protection temperature 3	
Defrosting temperature	
Extra controller temperature	
Efficiency temperature exchanger	
Pressure supply air	Differential pressure transmitters
Pressure extract air	
Flow supply air	
Flow extract air	
Pressure filter supply air	
Pressure filter extract air	
Pressure exchanger extract air	
Flow exchanger supply air	
CO2 room/extract air	CO2 level transmitter
Humidity sensor room/extract air	Relative humidity transmitters
Humidity sensor supply air	
Humidity outdoor	
External control supply air fan	External setpoint devices
External control extract air fan	
External setpoint temperature	
External setpoint flow	
Extra sensor 1	Extra sensors or transmitters
Extra sensor 2	
Extra sensor 3	
Extra sensor 4	
Extra sensor 5	

Analog outputs

Configuration > I/O allocation settings > Analog outputs >

Analog output	Description
Heating	Output for SEQ-A (Heating)
Exchanger	Output for SEQ-B (Exchanger)
Cooling	Output for SEQ-C (Cooling)
Recirculation 1	Output for SEQ-D (Recirculation 1)
Recirculation 2	Output for SEQ-E (Recirculation 2)
Fan heating/cooling	Output for SEQ-F (Fan setpoint compensation)
Heating 2	Output for SEQ-G (Heating 2)
Cooling 2	Output for SEQ-H (Cooling 2)
Exchanger extract	Output for SEQ-I (Exchanger extract)
External heating/cooling capacity	Output for SEQ-J (External heating/cooling capacity)
Changeover 1	Output for Changeover 1
Changeover 2	Output for Changeover 2
Supply air fan	Supply air fan output signal
Extract air fan	Extract air fan output signal
Humidity	Humidifier / De-humidifier output signal
Step controller 1	Output signal used to fill out between the steps
Step controller 2	
Extra controller	Output for extra controller capacity
Temperature output	Output for selected temperature scaled to 0-10V
Preheater	Output for preheater capacity

Digital inputs

Configuration > I/O allocation settings > Digital inputs >

Digital input	Description
Feedback supply air fan	Triggers alarm 1: Malfunction supply air fan 1
Feedback extract air fan	Triggers alarm 6: Malfunction extract air fan 1
Alarm extra fan motor 1	Triggers alarm 40: Malfunction extra fan motor 1
Alarm extra fan motor 2	Triggers alarm 41: Malfunction extra fan motor 2
Start/(Stop) extra fan motor 1	Start/stop signal for fan if Configuration > Functions > Extra fan motor control > Start/Stop function fan motor 1 (2) > "Digital input"
Start/(Stop) extra fan motor 2	
Extended operation low speed	Manual control: low speed
Extended operation normal speed	Manual control: normal speed
Extended operation high speed	Manual control: high speed
External stop	Manual stop
Fire alarm	N/A
Smoke sensor alarm	Triggers alarm 59: Smoke alarm
External alarm	N/A
Fire damper position switch	Fire damper end switch for functioning testing
Feedback SEQ-A	Triggers alarm 43: Malfunction heating (SEQ-A)
Feedback SEQ-B	Triggers alarm 44: Malfunction exchanger (SEQ-B)
Feedback SEQ-C	Triggers alarm 45: Malfunction cooling (SEQ-C)
Feedback SEQ-D	Triggers alarm 46: Malfunction recirculation 1 (SEQ-D)
Feedback SEQ-E	Triggers alarm 47: Malfunction recirculation 2 (SEQ-E)
Feedback SEQ-F	Triggers alarm 48: Malfunction fan setpoint comp (SEQ-F)
Feedback SEQ-G	Triggers alarm 49: Malfunction heating 2 (SEQ-G)
Feedback SEQ-H	Triggers alarm 50: Malfunction cooling 2 (SEQ-H)
Feedback SEQ-I	Triggers alarm 51: Malfunction exchanger extract (SEQ-I)
Feedback SEQ-J	Triggers alarm 52: Malfunction external heating/cooling (SEQ-J)
Alarm acknowledgment	N/A
Flow guard	Triggers alarm 55: Alarm low air flow
Defrost switch	N/A
Recirculation operation	N/A
Cooling/(heating) changeover 1	N/A
Cooling/(Heating) changeover 2	N/A
Rotary exchanger alarm	N/A
Frost protection switch	N/A
Overheated electric heater	N/A
Filter guard supply air	N/A
Filter guard extract air	N/A

Extra alarm 1	Undefined inputs for external alarms. Alarm name and action can be set.
Extra alarm 2	
Extra alarm 3	
Extra alarm 4	
Extra alarm 5	
Extra alarm 6	
Extra alarm 7	
Extra alarm 8	
Extra alarm 9	
Extra alarm 10	
Lock PID controller supply	Lock supply air temperature controller
Summer/(winter) mode	N/A

Digital outputs

Configuration > I/O allocation settings > Digital outputs >

Digital output	Description
SEQ-A start	SEQ-A..J start digital output is related to corresponding sequence. Digital output is engaged if sequence is active
SEQ-B start	
SEQ-C start	
SEQ-D start	
SEQ-E start	
SEQ-F start	
SEQ-G start	
SEQ-H start	
SEQ-I start	
SEQ-J start	
SEQ-A pump	SEQ-A..J pump digital output is related to corresponding sequence and is enabled if pump control has been selected. Digital output is engaged for active sequence according to pump control rules
SEQ-B pump	
SEQ-C pump	
SEQ-D pump	
SEQ-E pump	
SEQ-F pump	
SEQ-G pump	
SEQ-H pump	
SEQ-I pump	
SEQ-J pump	
Supply air fan start	fan start digital outputs allow activation of fans or frequency drives in hard wired installations
Extract air fan start	
Recirculation air damper	Damper digital outputs can be used for controlling hardwired ON-OFF damper actuators
Outdoor air damper	
Exhaust air damper	
Fire damper	
Sum alarm 1	Output is engaged in case of active "A/B" or just "A" level alarm. Option selectable in Configuration > Function > Extra indications & outputs > Sum alarm outputs >
Sum alarm 2	Output is engaged in case of active "B" or "B/C" level alarm. Option selectable in Configuration > Function > Extra indications & outputs > Sum alarm outputs >
Extra fan motor 1 start	Activated for starting extra fan motors
Extra fan motor 2 start	
Extra time channel 1	Output is engaged during active time period set for corresponding time channel.
Extra time channel 2	
Extra time channel 3	
Extra time channel 4	
Free cooling running	Indication of free cooling mode being active
Pretreatment start	Indication of pretreatment
Running indication	Indication of unit running
Step controller 1 step 1	Outputs are engaged for corresponding active step of the step

Step controller 1 step 2	controller
Step controller 1 step 3	
Step controller 1 step 4	
Step controller 2 step 1	
Step controller 2 step 2	
Step controller 2 step 3	
Step controller 2 step 4	
Dehumidify/(Humidify)	Used for on/off control of humidifiers/dehumidifiers
Changeover 1	engaged if start or pump start outputs of connected sequences are active.
Changeover 2	
Outdoor controlled exchanger	Outdoor temperature activated output for control of hardwired exchanger
Auxiliary indication 1	Configurable outputs engaged at alarm, fan level, running mode or at 100% of selected sequence level
Auxiliary indication 2	
Auxiliary indication 3	
Preheater start	Digital output is engaged if preheater is active
Preheater pump	Digital output is engaged for preheater to pump control rules

Filter monitoring

Activation: `Configuration > Functions > Function activation > Filter monitoring > "Yes"`

Configuration: `Configuration > Functions > Filter monitoring >`

The application supports two modes of monitoring contamination level of the air filters:

- Guard - digital switch. A pressure switch is connected to digital input of the controller. The switch activates once pressure drop across the filter is higher then manually preset limit.
- Sensor - pressure transmitter. Filter monitoring is made air flow dependent. This means that a higher pressure drop is permitted across a filter at a higher air flow.
  The dependency curve can be adjusted in filter alarm configuration (alarms 53 and 54):

`Configuration > Alarms > Air and temperature control > Filter alarm supply air (53)`

`Configuration > Alarms > Air and temperature control > Filter alarm extract air (54)`

In addition to pressure drop monitoring - notification for planned filter replacement can be set:

`Configuration > Functions > Filter monitoring > Filter alarm time (month)`

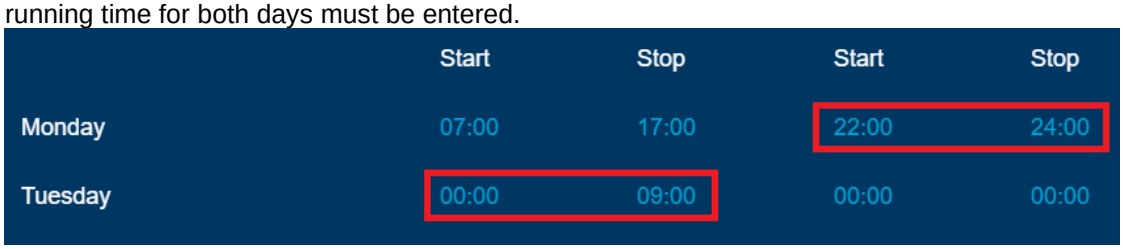
Upon end of the period the service interval alarm will be triggered (alarm 79).

Starting and stopping the unit

The unit can be put into operation using schedule, extended running switch, forced recirculation switch or if conditions for free cooling are met. It is possible that few running modes are active at the same time. In that case the unit runs at running mode which has higher priority.

Schedule

Access controller has a year-base clock function. This means that a week-schedule with holiday periods for a full year can be set. The clock has an automatic summertime/wintertime change-over. Each day has up to two individual running periods. For 24 hour running, set a period to 00:00 – 24:00. To disable a period, set it to 00:00 – 00:00. If both periods of a day are set to 00:00 – 00:00, the unit will not run at that speed that day. For 24 hour running, set a period to 00:00 – 24:00.
If you want to run the unit from one day to another, e.g. from Mon 22:00 to Tue 09:00, the desired running time for both days must be entered.



If the unit shall run at that speed during the holiday period – it can also be scheduled here.

There can be up to three independent schedules (one for each fan speed in use). If on/off recirculation is used with scheduled control, the additional “Extra time channel 4” schedule will be available.
If running periods in schedules overlap, the schedule for the higher speed gets the priority

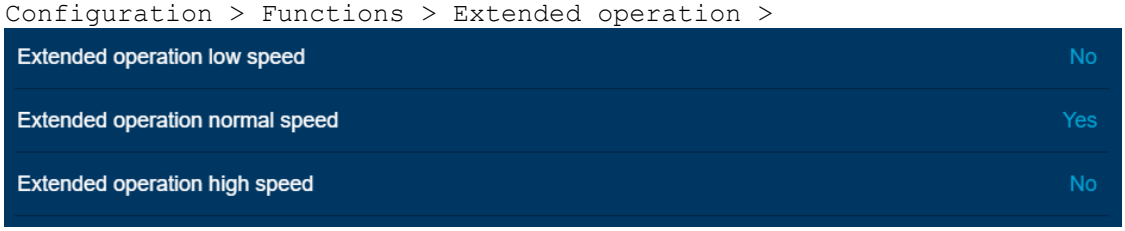
Lowest priority			Highest priority	Active Mode/Speed
Recirculation (Extra Time Channel 4)	Low Speed	Normal Speed	High Speed	
ON	OFF	OFF	OFF	Recirculation
ON	ON	OFF	OFF	Low Speed
ON	ON	ON	OFF	Normal Speed
ON	ON	ON	ON	High Speed

Up to 24 individual holiday periods can be configured. A holiday period can be anything from one day up to 365 days. Holiday schedules has priority over other schedules.
Time settings > Schedule > Holiday calendar

Extended running

Digital inputs can be used to force the unit to start although the timer says the running mode should be “Off”.
`Configuration > Functions > Function Activation > Extended operation > "Yes"`

The unit can be set for extended running at one or all available speeds
`Configuration > Functions > Extended operation >`



Digital input of the controller must be assigned for extended running switch
`Configuration > I/O allocation settings > Digital inputs >`

Extended operation normal speed	Controller	DI2

If momentary switch is used to activate the function, the time for extended operation can be set
`Time settings > Extended operation stop delay >`

Extended operation stop delay	0 min

Then time is set to 0min, the unit will only run if the digital input is closed.

External stop

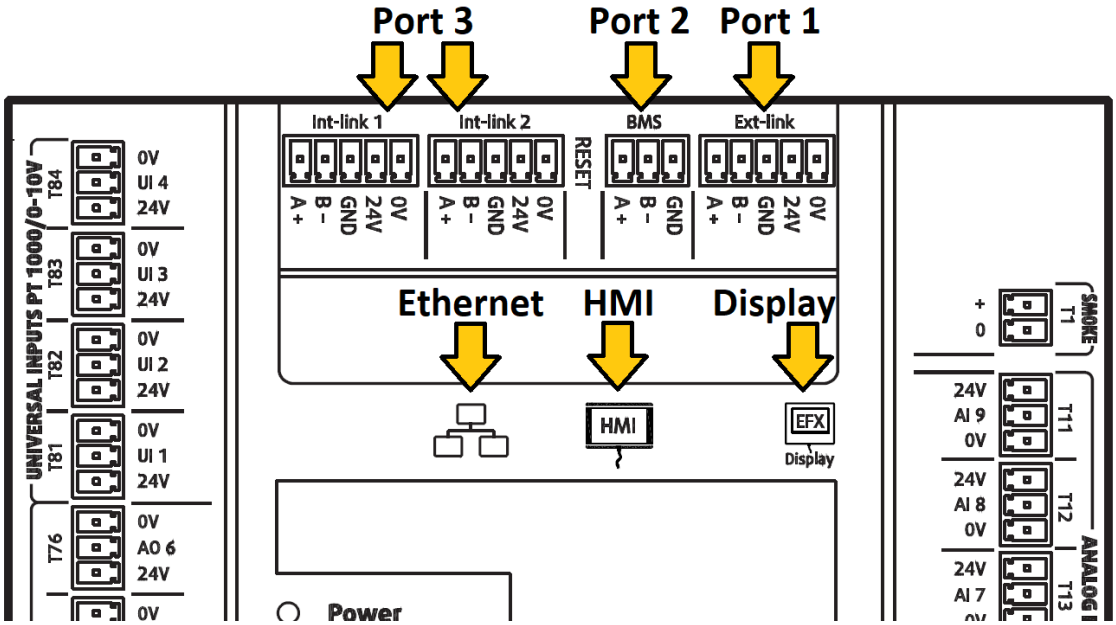
The ”External stop” signal will stop the unit, even if the timer or any of the extended operation signals says it should stay in running mode.
`Configuration > Functions > Function Activation > External stop > “Yes”`

Digital inputs of the controller must be assigned for external stop function
`Configuration > I/O allocation settings > Digital inputs >`

Communication

Terminals

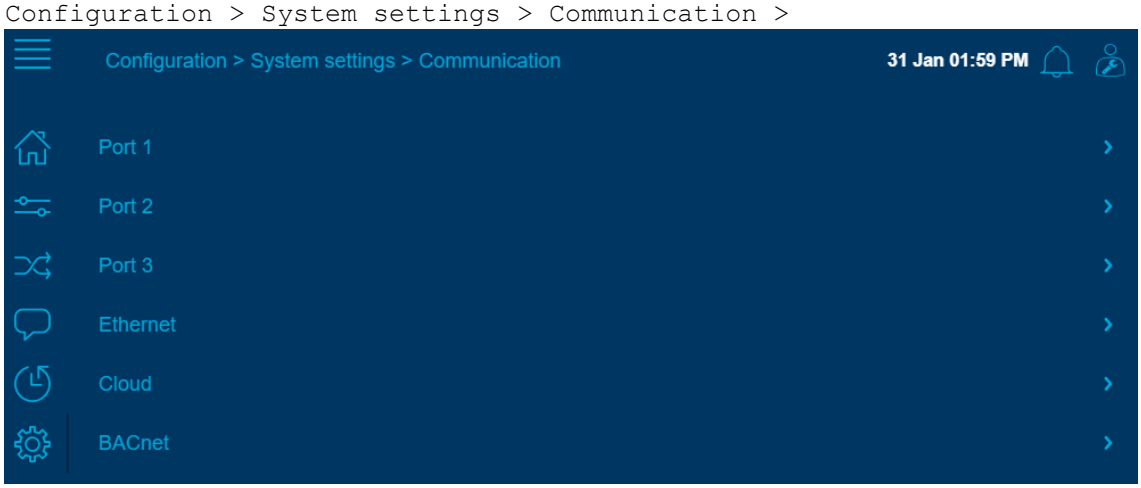
The Access controller contains dedicated terminals for Ethernet, HMI and EFX display and four terminals for internal and external bus communications.



Int-link 1 and **Int-link 2** are parallel and designated for internal bus communication.
Int-link 1 and **Int-link 2** terminals correspond to “Port 3” in the menu.
BMS terminal corresponds to “Port 2” in the menu.
Ext-link terminal corresponds to “Port 1” in the menu.
Ethernet – for connecting to local TCP/IP network
HMI – for connecting NaviPad. This connector support PoE (Power over Ethernet) therefore no additional power source for NaviPad is needed.
EFX – connector for E3-DSP external display unit.

Ports

`Configuration > System settings > Communication >`



The communication ports in the Access controller Port 1 (Ext-link), Port 2 (BMS) and Port 3 (Int-link 1|2) can be configured for particular function.

Port function

These ports can operate as follows:
EXOline slave – Connection to EXO SCADA system and application tool;
EXOline master – Connection to expansion units and Pressigo pressure transmitters;
Modbus slave – Connection to BMS via Modbus RTU;
Modbus master – Bus communication to components inside AHU;
BACnet MSTP slave - Connection to BMS via BACnet MSTP;
External display – Connection to touch display;
EFX master – communication to expansion units via EFX protocol.

Cloud

Cloud function must be enabled if the controller shall access “Systemair Connect” cloud service. The provided serial number is unique identification of the controller and must be entered upon request while registering at “Systemair Connect”.

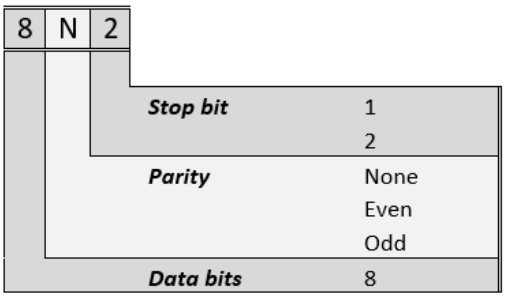
`Configuration > System settings > Communication > Cloud >`

BACnet

BACnet/IP shall be enabled if controller is connected to BMS via this protocol. The following entries include device name and BACnet communication related settings.

Message format

For proper communication, the right message format needs to be configured. Available formats and description



Baud rate	Description
9k6 bps	9600bps
14k4 bps	14400bps
19k2 bps	19200bps
28k8 bps	28800bps
38k4 bps	38400bps
57k6 bps	57600bps
76k8 bps	76800bps
115k2 bps	115200bps

Communication devices

`Configuration > System settings > Communication devices >`

The Access controller supports up to 20 devices connected via communication BUS (Modbus and EXOline).
Only limited number of predefined device models is supported.

Modbus devices on the bus must have unique address assigned. The address shall be the same as set in the device.

The device shall also hold the same message format and baud rate settings as the port it is connected to.

Function

Every device on the bus must have type and function assigned. Different functions are available in dependence on device type

`Configuration > System Settings > Communication devices > Device (n) > Function >`

Name
Each device can have a name assigned which would indicate device type and function
`Configuration > System Settings > Communication devices > Device (n) > Name >`

This name will be used in Device “drop down list” when you select Device under I/O allocation.

Communication monitor

`Configuration > System settings > Communication > Communication monitor >`

Communication monitor is port independent and is used to monitor if communication in selected protocol is active.

available protocols:
- EXOline slave
- Modbus slave
- BACnet MS/TP
- BACnet IP

Communication timeout - a maximum time between data exchanges. If no data exchange happens during this time - the alarm is triggered.

Alarm 186: Communication monitoring error

Alarms

Settings for controller's alarms are located in
`Configuration > Alarms`

The alarms can be searched if the alarm number is known.
`Configuration > Alarms > Search alarm no:`

Each alarm has independent settings:

- Action - defining forced performance of the unit in occurrence of the alarm ("No action" / "Fast stop" / "Normal stop" / "Low speed" / "Normal speed" / "High speed");
- Level - defining class the alarm is assigned to or if it is disabled. By default "Class A" - alarms with highest severity, "Class B" - medium severity, "Class C" - low importance;
- Delay - time from alarm condition occurrence till alarm triggering.

For easier navigation all alarms are divided into six groups

Air and temperature control

`Configuration > Alarms > Air and temperature control`

ID	Alarm name	Alarm trigger
53	Filter alarm supply air	N/A
54	Filter alarm extract air	N/A
55	Alarm low air flow	DI: Flow guard
56	Extra freeze protection	N/A
57	Defrost protection exchanger alarm	N/A
63	Electric heater is overheated	DI: Overheated electric heater
65	Low efficiency exchanger	Efficiency bellow limit
66	Defrosting alarm	N/A
81	Deviation alarm supply temperature	N/A
82	Deviation alarm Flow/pressure supply air	N/A
83	Deviation alarm Flow/pressure extract air	N/A
86	High supply air temperature	Temperature above alarm limit
87	Low supply air temperature	Temperature bellow alarm limit
88	Supply air temperature max limit	Temperature above alarm limit
89	Supply air temperature min limit	Temperature bellow alarm limit
90	High room temperature	Temperature above alarm limit
91	Low room temperature	Temperature bellow alarm limit
92	High extract air temperature	Temperature above alarm limit
93	Low extract air temperature	Temperature bellow alarm limit
94	High outdoor air temperature	Temperature above alarm limit
95	Low outdoor air temperature	Temperature bellow alarm limit
96	Freeze protection alarm 1	Temperature bellow alarm limit
97	Freeze protection alarm 2	Temperature bellow alarm limit
98	Freeze protection alarm 3	Temperature bellow alarm limit
187	Leakage heater valve	N/A

Extra functions

`Configuration > Alarms > Extra functions`

ID	Alarm name	Alarm trigger
33	External fan 1 run	N/A
34	External fan 2 run	N/A
40	Malfunction external fan 1	DI: Alarm extra fan motor 1
41	Malfunction external fan 2	DI: Alarm extra fan motor 2
60	External stop	DI: External stop
61	External alarm	N/A
79	Alarm service interval	N/A
84	Deviation alarm humidity	N/A
85	Deviation alarm extra controller	N/A
109	High temperature selected sensor 1	Temperature above alarm limit
110	Low temperature selected sensor 1	Temperature bellow alarm limit
111	High temperature selected sensor 2	Temperature above alarm limit
112	Low temperature selected sensor 2	Temperature bellow alarm limit
163	Sensor error CO2	Sensor faulty (Invalid reading) or missing
164	Sensor error humidity room/extract air	Sensor faulty (Invalid reading) or missing
165	Sensor error humidity supply air	Sensor faulty (Invalid reading) or missing
166	Sensor error humidity outdoor	Sensor faulty (Invalid reading) or missing
167	Sensor error extra controller	Sensor faulty (Invalid reading) or missing
181	Malfunction extra controller	N/A

Extra sensors and alarms

`Configuration > Alarms > Extra sensors and alarms`

ID	Alarm name	Alarm trigger
68	Extra alarm 1	N/A
69	Extra alarm 2	N/A
70	Extra alarm 3	N/A
71	Extra alarm 4	N/A
72	Extra alarm 5	N/A
73	Extra alarm 6	N/A
74	Extra alarm 7	N/A
75	Extra alarm 8	N/A
76	Extra alarm 9	N/A
77	Extra alarm 10	N/A
99	High temperature extra sensor 1	Temperature above alarm limit
100	Low temperature extra sensor 1	Temperature bellow alarm limit
101	High temperature extra sensor 2	Temperature above alarm limit
102	Low temperature extra sensor 2	Temperature bellow alarm limit
103	High temperature extra sensor 3	Temperature above alarm limit
104	Low temperature extra sensor 3	Temperature bellow alarm limit
105	High temperature extra sensor 4	Temperature above alarm limit
106	Low temperature extra sensor 4	Temperature bellow alarm limit

107	High temperature extra sensor 5	Temperature above alarm limit
108	Low temperature extra sensor 5	Temperature bellow alarm limit
170	Sensor error extra sensor 1	Sensor faulty (Invalid reading) or missing
171	Sensor error extra sensor 2	Sensor faulty (Invalid reading) or missing
172	Sensor error extra sensor 3	Sensor faulty (Invalid reading) or missing
173	Sensor error extra sensor 4	Sensor faulty (Invalid reading) or missing
174	Sensor error extra sensor 5	Sensor faulty (Invalid reading) or missing

Fire/Smoke

`Configuration > Alarms > Fire/Smoke`

ID	Alarm name	Alarm trigger
42	Error fire damper position	N/A
58	Fire alarm	N/A
59	Smoke detector alarm	DI: Smoke sensor alarm
183	Service alarm smoke detector	N/A
184	Sensor error smoke detector	Sensor faulty (Invalid reading) or missing

Component malfunction

`Configuration > Alarms > Component malfunction`

ID	Alarm name	Alarm trigger
1	Malfunction supply air fan 1	DI: Feedback supply air fan
2	Malfunction supply air fan 2	N/A
3	Malfunction supply air fan 3	N/A
4	Malfunction supply air fan 4	N/A
5	Malfunction supply air fan 5	N/A
6	Malfunction extract air fan 1	DI: Feedback extract air fan
7	Malfunction extract air fan 2	N/A
8	Malfunction extract air fan 3	N/A
9	Malfunction extract air fan 4	N/A
10	Malfunction extract air fan 5	N/A
11	Alarm supply air fan 1	N/A
12	Alarm supply air fan 2	N/A
13	Alarm supply air fan 3	N/A
14	Alarm supply air fan 4	N/A
15	Alarm supply air fan 5	N/A
16	Alarm extract air fan 1	N/A
17	Alarm extract air fan 2	N/A
18	Alarm extract air fan 3	N/A
19	Alarm extract air fan 4	N/A
20	Alarm extract air fan 5	N/A
35	Malfunction pump heater	N/A
36	Malfunction pump cooler	N/A

37	Malfunction pump exchanger	N/A
38	Malfunction fire damper	N/A
39	Malfunction damper	N/A
43	Malfunction heating (SEQ-A)	DI: Feedback SEQ-A
44	Malfunction exchanger (SEQ-B)	DI: Feedback SEQ-B
45	Malfunction cooling (SEQ-C)	DI: Feedback SEQ-C
46	Malfunction recirculation 1 (SEQ-D)	DI: Feedback SEQ-D
47	Malfunction recirculation 2 (SEQ-E)	DI: Feedback SEQ-E
48	Malfunction fan setpoint comp (SEQ-F)	DI: Feedback SEQ-F
49	Malfunction heating 2 (SEQ-G)	DI: Feedback SEQ-G
50	Malfunction cooling 2 (SEQ-H)	DI: Feedback SEQ-H
51	Malfunction exchanger extract (SEQ-I)	DI: Feedback SEQ-I
52	Malfunction external heating/cooling (SEQ-J)	DI: Feedback SEQ-J
67	Rotary exchanger alarm	N/A
78	Internal battery error	N/A
144	Sensor error outdoor air temp	Sensor faulty (Invalid reading) or missing
145	Sensor error intake air temp	Sensor faulty (Invalid reading) or missing
146	Sensor error supply air temp	Sensor faulty (Invalid reading) or missing
147	Sensor error exhaust air temp	Sensor faulty (Invalid reading) or missing
148	Sensor error extract air temp	Sensor faulty (Invalid reading) or missing
149	Sensor error room temp 1	Sensor faulty (Invalid reading) or missing
150	Sensor error room temp 2	Sensor faulty (Invalid reading) or missing
151	Sensor error room temp 3	Sensor faulty (Invalid reading) or missing
152	Sensor error room temp 4	Sensor faulty (Invalid reading) or missing
153	Sensor error pressure supply air	Sensor faulty (Invalid reading) or missing
154	Sensor error pressure extract air	Sensor faulty (Invalid reading) or missing
155	Sensor error flow supply air	Sensor faulty (Invalid reading) or missing
156	Sensor error flow extract air	Sensor faulty (Invalid reading) or missing
157	Sensor error pressure exchanger supply air	Sensor faulty (Invalid reading) or missing
158	Sensor error pressure exchanger extract air	Sensor faulty (Invalid reading) or missing
159	Sensor error defrost temperature	Sensor faulty (Invalid reading) or missing
160	Sensor error frost protection 1	Sensor faulty (Invalid reading) or missing
161	Sensor error frost protection 2	Sensor faulty (Invalid reading) or missing
162	Sensor error frost protection 3	Sensor faulty (Invalid reading) or missing
168	Signal error external control supply air fan	Sensor faulty (Invalid reading) or missing
169	Signal error external control extract air fan	Sensor faulty (Invalid reading) or missing
175	Sensor error external setpoint device temperature	Sensor faulty (Invalid reading) or missing
176	Signal error external flow setpoint	Sensor faulty (Invalid reading) or missing
177	Sensor error filter monitoring supply air	Sensor faulty (Invalid reading) or missing
178	Sensor error filter monitoring extract air	Sensor faulty (Invalid reading) or missing
179	Sensor error efficiency temperature	Sensor faulty (Invalid reading) or missing
180	Communication fault device	Device on the bus is not responding
182	Internal error	N/A
185	Malfunction preheater	DI: Feedback preheater
186	Communication fault BMS master	N/A
188	Sensor error preheater temperature	Sensor faulty (Invalid reading) or missing

Manual operation and warnings

Configuration > Alarms > Manual operation and warnings

ID	Alarm name	Alarm trigger
21	Warning supply air fan 1	N/A
22	Warning supply air fan 2	N/A
23	Warning supply air fan 3	N/A
24	Warning supply air fan 4	N/A
25	Warning supply air fan 5	N/A
26	Warning extract air fan 1	N/A
27	Warning extract air fan 2	N/A
28	Warning extract air fan 3	N/A
29	Warning extract air fan 4	N/A
30	Warning extract air fan 5	N/A
31	External operation supply air fan	N/A
32	External operation extract air fan	N/A
62	Service stop	N/A
64	Warning freeze protection	N/A
80	Restart blocked after power on	N/A
113	Manual operation air handling unit	Manual operation
114	Manual operation supply air	Manual operation
115	Manual operation supply air fan	Manual operation
116	Manual operation extract air fan	Manual operation
117	Manual operation heater	Manual operation
118	Manual operation exchanger	Manual operation
119	Manual operation cooler	Manual operation
120	Manual operation damper	Manual operation
121	Manual operation pump heater	Manual operation
122	Manual operation pump exchanger	Manual operation
123	Manual operation pump cooler	Manual operation
124	Manual operation damper recirculation	Manual operation
125	Manual operation damper outdoor air	Manual operation
126	Manual operation damper exhaust air	Manual operation
127	Manual operation fire damper	Manual operation
128	Sequence in manual operation	Manual operation
129	Sequence in manual operation	Manual operation
130	Sequence in manual operation	Manual operation
131	Sequence in manual operation	Manual operation
132	Sequence in manual operation	Manual operation
133	Sequence in manual operation	Manual operation
134	Sequence in manual operation	Manual operation
135	Sequence in manual operation	Manual operation
136	Sequence in manual operation	Manual operation
137	Sequence in manual operation	Manual operation
138	Output in manual operation	Manual operation
139	Input in manual operation	Manual operation
140	Manual operation extra controller	Manual operation

141	Manual operation external fan motor 1	Manual operation
142	Manual operation external fan motor 2	Manual operation
143	Manual operation pretreatment	Manual operation

Systemair Sverige AB
Industrivägen 3
SE-739 30 Skinnskatteberg, Sweden

Phone +46 222 440 00
Fax +46 222 440 99

www.systemair.com

Access V4.X Configuration Manual · 153830 · en_GB · A001