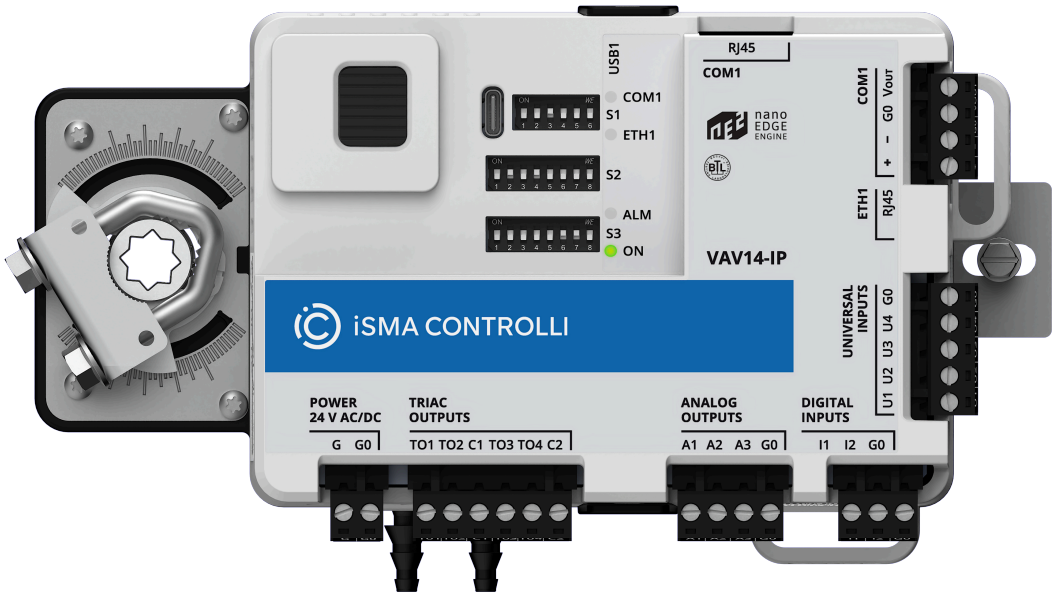
VAV14-IP

User Manual

Pressure Control Application



iSMA CONTROLLI S.p.A. - Via Carlo Levi 52, 16010 Sant'Olcese (GE) - Italy | support@ismacontrolli.com

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1 Introduction

The VAV14-IP is a configurable and freely programmable controller with BACnet IP, BACnet MS/TP, Modbus TCP/IP, and Modbus RTU protocols onboard. It is delivered with a built-in application, which supports the most popular types of VAV boxes. The possibility of creating a tailor-made application with the power and flexibility offered by the nano EDGE ENGINE makes the controller useful not only for typical VAV boxes but for all types, even the most advanced ones. The VAV14-IP controllers are developed on the nano EDGE ENGINE software platform, which offers cloud connectivity, real-time programming, and automatic exposure of Data Points. This enables a seamless integration with BMS. The platform supports remote control, real-time monitoring, and data analysis, enhancing energy consumption tracking, system performance, and maintenance needs.

1.1 Revision History

Date	Manual rev.	nano EDGE ENGINE OS ver.	nE2 Link module ver.	Description
16 Jun 2026	1.0.0	1.9.0	1.9	First edition

1.2 VAV14-IP Controller

To learn more about the VAV14-IP controller's features, such as a quick start-up, default VAV application, balancing, etc., please visit the VAV14-IP Software user manual.

2 Pressure Control Application for VAV14-IP

Credentials
With the Pressure Control example application on the controller, the VAV14-IP default credentials are:
- Username: admin
- Password: Admin123!

For more information, please see: Default Communication Settings and Credentials.

App Versioning
Please make sure to upload the most recent version of the application to the controller.
The most recent releases of tools containing the application (iC Tool or the nE2 Link module) are available in iSMA CONTROLLI Download Center.

Warning - Factory Default Deletes Application
The process of bringing back factory default settings **erases the application from the controller**. In such a case, it is required to restore the application from the available backup.
For detailed information on how to restore the backup, please see: Default Communication Settings and Credentials.

A Pressure Control example application for the VAV14-IP controls the room pressure adjusting it to a current demand setpoint. Additionally, this application has been enhanced with the function of heating the room using a duct reheater and/or peripheral heating such as a radiator or underfloor heating, implementing this function based on:

- occupancy status,
- space temperature,
- setpoint temperature.

The pressure control is based on the currently measured differential pressure between the room and the reference source in relation to the requested pressure setpoint for the room. The pressure demand is affected by the level of damper opening resulting from the pressure control loop.

The space temperature control loop is used to regulate the room temperature based on the current setpoint temperature and room occupancy status and influences the control of the reheater or peripheral heating according to the heating demand, as well as due to forcing from the HVAC mode.

The discharge air temperature control loop is used to regulate and limit the discharge air temperature specified by the current discharge air temperature setpoint based on the supply air temperature measurement. It can regulate and limit the reheater control only. The supply air temperature control loop operates only when there is a discharge air temperature sensor connected. If there is no discharge air temperature sensor, the control loop has no effect on regulate and limiting the supply air temperature.

The application is constructed to work in the following device configurations:

- pressure control,
- pressure control with optional reheater,
- pressure control with optional perimeter,
- pressure control with optional reheater and optional perimeter.

2.1 Configuration Scope

The Pressure Control example application can be configured in the following areas:

- damper direction,
- heating device type and priority,
- occupancy source,
- window and presence sensors,

- temperature source,
- temperature setpoint and offset.

For more details, please see Methods of Configuration.

2.2 Application Modes

Taking into consideration all configuration options the Pressure Control example application can be adapted to work in the following modes:

- pressure control,
- pressure control with optional reheater,
- pressure control with optional perimeter,
- pressure control with optional reheater and optional perimeter.

For more details, please see Configuration Variants.

2.3 Application Algorithm

The Pressure Control example application algorithm is designed to maintain the set over- or under-pressure in the room, measured in relation to a reference, e.g., a corridor, and also, optionally, achieve the set temperature by controlling the heating source based on the occupancy status, measured temperature. It functioning is formulated on the operation the following control loops:

- **pressure control loop** is based on the currently measured differential pressure between the room and the reference source in relation to the requested pressure setpoint for the room. The demand for pressure is affected by the level of damper opening resulting from the pressure control loop;
- **optional space temperature control loop** determines the demand for heating based on the room temperature measurement and the corresponding setpoint temperature;
- **optional discharge air temperature control loop** is used to regulate and limit the discharge air temperature specified by the current discharge air setpoint based on the discharge air temperature measurement. It has the effect of regulate and limiting the reheater control only. The discharge air temperature control loop operates only when there is a need for heating and discharge air temperature sensor is connected. If there is no discharge air temperature sensor, the control loop has no effect on regulate and limiting the discharge air temperature (it has a value of 0).

2.3.1 Pressure

The pressure control is a central part of the Pressure Control application algorithm. Reaching and maintaining the pressure setpoint is the goal of the algorithm's operation by adjusting the damper based on the current differential pressure measurements.

Pressure Sensor

One of the essential configuration settings for a proper functioning of the Pressure Control example application is selecting the pressure measurements source. The available options are:

- dedicated universal input, U4 (connected sensor),
- network.

Automatic Detection

Additionally, the Pressure Control application has a mechanism to provide an automatic pressure sensor detection in case the selected pressure source does not provide any value. First, the application checks the dedicated U4 input and if no sensor is connected, it proceeds to check the value from the network. In

case all these steps fail to provide the measured pressure, the algorithm uses the pressure setpoint value, which forces the application to stop work.

Note
In case more than one pressure source is connected and active (for example, the sensor connected to the U4 input and network), it is possible to indicate one of them as a leading one using the Input Selector slot (PressureSelector component in the PressureSelector folder of the Pressure Control example application) or calculate an average using the averaging slot (the same location).

Pressure Setpoint

Pressure setpoint is fundamental for the pressure control setting in the Pressure Control example application's algorithm. It determines the pressure setpoint calculations regardless of the area's occupancy status.

For pressure control, information on the measured pressure in the room from the differential pressure sensor connected to the U4 input or from the network is required. Generally, if there is no pressure measurement, pressure control based on the pressure control loop is disabled.

The application starts the control loop if the pressure sensor measurement is valid and the room pressure is above the pressure setpoint (for positive setpoint) or below the pressure setpoint (for negative setpoint) by opening or closing the damper accordingly.

Pressure Control Loop

The pressure control loop in the Pressure Control example application determines the pressure demand based on the pressure sensor measurements (connected to the U4 input) and the corresponding pressure setpoint. It operates according to the sensor validation.

Pressure control loop settings are only available from iC Tool and must be adjusted to the current room:

- Kp: default 5.0,
- Ki: default 0.33,
- Kd: default 0.0.

2.3.2 Temperature

The temperature control is an optional part of the Pressure Control application algorithm. Reaching and maintaining the temperature setpoint is achieved by adjusting the reheater and/or perimeter based on the current space temperature measurements and occupancy status.

The application's algorithm includes a number of variables referring to the temperature:

- temperature setpoints,
- temperature setpoint's offset,
- space temperature,
- discharge temperature.

Space Temperature

To enable the temperature control in the Pressure Control example application, it is required to select the temperature measurements source. The available options are:

- Control Point VAV panel,
- dedicated universal input, U2 (connected sensor),
- network.

Automatic Detection

Additionally, the Pressure Control application has a mechanism to provide an automatic temperature detection in case the selected temperature source does not provide any value. First, the application checks for the Control Point VAV panel availability. If the value cannot be read from the panel, the algorithm checks the dedicated U2 input and if no sensor is connected, it proceeds to check the value from the network. In case all these steps fail to provide the measured temperature, the algorithm uses the calculated effective heating setpoint value, which forces the application to work in minimal ranges.

Note
In case more than one temperature source is connected and active (for example, the Control Point VAV panel and sensor connected to the U2 input), it is possible to indicate one of them as a leading one using the Input Selector slot (TemperatureSensorSelector component in the TemperatureSelector folder of the Pressure Control example application) or calculate an average using the Temperature Averaging slot (the same location).

Discharge Air Temperature

Discharge air temperature sensor is measured temperature in the duct after a reheater: acting as regulation and high limit for discharge air temperature, the reheater is indirectly controlled by the space temperature and directly by the discharge air temperature with high limit the reheater when the discharge air temperature is too hot.

The universal input U1 is dedicated for the sensor of the discharge air temperature.

Automatic Detection

Similarly, as in case of the space temperature, the application has a mechanism providing an automatic discharge temperature detection in case the sensor is not available or its value cannot be read from it. In such an event, the algorithm takes the MinDischTempSetpoint component's value to calculations (located in the TemperatureSetpointSelector folder of the Pressure Control example application).

Temperature Setpoint

Temperature setpoint is a fundamental for an optional heating setting in Pressure Control example application's algorithm. It determines the temperature setpoint calculations depending on the area's occupancy status. The algorithm will work to achieve the temperature setpoint according to the set HVAC mode.

Heating Setpoint

The heating setpoint is used for heating control with high limit in systems with the reheater.

For heating control with electrical reheater, information on the discharge air temperature from the discharge air temperature sensor connected to the U1 input or from the network is required. Generally, in systems with the reheater, if there is no discharge air temperature measurement, heating is based on the space temperature control loop. In systems with the discharge air temperature measurement, heating is based on the discharge air temperature control loop.

In systems with the perimeter, the discharge air temperature sensor is not necessary because heating is based on the space temperature control loop only.

The application starts heating if the space temperature falls below the actual heating setpoint temperature for the corresponding occupied state.

Note
The CentralSetpoint value (TemperatureSetpointSelector component in the TemperatureSetpointSelector of the Pressure Control example application) is an average of the heating and default cooling (not used in application) setpoints of component according to the occupancy mode.

Effective Setpoint

The actual heating temperature setpoint for the occupied mode are further adjusted by:

- offset: the value is added or subtracted from the occupancy setpoint;
- panel-derived setpoint temperature depending on the setting (offset or setpoint) of the PanelSetpointMode variable (TemperatureSetpointSelector folder of the Pressure Control example application):
  - offset: added or subtracted from the occupancy setpoint,
  - setpoint: the setpoint set on the Control Point VAV panel is corrected by half the difference between the default cooling occupancy setpoint (not used) in component and OccHeatTempSetpoint values, added or subtracted from the panel's setpoint providing setpoint for heating.

This selection, impacting the effective setpoint temperature, is made with the HVAC Mode slot (set in the HeatLoop folder):

- Auto: effective setpoint equals the heating setpoint depending on the occupancy mode:
  - occupied: effective setpoint equals the OccHeatTempSetpoint value,
  - bypass: effective setpoint equals the OccHeatTempSetpoint value,
  - standby: effective setpoint equals the StandbyHeatTempSetpoint value,
  - unoccupied: effective setpoint equals the UnoccHeatTempSetpoint value;
- Heat: effective setpoint equals the heating setpoint depending on the occupancy mode:
  - occupied: effective setpoint equals the OccHeatTempSetpoint value,
  - bypass: effective setpoint equals the OccHeatTempSetpoint value,
  - standby: effective setpoint equals the StandbyHeatTempSetpoint value,
  - unoccupied: effective setpoint equals the UnoccHeatTempSetpoint value;
- Cool: the heating control loop is disabled;
- MorningWarmUp: effective setpoint equals the heating setpoint depending on the occupancy mode:
  - occupied: effective setpoint equals the OccHeatTempSetpoint value,
  - bypass: effective setpoint equals the OccHeatTempSetpoint value,
  - standby: effective setpoint equals the StandbyHeatTempSetpoint value,
  - unoccupied: effective setpoint equals the UnoccHeatTempSetpoint value;
- PreCool: the heating control loop is disabled;
- NightPurge: the heating control loop is disabled;
- Fire: the heating control loop is disabled;
- Off: the heating control loop is disabled.

Discharge Air Temperature Setpoint

The discharge air temperature setpoint is obtained by a linear function from the current value of the effective heating setpoint temperature to the effective heating setpoint increased by a value of 15 degrees with a low limit MinDischTempSetpoint and high limit MaxDischSetpoint. The value is calculated based on the output value from the heating control loop. The x value is based on the heating demand and depending on whether the DualHeat options is turned on (50-100% default for a secondary source or 0-50% for primary source) or turned off (0-100%).

Temperature Setpoint Offset

The offset value for the temperature setpoint can be set from the Control Point VAV panel or using a resistance adjuster like SP connected to the U3 input. It is possible to select a leading offset source in the Input Selector variable (SetpointOffsetSelector in the OffsetCalculator folder of the Pressure Control example application).

From the Control Point VAV panel and iSMA Configurator, the user has the option to change the range in the SetpointOffsetRange variable for a resistance adjuster connected to the U3 input, which by default is set to 3°C (from -3 to +3) or 5°F (from -5 to +5). Changing the variable also triggers a change in the offset setpoint range in the Control Point VAV panel.

Temperature Control Loop

The temperature control loop in the Pressure Control example application determines the demand for heating only based on the space temperature measurement and the corresponding actual heating temperature setpoint.

Space Temperature Control Loop

The space temperature control loop for heating is based on the space temperature sensor measurements (Control Point VAV panel or connected to the U2 input). It operates according to the HVAC Mode settings (HeatLoop folder):

- Auto: the heating control loop is always active,
- Heat: the heating control loop is always active,
- Cool: the heating control loops is disabled,
- MorningWarmUp: the heating control loop is always active,
- PreCool: the heating control loop is disabled,
- NightPurge: the heating control loop is disabled,
- Fire: the heating control loop is disabled,
- Off: the heating control loop is disabled.

Space temperature control loop settings are only available from iC Tool and must be adjusted to the current room:

- Kp: default 20.0,
- Ki: default 0.33,
- Kd: default 0.0.

Discharge Air Temperature Control Loop

The discharge air temperature control loop for heating and cooling is active when there is the discharge air temperature sensor connected to the U1 input or there is the discharge air temperature value available from the network. It operates according to the HVAC mode set in the HVAC Mode settings (HeatLoop folder):

- Auto: the heating control loop is always active,
- Heat: the heating control loop is always active,
- Cool: the heating control loop is disabled,
- MorningWarmUp: the heating control loop is always active,
- PreCool: the heating control loop is disabled,
- NightPurge: the heating control loop is disabled,
- Fire: the heating control loop is disabled,
- Off: the heating control loop is disabled.

Discharge air temperature control loop settings are only available from iC Tool and must be adjusted to the current room:

- Kp: default 10.0,
- Ki: default 0.33,
- Kd: default 0.0.

2.3.3 Occupancy

In the Pressure Control example application, occupancy is one of the factors determining the calculated heating temperature setpoint. In the application algorithm, the occupancy status has an impact on the

control of a room temperature to achieve maximum energy efficiency taking into account the user's comfort. The algorithm is designed to adjust the temperature setpoint to the occupancy status in order to maximize energy efficiency and minimize the effect on the user's comfort—even the smallest range of the dead zone in the occupied mode generates savings for the system, while the effect on the user's comfort is non-distinctive.

Primarily, the occupancy status is retrieved from the network. If there is no update from the network and the OccupancyMode Data Point falls into status different than OK, the local schedule is checked next and becomes a source for the occupancy status.

The occupancy status is also affected by the motion detector and window open/close state.

The motion detector, if available, is connected to the I1 digital input. Its state is read to the PresenceSensor variable. The PresenceSensorInvert variable has two modes, normal and invert, which are used to control the sensor state interpretation. In the normal mode, if the value from I1 is true, it means the sensor has detected presence and the occupancy status is switched to occupied. If I1 is false, it means no motion has been detected. If the sensor does not detect motion after the StandbyTimeOverride time expires, it switches the status to standby (temporarily unoccupied). In the invert mode, if I1 is true, it means no presence has been detected, and if I1 is false, it means that motion has been detected.

Note
If there is no presence sensor connected, it is recommended to use the inverted mode, because in the inverted mode the constant state is motion detected.

The window contact switch is connected to the I2 digital input. Its open/close state is read to the WindowContact variable. The WindowContantInvert variable has two modes, normal and invert, which are used to control the sensor state interpretation. In the normal mode, if the value from the I2 is true, the window is open, if the value is false, the window is closed. In the invert mode, if the I2 value is true, it means the window is closed, and if the I2 is false, the window is open. Most contact switches work in the invert mode. If there is no contact switch installed on the window, the WindowContantInvert works in its default, normal, mode.

Occupied Mode

In the occupied mode, the application algorithm works to reach a desired comfort temperature taking into occupied heating temperature setpoint (21°C/70°F) according to the following rule:

- if the temperature falls below the occupancy heating temperature setpoint (<21°C/70°F), the algorithm increases heating demand.

Standby Mode (Temporarily Unoccupied)

The standby mode means that the area is temporarily unoccupied (e.g., an employee has left the room for a meeting). It is normally used in combination with the presence sensor. In the standby mode, standby heating temperature setpoint is used (19°C/67°F). The occupied status changes to standby after the time set in the StandbyTimeOverride variable (by default, 15 minutes). If the presence sensor detect motion again, the status changes back to occupied. Occupancy in the standby mode does not change automatically to unoccupied, only the signal form the BMS can trigger the unoccupied status (in the OccupancyMode variable).

Bypass Mode (Temporarily Occupied)

The bypass mode means that the area is temporarily occupied (e.g., in a spare conference room, which is normally unoccupied, the bypass mode would be used for an occasional meeting), the occupied heating temperature setpoint is the same as in the occupied mode (21°C/70°F) but it is active for a specific time (by default, 2 hours) and switches back to a previous state.

Unoccupied Mode

The unoccupied mode triggers the unoccupied heating temperature setpoint (16°C/64°F). The unoccupied mode is usually activated from the BMS or the local schedule.

2.3.4 Damper Control

The DamperControl variable is used to directly control the motor which is responsible for opening or closing the damper. The motor is controlled in the form of a floating type of control, where a specific drive time is required for correct (full opening) control, allowing for full opening of the damper under load.

Due to the possibility of the transmitted signal diverging from the actual opening (e.g., in the event of jamming, blocking, etc.), a calibrated mechanism is used, which involves a calibration process for the duration of the motor's drive time. This function is always performed after the power supply voltage fails and returns, and cyclically, e.g. every day at midnight.

The priority signal is the damper operating mode resulting from, among others or testing procedure.

Damper control is carried out in the range defined by the MinDamperPosition and MaxDamperPosition variables, scaling the corresponding demands.

For the correct operation of the damper, the correct transition time for a full cycle—from fully closed to fully open—must be set in the DamperDriveTime variable (by default, 90 s) and the correct direction of damper operation must be set in the DirectionDirection variable as CW (clockwise) or CCW (counterclockwise).

> Warning!
> Changing the DamperDriveTime without a valid reason is strongly not recommended.

The DamperPosition variable returns the actual value of the damper opening, and the DamperControl variable returns its control.

The Damper Command variable, accessible from the Control Point VAV panel and software like a iC Tool, iSMA Configurator or directly via BACnet/Modbus, is mainly used to force testing of the set damper position.

Damper Operating Modes

The damper can be configured to work in the following operating modes:

- Auto: the damper is controlled according to the pressure control loop output,
- Full Open: the damper control is forced to 100% open position,
- Full Close: the damper control is forced to 0% open position (closed), even when the MinDamperPosition value is higher than 0%,
- User Position: the damper control is forced to the user set position (the UserSetPosition variable),
- Min Flow: no action,
- Max Flow: no action,
- User Flow: no action,
- Calibrate: forces the damper calibration (the damper goes to 100%, then to 0%, and goes back to the control loop output).

Initial Position

The Initial Position function is an auto-synchronization of the actuator, which allows for maintaining proper airflow parameters. In the process, the damper goes to 0% and goes back to the control loop output. It is performed each first day of the month, on the time calculated by the formula:

Calibration time = 00:00 + (serial number MOD 100)

This way helps to avoid the situation when all controllers perform the process at one moment, compromising the stability of the system.

DamperResponse

In case of significant fluctuations of pressure demand (resulting from the respective control loop), it is possible to mitigate the changes of value using the DamperResponse variable. It allows to enforce the change of value on the DamperControl component if the change of output demand is higher than set in the DamperResponse In16 slot (by default, 2%). It means that the DamperControl output will change only if the pressure demand changes more than 2%.

2.3.5 Reheater Control

The Pressure Control example application is designed to work with either water or electric reheaters. Reheater control is based on the heating demand from the discharge air temperature sensor or the space temperature sensor (if no discharge air temperature sensor is in place).

If the discharge air temperature sensor is available (required in systems with an electric reheater), the reheater is controlled based on the discharge air temperature control loop, taking into account the sensor measurements and setpoint calculated based on the space temperature heating control loop (in full range of the loop), up to the maximum set limit (important for versions with electric reheater).

If there is no discharge air temperature sensor, the reheater is controlled based on the main space temperature heating control loop directly – in full range of the loop – or as the first (or second) heating stage (in half range of the loop) with DualHeat active (for works with perimeter).

Additionally, if used simultaneously with a perimeter, it can be specified whether both heaters should work together simultaneously or which should be the first and second stage of the primary/secondary heating level (in half range of the space temperature heating loop).

Note
An additional factor in the reheater auto control is the level of energy load cut-off, which decreases the value of the reheater control output:
RH control output = (100% - LoadShedding)*HeatDemand

Reheater Control According to HVAC Modes

Depending on the HVAC Mode settings (HeatLoop folder):

- **Auto:** working according to the heating demand,
- **Heat:** working according to the heating demand,
- **Cool:** switched off,
- **MorningWarmUp:** if the WarmUpHeater variable is set to true, the reheater works according to the heating demand,
- **PreCool:** switched off,
- **NightPurge:** switched off,
- **Off:** switched off,
- **Fire:** switched off.

The reheater can work in three modes defined in the ReheaterCommand variable:

- **Auto:** reheater works based on the heating demand,
- **Full Open:** reheater is set to the maximum control output, 100%,
- **Full Close:** reheater is set to the minimum control output, 0%.

DualHeat

The DualHeat function for reheater allows to meet energy efficiency requirements by allowing to select between two modes of heating. The DualHeat function is activated according to the setting of the HeaterPriority variable.

The heaters priority is set in the HeaterPriority variable (ReheaterControl folder):

- HeaterPriority set to reheater:
  - primary mode: reheater in the range of 0-50% (directly from the space temperature heating loop),
  - secondary mode: perimeter in the range of 50-100% (directly from the space temperature heating loop);
- HeaterPriority set to perimeter:
  - primary mode: perimeter in the range of 0-50% (directly from the space temperature heating loop),
  - secondary mode: reheater in the range of 50-100% (directly from the space temperature heating loop);
- HeaterPriority set to simultaneous:
  - reheater and perimeter work in full range of the the space temperature heating loop.

Reheater Types

Depending on the configuration (see: Methods of Configuration), the reheater can be controlled by triac outputs (TO1, TO2) as follows:

- time-proportional (PWM) water reheater with a valve and actuator or time-proportional (PWM) electric reheater with a period set in the TimePropReheaterPeriod variable, controlled by the TO1 output,
- water reheater with a valve and actuator controlled as floating type with a full-position switch time set in the FloatReheaterValveDriveTime variable, controlled by the TO1 output for closing and TO2 output for opening,
- electric reheater controlled in one or two heating stages, on/off type (the second stage switched on above the 50% heating demand), controlled by TO1 output for 1-stage heating and TO2 output for 2-stage heating,
- water reheater with a valve and actuator, on/off type, controlled by the TO1 output.

Regardless of the configuration of the control type, the reheater is simultaneously controlled in analog mode by the AO1 output.

If the outside temperature signal is connected (from the BACnet/Modbus network), the reheater is blocked over the setpoint in the MaxOatReheater variable (by default, 32°C/90°F).

2.3.6 Perimeter Control

The perimeter is an additional heating source, independent from the ventilation system, for example, an underfloor heating. The perimeter control is based on the heating demand from the space temperature heating control loop – in full range of the loop – or as the first (or second) heating stage (in half range of the loop) with DualHeat active (for works with reheater).

Additionally, if used simultaneously with a reheater, it can be specified whether both heaters should work together simultaneously or which should be the first and second stage of the primary/secondary heating level (in half range of the space temperature heating loop).

Note
An additional factor in the perimeter auto control is the level of energy load cut-off, which decreases the value of the perimeter control output:
PM control output = (100% - LoadShedding)*HeatDemand

Perimeter Control According to HVAC Modes

Depending on the HVAC Mode settings (HeatLoop folder):

- **Auto:** working according to the heating demand,
- **Heat:** working according to the heating demand,
- **Cool:** switched off,
- **MorningWarmUp:** if the WarmUpHeater variable is set to true, the perimeter works according to the heating demand,
- **PreCool:** switched off,
- **NightPurge:** switched off,
- **Off:** switched off,
- **Fire:** switched off,

The perimeter can work in three modes defined in the ReheaterCommand variable:

- **Auto:** perimeter works based on the heating demand,
- **Full Open:** perimeter is set to the maximum control output, 100%,
- **Full Close:** perimeter is set to the minimum control output, 0%.

DualHeat

The DualHeat function for perimeter allows to meet energy efficiency requirements by allowing to select between two modes of heating. The DualHeat function is activated according to the setting of the HeaterPriority variable.

The heaters priority is set in the HeaterPriority variable (ReheaterControl folder):

- HeaterPriority set to reheater:
  - primary mode: reheater in the range of 0-50% (directly from the space temperature heating loop),
  - secondary mode: perimeter in the range of 50-100% (directly from the space temperature heating loop);
- HeaterPriority set to perimeter:
  - primary mode: perimeter in the range of 0-50% (directly from the space temperature heating loop),
  - secondary mode: reheater in the range of 50-100% (directly from the space temperature heating loop);
- HeaterPriority set to simultaneous:
  - reheater and perimeter work in full range of the heating loop.

Perimeter Types

Depending on the configuration (see: Methods of Configuration), the perimeter can be controlled by the triac output (TO3, TO4) as follows:

- time-proportional (PWM) water perimeter with a valve and actuator with a period set in the TimePropPerimeterPeriod variable, controlled by the TO3 output,
- water reheater with a valve and actuator controlled as floating type with a full-position switch time set in the FloatPerimeterValveDriveTime variable, controlled by the TO3 output for closing and TO4 output for opening
- water perimeter with a valve and actuator, on/off type, controlled by the TO3 output.

Regardless of the configuration of the control type, the perimeter is simultaneously controlled in analog mode by the AO2 output.

If the outside temperature signal is connected (from the BACnet/Modbus network), the perimeter is blocked over the setpoint in the MaxOatPerimeter variable (by default, 18°C/65°F).

2.3.7 Highlights

HVAC Mode Dependencies

The HVAC Mode settings in the AirflowSetpointControl folder affects a lot of factors in the Pressure Control application. The below tables offers a basic summary.

HVAC Mode	Effective setpoint	Space temp. control loop	DAT control loop	Reheater control	Perimeter control
Auto	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Heating CL active	Heating CL active	According to the heating demand	According to the heating demand
Heat	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Heating CL active	Heating CL active	According to the heating demand	According to the heating demand
Cool	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Disabled	Disabled	Off	Off

HVAC Mode	Effective setpoint	Space temp. control loop	DAT control loop	Reheater control	Perimeter control
Morning WarmUp	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Heating CL active	Heating CL active	According to the heating demand (if WarmUpHeater is true)	According to the heating demand (if WarmUpHeater is true)
PreCool	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Disabled	Disabled	Off	Off
Night Purge	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Disabled	Disabled	Off	Off
Fire	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Disabled	Disabled	Off	Off

HVAC Mode	Effective setpoint	Space temp. control loop	DAT control loop	Reheater control	Perimeter control
Off	Occupied: OccHeatTempSetpoint Bypass: OccHeatTempSetpoint Standby: StandbyHeatTempSetpoint Unoccupied: UnoccHeatTempSetpoint	Disabled	Disabled	Off	Off

2.4 Configuration Variants

2.4.1 Pressure Control Only

The pressure control only example application is a configuration factory default; it does not require any further configuration of the reheater or perimeter. Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in software programming tools (iSMA Configurator/iC Device Manager module/iC Tool/BACnet/Modbus).

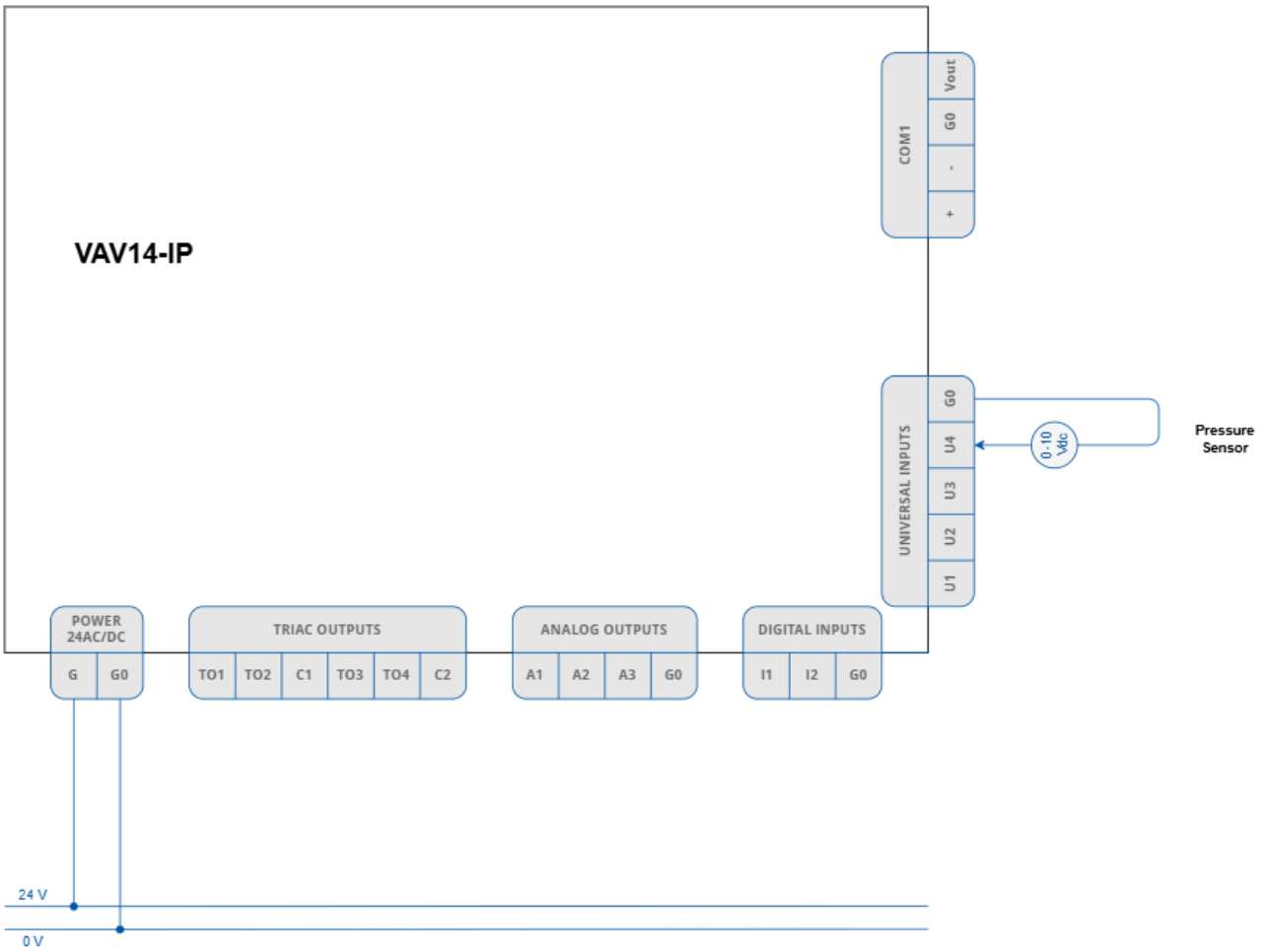


Figure 1. Pressure Control Only - application connections diagram

The pressure sensor connected to U4 input are required for the application to operate properly.

2.4.2 Pressure Control with Water Reheater

The pressure control with water reheater application requires to configure the following parameter:

- reheater's control type (time proportional - PWM, digital, or floating).

Configuring of any type of the reheater automatically activates an analog control mode, so it does not require any further configuration.

Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in the Control Point VAV panel or software programming tools (iSMA Configurator/iC Device Manager module/iC Tool/BACnet/Modbus).

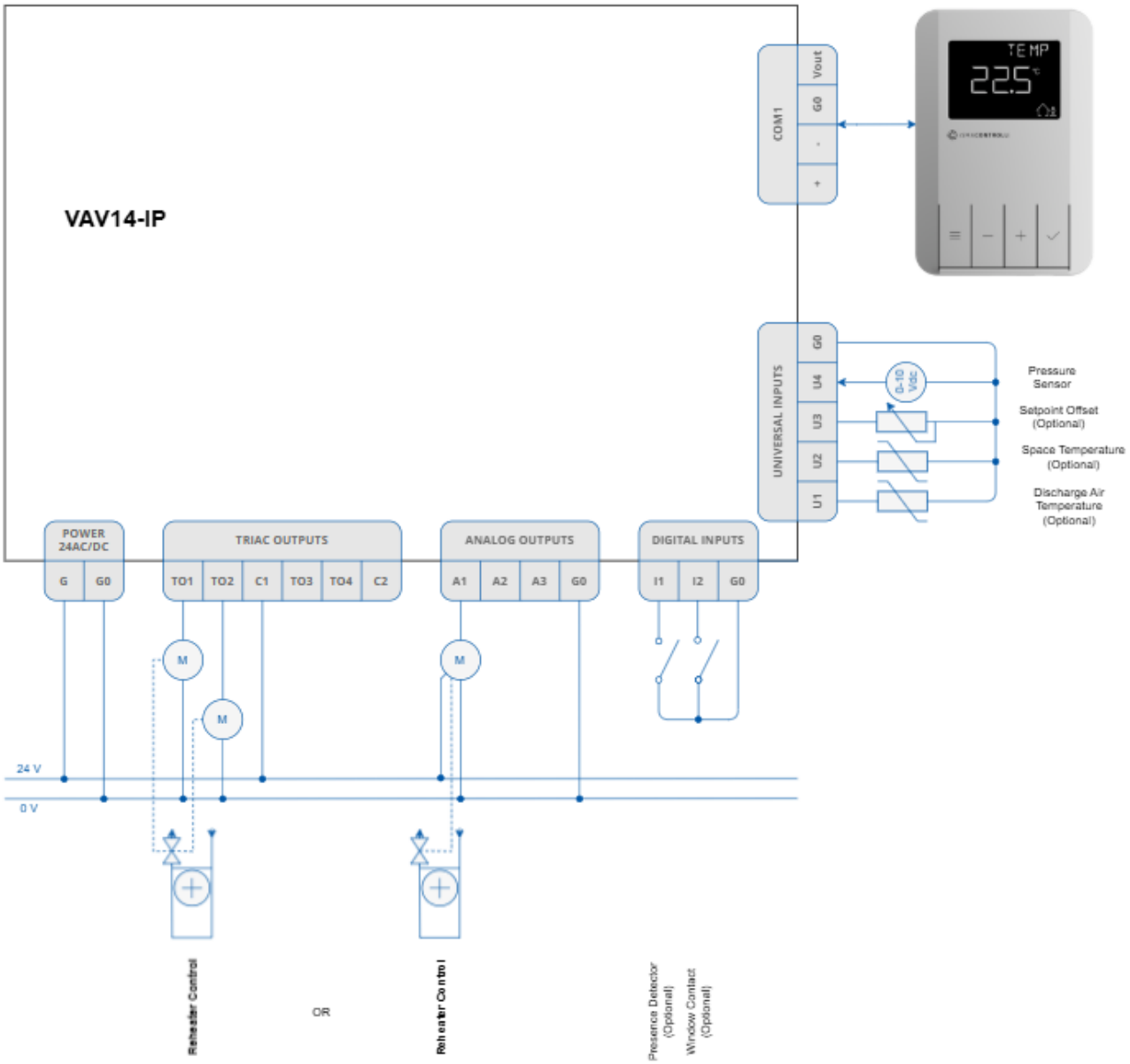


Figure 2. Pressure Control with water reheater - application connections diagram

For the application to operate properly, it is required to connect the following elements:

- pressure sensor connected to U4 input,
- Control Point VAV panel or sensors on inputs (space temperature, setpoint offset sensor),
- optionally, DAT sensor located in the supply air duct after reheater.

Optionally, it is possible to connect the presence detector and window contact sensors to minimize energy efficiency loss. To control the reheater dedicated triac and analog output are available, as depicted on the diagram above.

2.4.3 Pressure Control with Electric Reheater

The pressure control with up to 2-stage electric reheater application requires to configure the following parameter:

- reheater's control type:
  - 1-stage reheater: time proportional (PWM), digital (on/off),
  - 2-stage reheater: digital (on/off).

Configuring of any type of the reheater automatically activates an analog control mode, so it does not require any further configuration.

Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in the Control Point VAV panel or software programming tools (iSMA Configurator/iC Device Manager module/iC Tool//BACnet/Modbus).

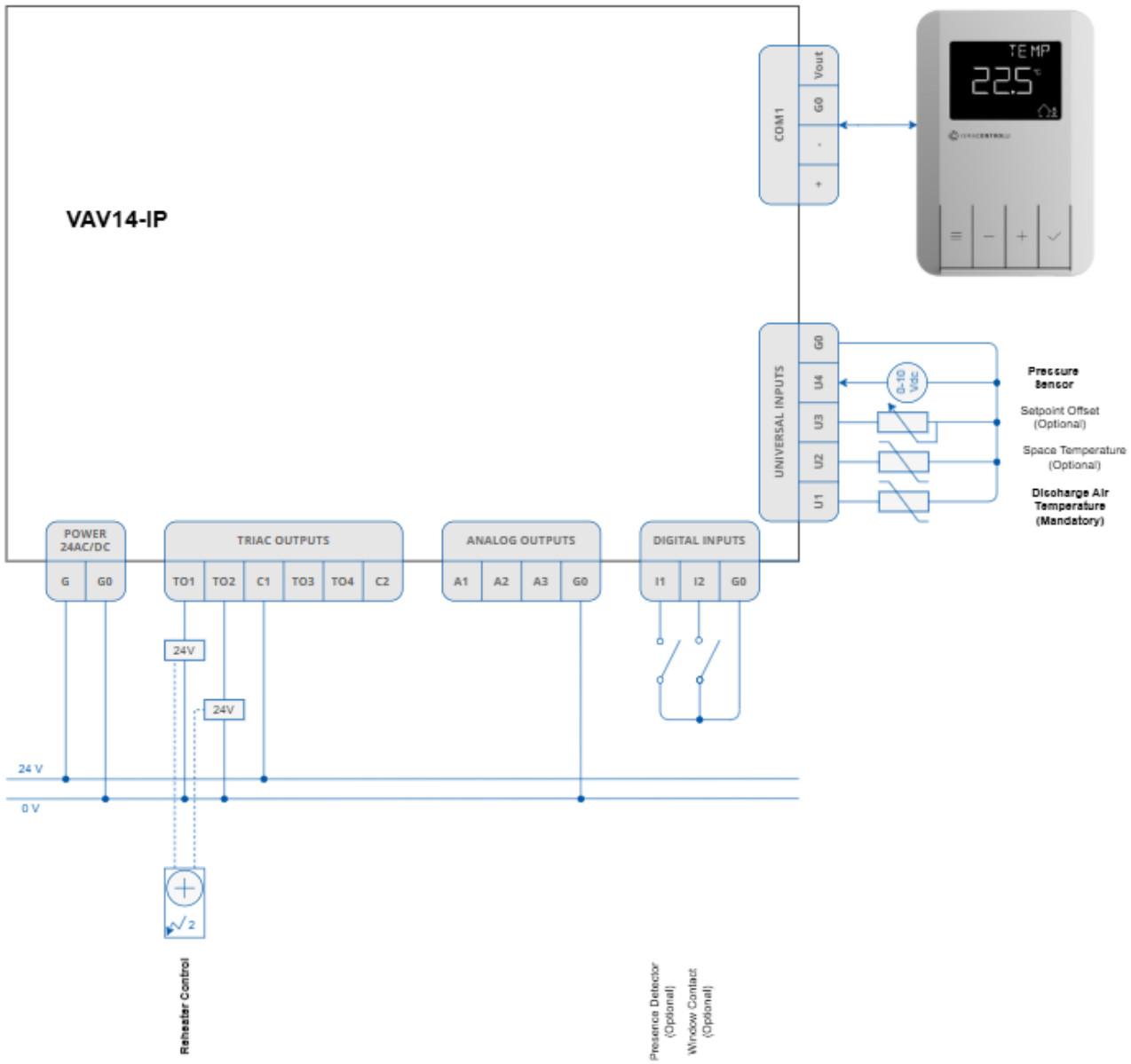


Figure 3. Pressure Control with up to 2-stage electric reheater - application connections diagram

For the application to operate properly, it is required to connect the following elements:

- pressure sensor connected to U4 input,
- Control Point VAV panel or sensors on inputs (space temperature, setpoint offset, sensor), and
- DAT sensor located in the supply air duct after reheater.

Optionally, it is possible to connect the presence detector and window contact sensors to minimize energy efficiency loss. To control the reheater dedicated triac and analog output are available, as depicted on the diagram above.

2.4.4 Pressure Control with Perimeter

The pressure control with perimeter application requires to configure the following parameter:

- perimeter's control type (time proportional - PWM, on/off, or floating).

Configuring of any type of the perimeter automatically activates an analog control mode, so it does not require any further configuration.

Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in the Control Point VAV panel or software programming tools (iSMA Configurator/iC Device Manager module/iC Tool/BACnet/Modbus).

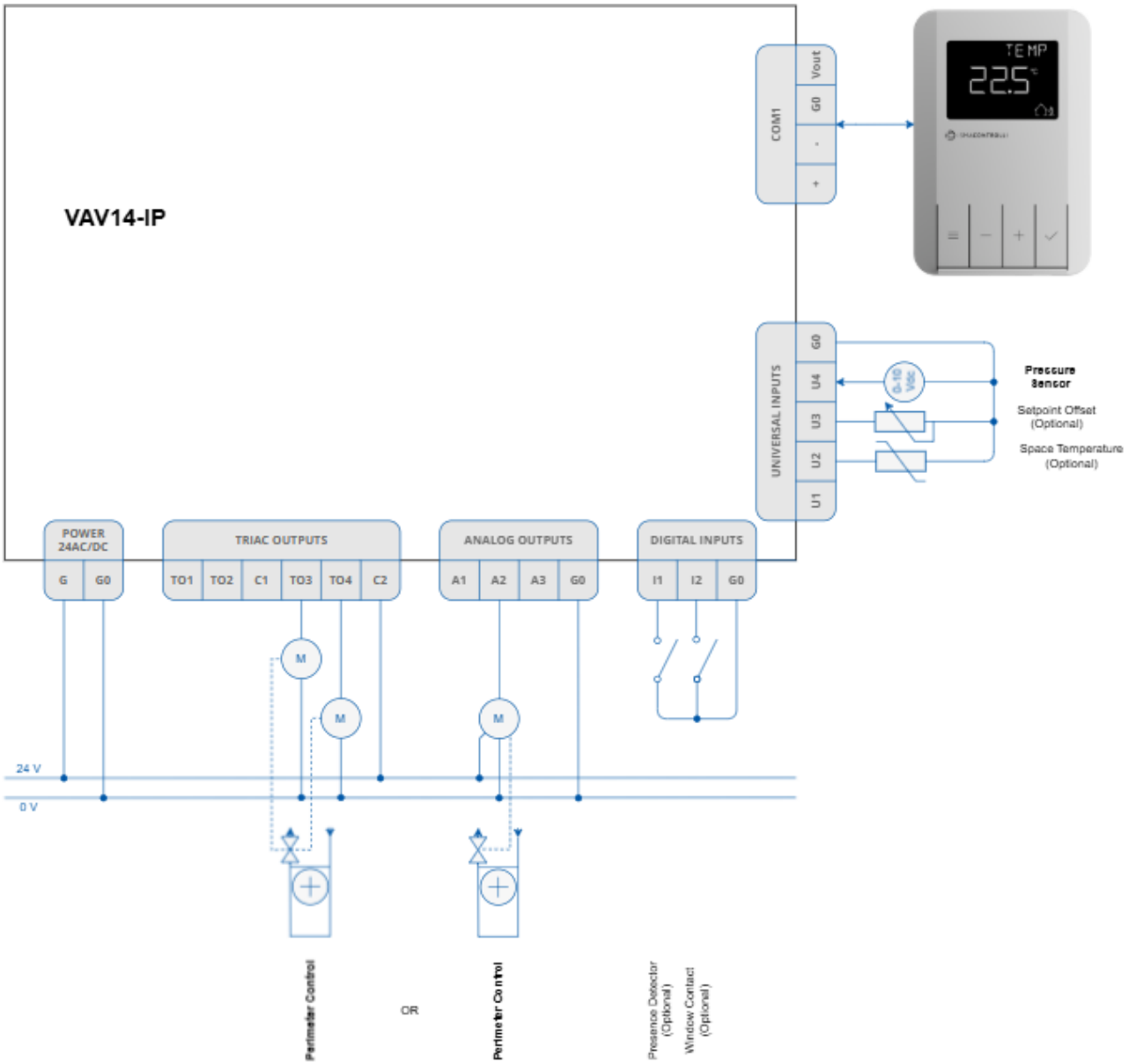


Figure 4. Pressure Control with perimeter - application connections diagram

For the application to operate properly, it is required to connect the following elements:

- pressure sensor connected to U4 input,
- Control Point VAV panel or sensors on inputs (space temperature, setpoint offset, sensor).

Optionally, it is possible to connect the presence detector and window contact sensors to minimize energy efficiency loss. To control the perimeter, dedicated triac and analog output are available, as depicted on the diagram above.

2.4.5 Pressure Control with Water Reheater and Perimeter

The Pressure Control with water reheater and perimeter application requires to configure the following parameters:

- reheater's control type (time proportional - PWM, digital, or floating),
- perimeter's control type (time proportional - PWM, on/off, or floating).

Configuring of any type of the reheater or perimeter automatically activates an analog control mode, so it does not require any further configuration.

Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in the Control Point VAV panel or software programming tools (iSMA Configurator/iC Device Manager module/iC Tool/BACnet/Modbus).

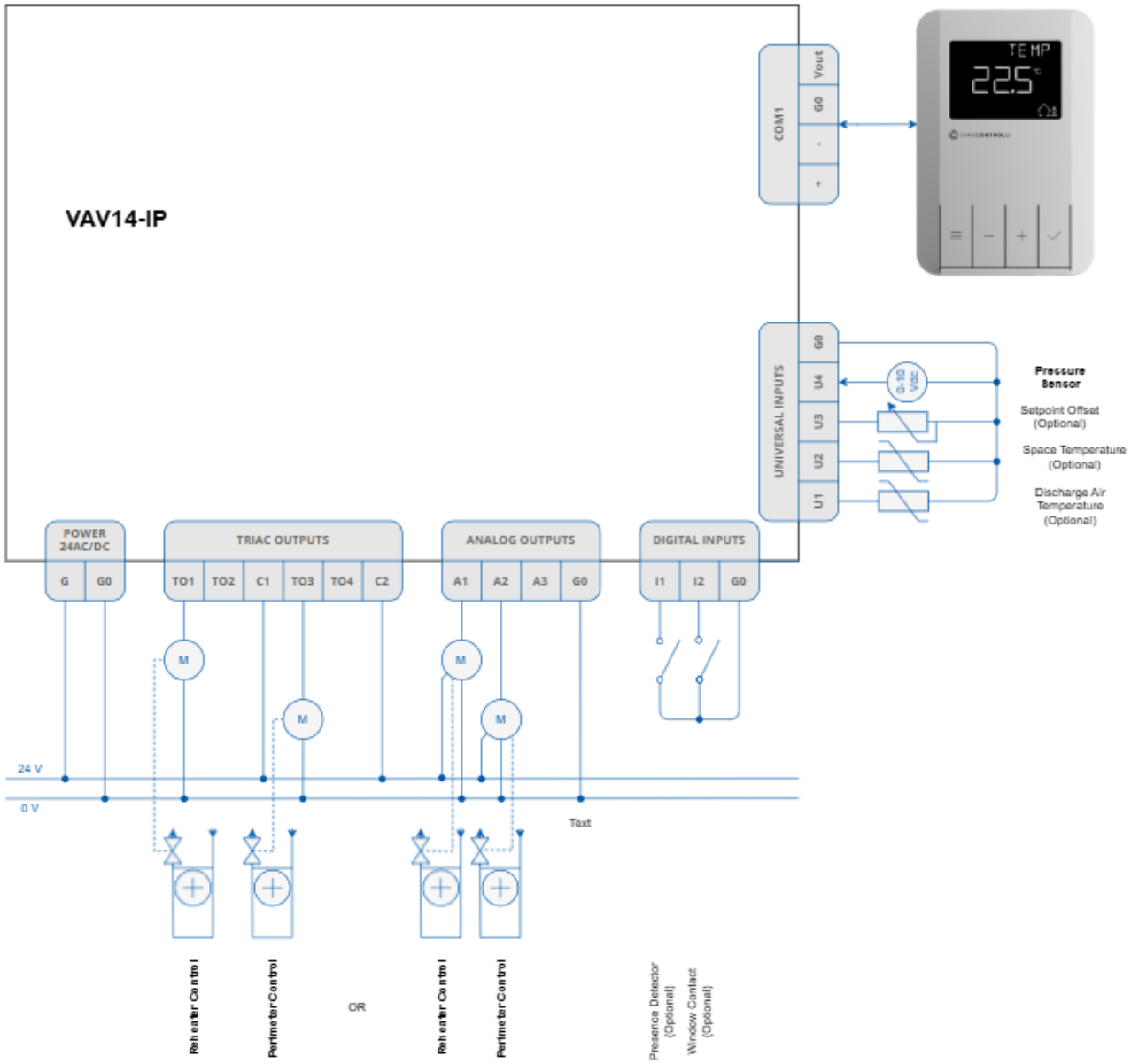


Figure 5. Pressure Control with water reheater and perimeter - application connections diagram

For the application to operate properly, it is required to connect the following elements:

- pressure sensor connected to U4 input,
- Control Point VAV panel or sensors on inputs (space temperature, setpoint offset sensor),
- optionally, DAT sensor located in the supply air duct after reheater.

Optionally, it is possible to connect the presence detector and window contact sensors to minimize energy efficiency loss. To control the reheater and perimeter, dedicated triac and analog output are available, as depicted on the diagram above.

2.4.6 Pressure Control with Electric Reheater and Perimeter

The Pressure Control with up to 2-stage electric reheater and perimeter application requires to configure the following parameter:

- reheater's control type:
  - 1-stage reheater: time proportional (PWM), digital (on/off),
  - 2-stage reheater: digital (on/off);
- perimeter's control type (time proportional - PWM, on/off, or floating).

Configuring of any type of the reheater or perimeter automatically activates an analog control mode, so it does not require any further configuration.

Other configuration parameters (such as damper direction – CW or CCW, default sensor source, type and range or polarity, dual heating function, or heater priority) are available in the Control Point VAV panel or software programming tools (iSMA Configurator/iC Device Manager module/iC Tool/BACnet/Modbus).

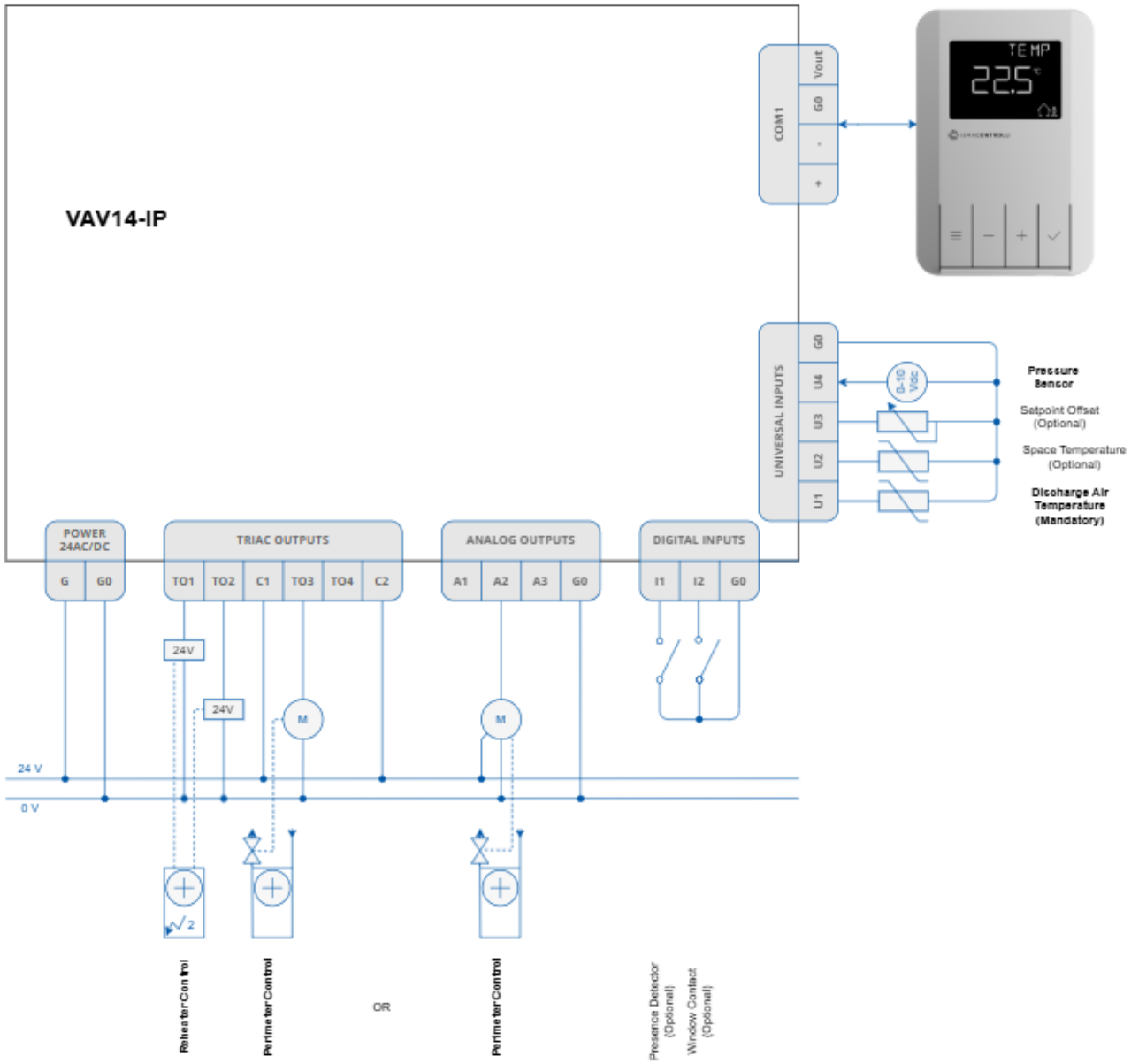


Figure 6. Pressure Control with up to 2-stage electric reheater and perimeter - application connections diagram

For the application to operate properly, it is required to connect the following elements:

- pressure sensor connected to U4 input,
- Control Point VAV panel or sensors on inputs (space temperature, setpoint offset sensor), and
- DAT sensor located in the supply air duct after reheater.

Optionally, it is possible to connect the presence detector and window contact sensors to minimize energy efficiency loss. To control the reheater and perimeter, dedicated triac and analog output are available, as depicted on the diagram above.

2.5 Methods of Configuration

2.5.1 Configuration Sources Priority

Configuration	S3 DIP Switch	OFF (0)	ON (1)
Configuration priority	Switch 1	Software (BACnet/Modbus)	DIP switch

Please note that if the switch 1 on the S3 DIP switch is on, than configuration from any other source is blocked, for example, any changes made by BACnet will not be written to the device.

2.5.2 Configuration by Type of Device

Configuration parameters	S3 DIP switch	iSMA Configurator	Control Point VAV	BACnet objects/Modbus registers
Reheater type	Switch 2 and 3	☑	☑	MSV12/40073
Perimeter type	Switch 6 and 7	☑	☑	MSV13/40074

2.5.3 DIP Switches

Note
Please note that the default state of all DIP switches, S1, S2, and S3, is off (0).

S1 DIP Switch

6-position DIP switch (only the last switch is used for factory reset):

Number	Description	OFF (0)	ON (1)
1	Units	Metric	Imperial
6	Factory Reset	Down - perform an action	Up - preparation for action

Warning - Factory Default Deletes Application
The process of bringing back factory default settings **erases the application from the controller**. In such a case, it is required to restore the application from the available backup.
For detailed information on how to restore the backup, please see: Default Communication Settings and Credentials.

S2 DIP Switch

The S2 8-position DIP switch is reserved for future IP configuration.

S3 DIP Switch

8-position DIP switch configures the application settings:

Note
Please note that if the switch 1 on the S3 DIP switch is on, than configuration of the reheater, and perimeter type from any other source is blocked, as well as any changes made to the referring parameters will not be written to the device.

Number	Description	OFF (0)	ON (1)
1	Configuration priority	Software (BACnet/Modbus)	DIP switch
2	Reheater type	2 - off, 3 - off: no reheater 2 - on, 3 - off: reheater PWM (time proportional) 2 - off, 3 - on: reheater digital/staged (up to 2 stages) 2 - on, 3 - on: reheater floating	
3			
4	none		
5			
6	Perimeter type	6 - off, 7 - off: no perimeter 6 - on, 7 - off: perimeter PWM (time proportional) 6 - off, 7 - on: perimeter digital (on/off) 6 - on, 7 - on: perimeter floating	
7			

2.5.4 BACnet Objects/Modbus Registers

Note
Please note that if the switch 1 on the S3 DIP switch is on, than configuration of the reheater, and perimeter type from any other source is blocked (BACnet/Modbus), as well as any changes made to the referring parameters will not be written to the device.

- Configuration
- Other

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
Configuration						
AV37	40238 (237)	SetpointOffsetRange	N/a	Read /write	3	Sets the setpoint offset range to be changed by the user (e.g., a value of 5 means a range from -5 to +5), (min = 0, max = 10) Connected to CP AV59

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
AV38	40239 (238)	U4PressureSensorRange	N/a	Read/write	100	Sets the relative range of the pressure sensor used (min = 0, max = 1000) Connected to CP AO37
BV4	00105 (104)	PresenceSensorInvert	True/false	Read/write	True	Allows to invert the I1 input signal if required: false (normal), true (invert) Connected to CP BO66
BV5	00106 (105)	WindowContactInvert	True/false	Read/write	False	Allows to invert the I2 input signal if required: false (normal), true (invert) Connected to CP BO67
BV8	00109 (108)	DualHeat	True/false	Read/write	False	Allows to enable dual heating mode with repeater and perimeter: false (no), true (yes) Connected to CP BO69
BO2	00123 (122)	Units	True/false	Read/write	False	Allows to change the unit in the application provided that the BACnet configuration is allowed in the Device Configuration Source variable: false (metric), true (imperial) Connected to CP BO2
MSV12	40273 (272)	ReheaterType	N/a	Read/write	None	Allows to set the reheater type: 1: none 2: TimeProp 3: staged 4: float Connected to CP MSV10
MSV13	40274 (273)	PerimeterType	N/a	Read/write	None	Allows to set the perimeter type: 1: none 2: TimeProp 3: digital 4: float Connected to CP MSV11
MSV14	40275 (274)	HeaterPriority	N/a	Read/write	Reheater	Possibility to select heating priority for heating sources: 1: reheater 2: perimeter 3: simultaneous Connected to CP MSV14

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
MSV21	40282 (281)	U1DischargeTempType	N/a	Read/write	10K3A1 NTC	Allows to select the discharge temperature type: 1: Voltage measurement 2: Current 3: Resistance input 4: 10K3A1 NTC 5: 10K4A1 NTC 6: 10K NTC Carel 7: 20K6A1 NTC 8: 2,2K3A1 NTC 9: 3K3A1 NTC 10: 30K6A1 NTC 11: SIE1 12: TAC1 13: SAT1 14: PT1000 15: NI1000 16: NI1000 21C 17: NI1000 LG F 18: 10K Type2 NTC F 19: 10K Type3 NTC F 20: 20K NTC F 21: 3K NTC F 22: PT1000 F 23: NI1000 32F 24: NI1000 70F Connected to CP MSV12

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
MSV22	40283 (282)	U2SpaceTempType	N/a	Read/write	10K3A1 NTC	Allows to select the space temperature type: 1: Voltage measurement 2: Current 3: Resistance input 4: 10K3A1 NTC 5: 10K4A1 NTC 6: 10K NTC Carel 7: 20K6A1 NTC 8: 2,2K3A1 NTC 9: 3K3A1 NTC 10: 30K6A1 NTC 11: SIE1 12: TAC1 13: SAT1 14: PT1000 15: NI1000 16: NI1000 21C 17: NI1000 LG F 18: 10K Type2 NTC F 19: 10K Type3 NTC F 20: 20K NTC F 21: 3K NTC F 22: PT1000 F 23: NI1000 32F 24: NI1000 70F Connected to CP MSV13
BV9	00110 (109)	DamperDirection	True/ false	Read/write	False	Sets the damper opening direction: false (CW), true (CCW) Connected to CP BO65
AV1	40202 (201)	OccHeatTempSetpoint	°C/ °F	Read/write	21/70	Temperature setpoint for heating in the occupied state
AV3	40204 (203)	StandbyHeatTempSetpoint	°C/ °F	Read/write	19/67	Temperature setpoint for heating in the standby state
AV5	40206 (205)	UnoccHeatTempSetpoint	°C/ °F	Read/write	16/64	Temperature setpoint for heating in the unoccupied state
AV6	40207 (206)	SpacePressureSetpoint	Pa	Read/write	0	Pressure setpoint for the room (regardless of the occupancy status)

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
AV64	40292 (291)	UserSetPosition	%	Read/write	0	User-set damper opening level (after selecting the User Position mode in the Damper Command variable) (min = 0, max = 100) Connected to CP AO26
AO0	30251 (250)	DamperPosition	%	Read-only	N/a	Actual damper opening level coming from the Rotary Actuator component (Position Feedback signal) Connected to CP AO24
MSV7	40268 (267)	DamperCommand	N/a	Read/write	None	Allows to set different damper command modes for calibration, balancing, or testing: 1: Auto 2: - 3: - 4: - 5: User position 6: Full open 7: Full close 8: Calibrate Connected to CP MSV5
Other						
AI0	30001 (0)	UpTime	s	Read-only	N/a	Device's up time
AI1	30005 (4)	SpaceTemperature	°C/°F	Read-only	N/a	Calculated space temperature
AI3	30004 (3)	U2SpaceTemperature	°C/°F	Read-only	N/a	Actual temperature sensor value from the local U2 input
AI4	30301 (300)	PanelTemperature	°C/°F	Read-only	N/a	Actual temperature sensor value from the room panel
AI5	30006 (5)	SpacePressure	Pa	Read-only	N/a	Calculated space pressure
AI8	30009 (8)	U4PressureSensor	ppm	Read-only	N/a	Actual pressure sensor value from the local U4 input
AI9	30010 (9)	EffectiveTempSetpoint	°C/°F	Read-only	N/a	Calculated effective temperature setpoint based on occupancy status and heating or cooling temperature setpoints (depending on demand)
AI10	30011 (10)	CentralTempSetpoint	°C/°F	Read-only	N/a	Calculated Central Temperature Setpoint based on setpoints and occupancy status
AI13	30014 (13)	DischargeTemperature	°C/°F	Read-only	N/a	Calculated discharge temperature

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
AI14	30015 (14)	ActDischTempSetpoint	°C/ °F	Read-only	N/a	Calculated discharge temperature setpoint based on the effective temperature setpoint and heating demand for high-limiting discharge temperature
AI16	30017 (16)	U1DischTemperature	°C/ °F	Read-only	N/a	Actual discharge temperature sensor value comes from the U1 input
AI17	30018 (17)	U3SetpointOffset	°C/ °F	Read-only	N/a	Actual setpoint offset value (calculated from resistance) from the U3 input
AI100	30103 (102)	AppVersion	N/a	Read-only	1.0	Current application version
AV7	40208 (207)	MaxDischTempSetpoint	°C/ °F	Read/write	32/90	High limit of discharge temperature supplied to the room
AV8	40209 (208)	MinDischTempSetpoint	°C/ °F	Read/write	13/55	Low limit of discharge temperature supplied to the room
AV10	40211 (210)	NetTemperature	°C/ °F	Read/write	-327	Temperature sensor value from the network
AV18	40219 (218)	NetDuctInTemp	°C/ °F	Read/write	-327	Discharge temperature sensor value from the network
AV19	40220 (219)	NetOutdoorTemp	°C/ °F	Read/write	-327	Outside air temperature sensor value from the network
AV20	40221 (220)	LoadShedding	%	Read/write	0	Load-shedding level required from the network (min = 0, max = 100)
AV21	40222 (221)	MaxDamperPosition	%	Read/write	100	Maximum damper open position limit (min = 0, max = 100)
AV22	40223 (222)	MinDamperPosition	%	Read/write	0	Minimum damper open position limit (min = 0, max = 100)
AV25	40226 (225)	DamperDriveTime	s	Read/write	90	Time required to reach full damper open position (from 0% to 100%) (min = 0)
AV26	40227 (226)	DamperResponse	%	Read/write	15	Sets the value of how much the control signal must change to perform the next damper movement
AV27	40228 (227)	U4PressureSensorMin	Pa	Read/write	0	Min value of pressure sensor range
AV28	40229 (228)	MaxOatReheater	°C/ °F	Read/write	32/90	Maximum outside air temperature limit that allows the use of a reheater
AV29	40230 (229)	MaxOatPerimeter	°C/ °F	Read/write	18/65	Maximum outside air temperature limit that allows the use of a perimeter

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
AV30	40231 (230)	FloatReheaterValveDriveTime	s	Read/write	120	Time required to reach full reheater valve open (from 0% to 100%)
AV32	40233 (232)	TimePropReheaterPeriod	s	Read/write	60	Time required for a PWM valve for a full cycle time of a reheater
AV31	40232 (231)	FloatPerimeterValveDriveTime	s	Read/write	120	Time required to reach full perimeter valve open (from 0% to 100%)
AV33	40234 (233)	TimePropPerimeterPeriod	s	Read/write	60	Time required for a PWM valve for a full cycle time of a perimeter
AV34	40235 (234)	BypassTimeOverride	min	Read/write	120	Time required to maintain the bypass occupancy status (after expiration it returns to the previous status)
AV35	40236 (235)	StandbyTimeOverride	min	Read/write	15	Time required to change the occupancy status to standby (after motion detection disappears)
AV40	40241 (240)	NetPressure	Pa	Read/write	-327	Pressure sensor value comes from the network
AV41	40242 (241)	NetOffsetSetpoint	°C/ °F	Read/write	0	Offset temperature setpoint value from the network
AV56	40502 (501)	PanelTempSetpoint	°C/ °F	Read/write	N/a	Temperature setpoint from the room panel
AV58	40504 (503)	OffsetTempSetpoint	°C/ °F	Read/write	N/a	Temperature offset for setpoint from the room panel
AV67	40295 (294)	DamperControl	%	Read/write	0	Damper opening level control resulting from the application
AO1	40252 (251)	ReheaterControl	%	Read-only	N/a	Reheater valve opening level control resulting from the application
AO3	40254 (253)	PerimeterControl	%	Read-only	N/a	Perimeter valve opening level control resulting from the application
BI0	10302 (301)	PresenceSensor	True/ false	Read-only	N/a	Actual presence sensor state from the I1 input
BI1	10304 (303)	WindowContact	True/ false	Read-only	N/a	Actual window contact state from the I2 input
BV1	00102 (101)	WarmUpHeater	True/ false	Read/write	False	Allows to use the reheater also in the Morning WarmUp mode (in the HVAC Mode variable): false (disabled), true (enabled)

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
BV12	00113 (112)	DeviceConfigurationSource	True/ false	Read /write	False	Allows to choose to set a source of the device application configuration: false (BACcnet), true (DIP switch)
BO0	00121 (120)	PerimeterStatus	True/ false	Read /write	False	Perimeter digital control status (if configured as digital) from the application: false (off), true (on)
BO16	00017 (116)	PanelHeating	True/ false	Read /write	N/a	Heating mode status to be displayed as an icon on the Control Point room panel false (no heating), true (heating) Connected to CP BO16
BO55	00156 (155)	PanelSetpointMode	True/ false	Read /write	N/a	Sets the temperature setpoint mode in the Control Point room panel - directly or as an offset false (offset), true (setpoint) Connected to CP BO55
BO56	00157 (156)	PanelSetpointDisplay	True/ false	Read /write	N/a	Allows to select which value to be displayed during the offset editing according to the set Panel Setpoint Mode false (offset), true (setpoint) Connected to CP BO56
MSI2	30023 (22)	Occupancy Status	N/a	Read -only	Unoccupied	Current occupancy status: 1: occupied 2: unoccupied 3: bypass 4: standby
MSV1	40262 (261)	HVACMode	N/a	Read /write	Auto	Allows to set the operating mode for the VAV device: 1: Auto 2: Heat 3: Morning WarmUp 4: Cool 5: Night Purge 6: PreCool 7: Off (depressurize) 8: Fire (pressurize)
MSV2	40263 (262)	Occupancy Mode	N/a	Read /write	Unoccupied	Allows to set room the occupancy mode from the BMS system: 1: occupied 2: unoccupied 3: bypass 4: standby

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
MSV3	40701 (700)	PanelOccupancy Status	N/a	Read/write	Unoccupied	Current room occupancy status dedicated to Control Point room panel 1: unoccupied 2: occupied 3: standby 4: bypass Connected to CP MSV3
MSV4	40702 (701)	PanelOccupancyMode	N/a	Read/write	Unoccupied	Status of set room occupancy mode from Control Point room panel 1: unoccupied 2: occupied Connected to CP MSV4
MSV5	40703 (702)	PanelOccupancyReset	N/a	Read/write	Unoccupied	Resetting the room occupancy mode from occupied to unoccupied in the Control Point room panel 1: unoccupied 2: occupied
MSV9	40270 (269)	ReheaterCommand	N/a	Read/write	None	Allows to set different reheater command modes for testing 1: Auto/none (null) 2: Full open 3: Full close Connected to CP MSV7
MSV10	40271 (270)	PerimeterCommand	N/a	Read/write	None	Allows to set different perimeter command modes for testing 1: Auto/none (null) 2: Full open 3: Full close Connected to CP MSV8
MSV23	40284 (283)	TemperatureInputSelector	N/a	Read/write	Panel	Allows to choose the temperature source for control logic: 1: panel 2: input 3: network Connected to CP MSV15
MSV24	40285 (284)	SetpointOffsetSelector	N/a	Read/write	Panel	Allows to choose the setpoint offset source for control logic: 1: panel 2: input 3: network Connected to CP MSV16

BACnet ID	Modbus address (dec)	Object/ register name	Units	Access	Default value	Description
MSV25	40286 (285)	PressureInputSelector	N/a	Read /write	Input	Allows to select the pressure source for control logic: 1: panel – not in use 2: input 3: network Connected to CP MSV17
MSO0	40291 (290)	ReheaterStatus	N/a	Read /write	Off	Reheater staged control status (if configured as digital or staged) from application: 1: off 2: stage 1 on 3: stage 2 on

2.5.5 iSMA Configurator

Note
Please note that if the switch 1 on the S3 DIP switch is on, than configuration of the reheater and perimeter type from any other source is blocked (iSMA Configurator), as well as any changes made to the referring parameters (for example, Heater Priority) will not be written to the device.

VAV Configurator

The configuration is carried out in a dedicated tool, VAV Configurator, available as a built-in tool in the iSMA Configurator:

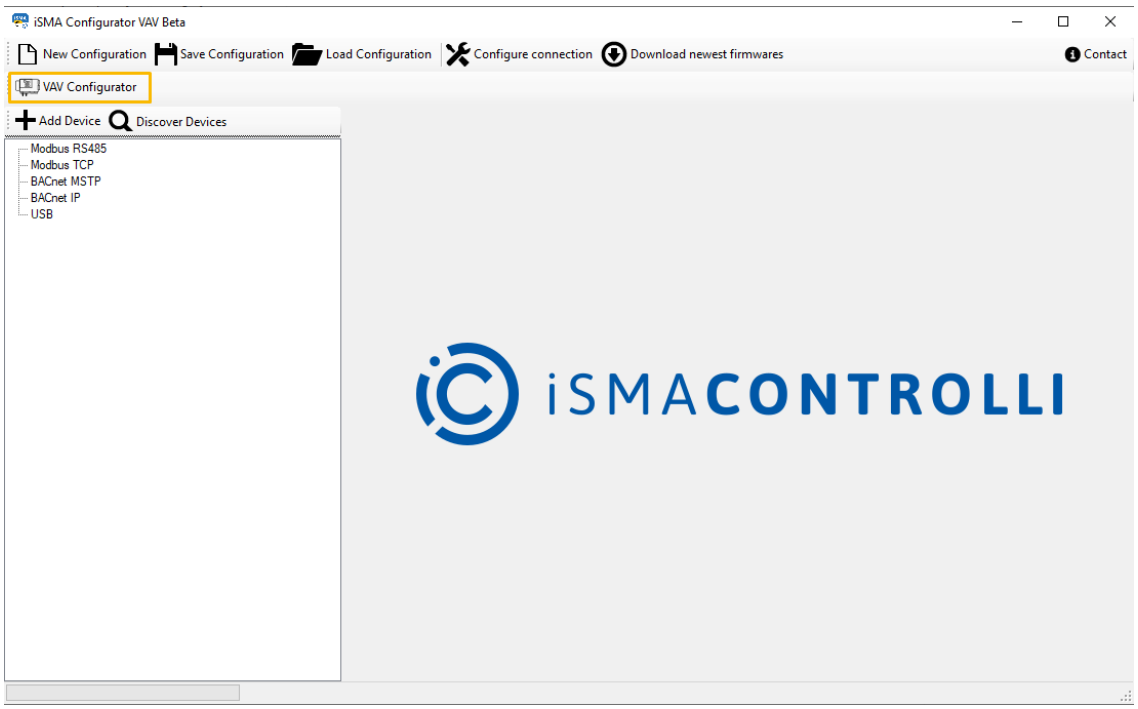


Figure 7. VAV Configurator button

Opening the VAV Configurator

The VAV Configurator is accessible under a dedicated button.

Before opening the VAV Configurator, it is required to start a BACnet IP transmission. Normally, a start-transmission prompt will be displayed automatically after pressing the VAV Configurator button:

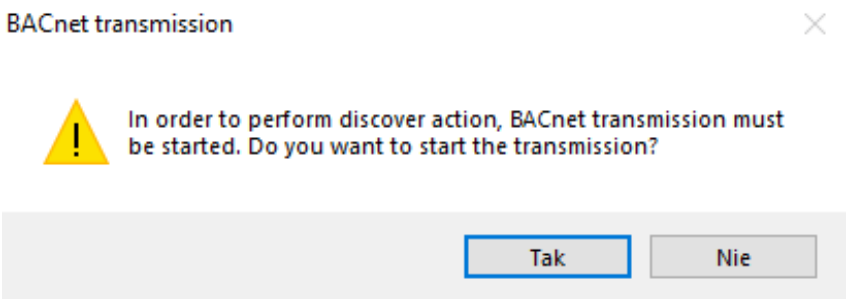


Figure 8. BACnet transmission prompt

Confirm the pop-up window and the BACnet IP transmission will be started automatically.

Note
In case there are any problems with an automatic start of the BACnet IP transmission, start it manually. Find out more here.
If BACnet IP communication is not started, the VAV Configurator button is not active.

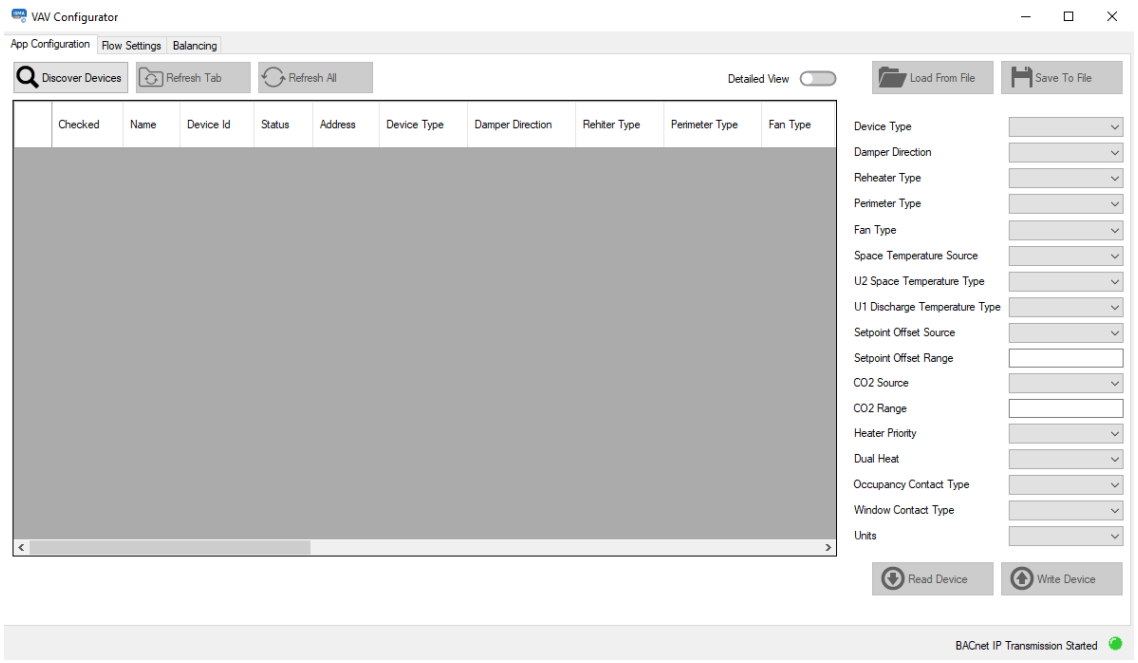


Figure 9. VAV Configurator started

Discovering Devices

The next required step is discovering devices. Use a dedicated button in the left top corner of the VAV Configurator window:

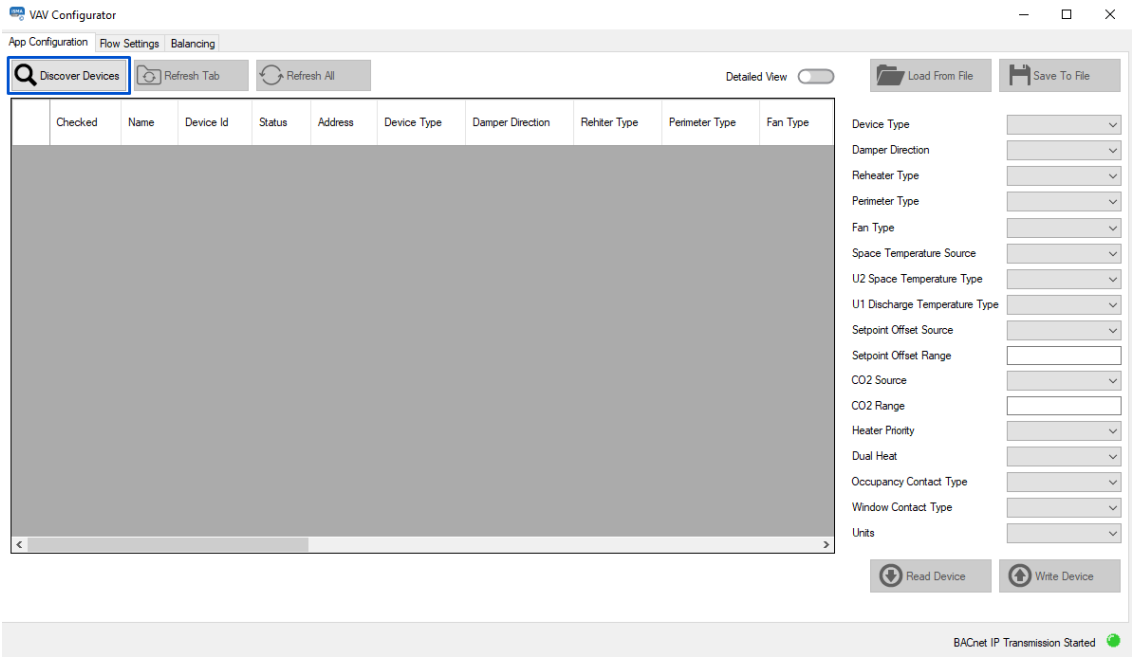


Figure 10. Discover Devices button

Warning!
For the discovering process to be successful, make sure that the subnet mask of the PC is compliant with the subnet mask of the device to be discovered. Network parameters of the controller can be checked and/or changed in the Ethernet component (System container).

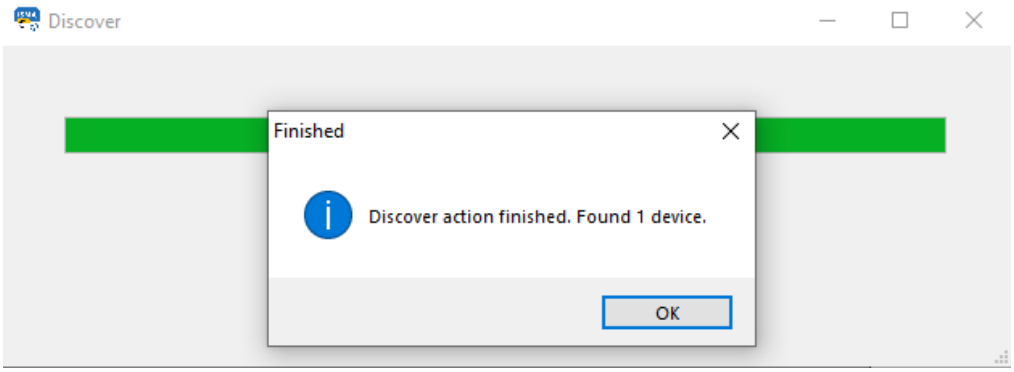


Figure 11. Finished discovering process

App Configuration

The first tab of the VAV Configurator is the App Configuration tab. Here, it is possible to execute four basic actions and configure some Pressure Control example application parameters.

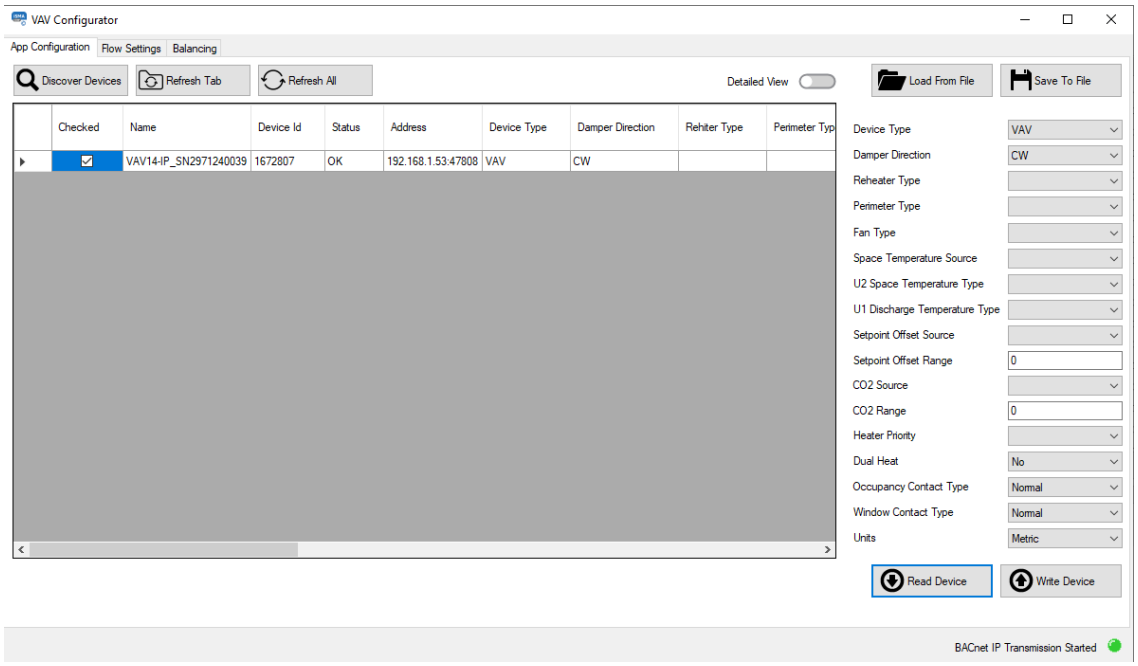


Figure 12. App Configuration view

The four available actions are:

- **Load From File:** allows to upload application parameters from a previously saved file (*.json);
- **Save To File:** allows to save current application settings to a .json file;
- **Read Device:** reads current application settings directly from the device;
- **Write Device:** sends new settings to the device.

Warning!
Please note that if the switch 1 on the S3 DIP switch is on, the Write Device action will take no effect.

The Pressure Control example application parameters available to configure are:

- **Device Type:** unused;
- **Damper Direction:** allows to set a damper moving direction to clockwise or counterclockwise (DamperDirection);
- **Reheater Type:** allows to set a reheater type;
  - Available settings: none, TimeProp (PWM), staged, float;
- **Perimeter Type:** allows to set a perimeter type;
  - Available settings: none, TimeProp (PWM), digital, float – not allow;
- **Fan Type:** unused;
- **Space Temperature Source:** allows to set a leading source for temperature measurement for the space temperature control loop calculations;
  - Available settings: panel (Control Point VAV), input (U2), network;
- **U2 Space Temperature Type:** allows to set a space temperature sensor type on the universal input 2;
  - Available settings: voltage measurement, current, resistance input, specific temperature sensor;
- **U1 Discharge Temperature Type:** if connected, allows to set a discharge temperature sensor type on the universal input 1 (used in the supply air temperature control loop calculations);
  - Available settings: voltage measurement, current, resistance input, specific temperature sensor;
- **Setpoint Offset Source:** allows to set a source for temperature setpoint offset settings;
  - Available settings: panel (Control Point VAV), input (U3), network;
- **Setpoint Offset Range:** allows to set a range for setpoint offset settings;
- **CO2 Source (Pressure Source):** allows to set a leading source for pressure measurement for the pressure control loop calculations;
  - Available settings: panel (Control Point VAV) – not in use, input (U4), network;
- **CO2 Range (Pressure Range):** allows to set a relative range for Pressure Sensor reading;

- **Heater Priority:** allows to select a first priority heat source in the DualHeat function for the reheater and perimeter (if used in the system);
  - Available settings: reheater, perimeter, simultaneous;
- **Dual Heat:** allows to enable a possibility to use one or two heat sources (reheater and perimeter, if used in the system);
  - Available settings: no, yes;

DualHeat
The DualHeat function allows to select one or two stages of heating (two stages of heating meaning heating with a reheater and perimeter).
Heater(s) in the primary stage can be reheater or perimeter, in the secondary they will be in opposite. If available in the system and properly configured, they can be arranged in order according to the HeaterPriority variable (ReheaterControl folder):
- reheater/perimeter
- perimeter/reheater
- simultaneous.

If there is no reheater and/or perimeter in the system, the DualHeat function cannot be activated. If the reheater is available in the system, it can be configured as the primary stage heater and the DualHeat function can be activated.

- **Occupancy Contact Type:** allows to select an occupancy contact type;
  - Available settings: normal, invert;

Normal/invert Modes
If available, the motion detector is connected to the I1 digital input. It is possible to choose between two types of a presence sensor operation:
- normal (default): I1 true - presence detected, I2 false - no presence detected,
- invert: I2 true - no presence detected, I2 false - presence detected.

- **Window Contact Type:** allows to select a mode window reed switch operation;
  - Available settings: normal, invert;

Normal/invert Modes
If available, the window reed switch is connected to the I2 digital input. It is possible to choose between two types of a reed switch operation:
- normal (default): I2 true - window open, I2 false - window closed,
- invert: I2 true - window closed, I2 false - window open.

- **Units:** allows to select a units system;
  - Available settings: imperial, metric.

Mode Override from Balancing tab

The Mode Override action allows to force an operating mode to a damper. Available modes are:

- **Auto:** sets auto mode (Pressure Control example application logic takes control),
- **Max flow:** no action,
- **Min flow:** no action,
- **User flow:** no action,
- **User position:** goes to a user-set position (% of damper opening),
- **Full open:** damper fully open,
- **Full close:** damper fully closed,
- **Calibrate:** performs a damper calibration (the damper goes to 100%, than to 0%, and goes back to the control loop output).

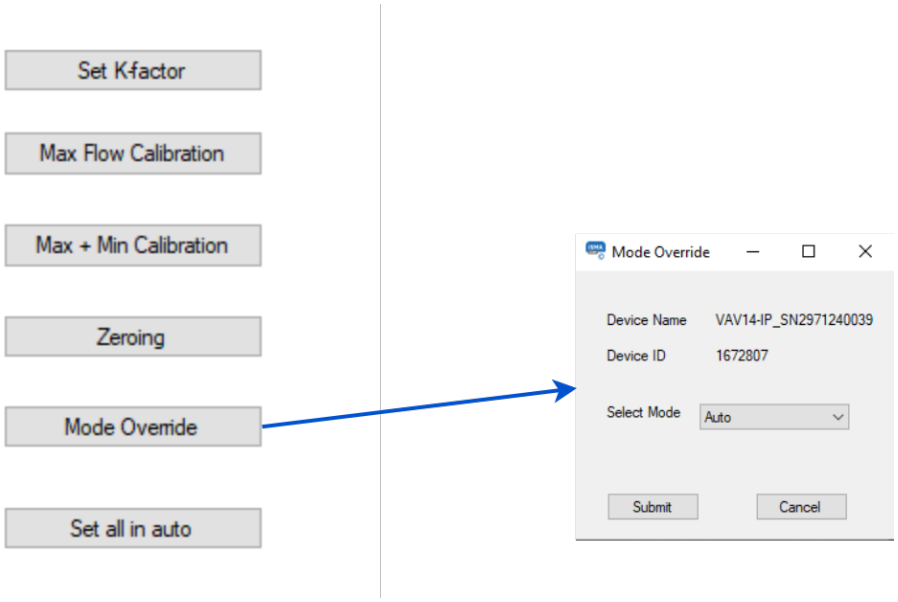


Figure 13. Mode override action pop-up

Set All in Auto

The Set All in Auto action forces all dampers to the Auto operating mode.

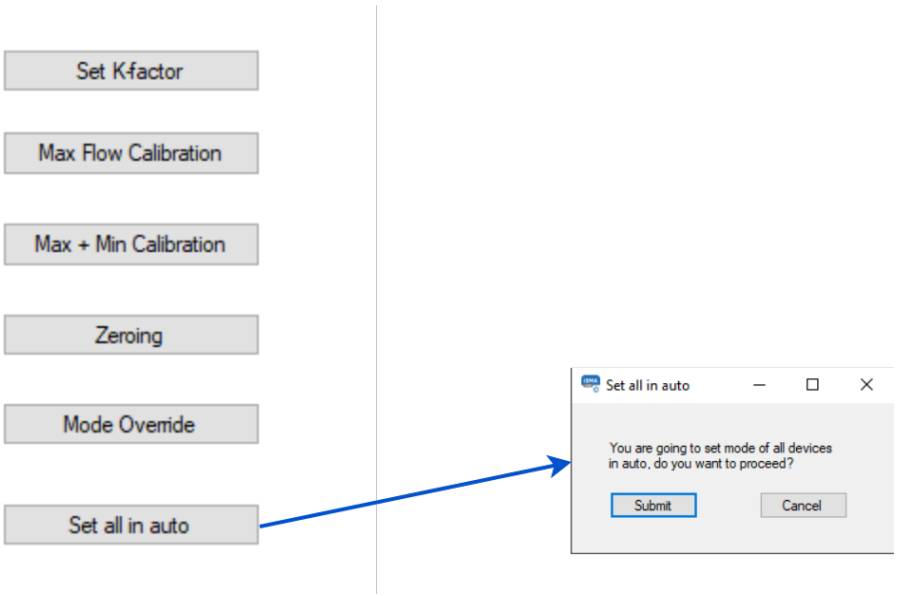


Figure 14. Set all in auto action pop-up

2.5.6 Control Point VAV

Note
Please note that if the switch 1 on the S3 DIP switch is on, than configuration of reheater and perimeter type from any other source is blocked (Control Point VAV), as well as any changes made to the referring parameters (for example, Heater Priority) will not be written to the device.

Warning!
Before using the Control Point VAV panel with the VAV14-IP controller, make sure to upgrade its firmware to version V2.5.
Instructions how to upgrade firmware: iSMA Configurator.

The configuration of the VAV14-IP device is possible directly from the Control Point VAV panel. To do that, it is required to connect the panel to the controller with an RJ45-RJ45 cable.

Parameters available to configure are contained in the panel's submenu. In order to enter the submenu:

- long-press the OK button;
- edit PIN (default: 0000);
- short-press the OK button.

Figure 15. Panel access to the VAV submenu

VAV Submenu

In the Control Point panel's VAV submenu, it is possible to configure parameters of the VAV controller.

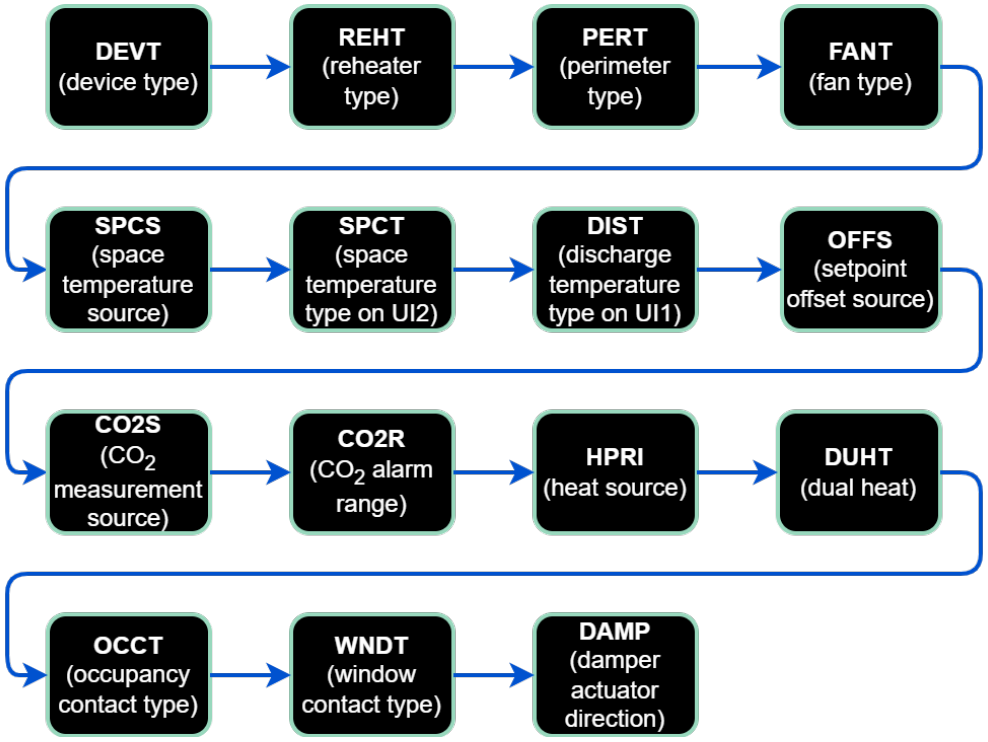


Figure 16. Sequence of app configuration options in the Control Point VAV submenu

App Configuration

In the Control Point panel's VAV submenu dedicated to the VAV application, it is possible to configure the following parameters:

DEVT: unused;

REHT: allows to set a reheater type;

- ReheaterType:
  - Modbus register: 40273;
  - BACnet object: MSV12, property: Present Value;

Register/object value	Value
1	None
2	Time proportional (PWM)
3	Staged
4	Float

PERT: allows to set a perimeter type – not in use due to blocking Float mode;

- PerimeterType:
  - Modbus register: 40274;
  - BACnet object: MSV13, property: Present Value;

Register/object value	Value
1	None
2	Time proportional (PWM)
3	Digital
4	Float – not allow

FANT: unused;

SPCS: allows to set a source for temperature readings;

- **TemperatureInputSelector:**
  - Modbus register: 40284;
  - BACnet object: MSV23, property: Present Value;

Register/object value	Value
1	Panel
2	Input
3	Network

SPCT: allows to set a space temperature type on the universal input 2;

- **U2SpaceTempType:**
  - Modbus register: 40283;
  - BACnet object: MSV22, property: Present Value;

DIST: allows to set a discharge temperature type on the universal input 1;

- **U1DischargeTempType:**
  - Modbus register: 40282;
  - BACnet object: MSV21, property: Present Value;

Register/object value	Value
1	Voltage measurement
2	Current
3	Resistance input
4	10K3A1 NTC
5	10K4A1 NTC
6	10K NTC Carel

Register/object value	Value
7	20K6A1 NTC
8	2,2K3A1 NTC
9	3K3A1 NTC
10	30K6A1 NTC
11	SIE1
12	TAC1
13	SAT1
14	PT1000
15	NI1000
16	NI1000 21C
17	NI1000 LG F
18	10K Type2 NTC F
19	10K Type3 NTC F
20	20K NTC F
21	3K NTC F
22	PT1000 F
23	NI1000 32F
24	NI1000 70F

OFFS: allows to set a source for setpoint offset settings;

- **SetpointOffsetSelector:**
  - Modbus register: 40285;
  - BACnet object: MSV24, property: Present Value;

CO2S (PRES): allows to set a source for pressure readings;

- **PressureInputSelector:**
  - Modbus register: 40286;
  - BACnet object: MSV25, property: Present Value;

Register/object value	Value
1	Panel – not in use

Register/object value	Value
2	Input
3	Network

CO2R (PRER): allows to set a relative range for pressure sensor readings;

- PressureSensorRange:
  - Modbus register: 40239;
  - BACnet object: AV38, property: Present Value;

Register/object value	Value
Min.	0
Max.	1000

HPRI: allows to select a priority order for the heat source;

- HeaterPriority:
  - Modbus register: 40275;
  - BACnet object: MSV14, property: Present Value;

Register/object value	Value
1	Reheater
2	Perimeter
3	Simultaneous

DUHT: allows to enable a possibility to use one or two heat sources;

- DualHeat:
  - Modbus register: 00109;
  - BACnet object: BV8, property: Present Value;

Register/object value	Value
0/false	No
1/true	Yes

OCCT: allows to select an occupancy contact type;

- PresenceSensorInvert:
  - Modbus register: 00105;
  - BACnet object: BV4, property: Present Value;

WNDT: allows to select a window contact type;

- WindowContactInvert:
  - Modbus register: 00106;
  - BACnet object: BV5, property: Present Value;

DAMP: allows to set a damper actuator's direction to open to clockwise or counterclockwise;

- DamperDirection:
  - Modbus register: 00110;
  - BACnet object: BV9, property: Present Value.

Register/object value	Value
0/false	Clockwise

MODE from BAL

DAMP: allows to force an operating mode to a damper;

- DamperCommand:
  - Modbus register: 40268;
  - BACnet object: MSV7, property: Present Value;

Damper mode	Action
AUTO	Set auto mode (Pressure Control example application logic takes control)
MAXF	No action
MINF	No action
USRF	No action
USRP	Go to a user-set position (% of damper opening)
OPEN	Damper fully open
CLOS	Damper fully closed
CLBR	Performs a damper calibration (the damper goes to 100%, then to 0%, and goes back to the control loop output)

- UserSetPosition: user-set opening level (after selecting the USRP opting in the VAV_DAMPER_COMMAND variable);
  - Modbus register: 40292;
  - BACnet object: AV64, property: Present Value;
- UserSetAirflow: No action;

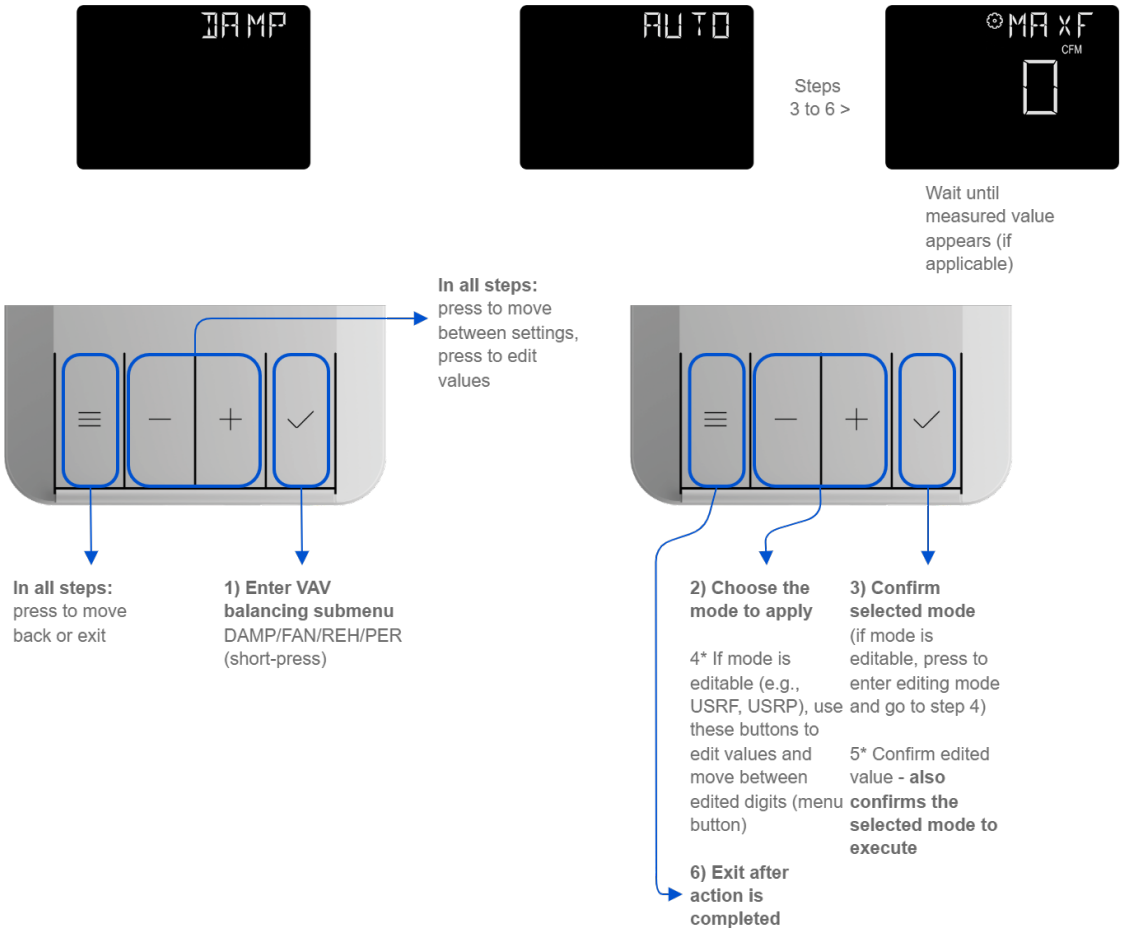


Figure 17. Panel access to MODE submenu

FAN: no action;

REH: allows to force an operating mode to a reheater;

- ReheaterCommand:
  - Modbus register: 40270;
  - BACnet object: MSV9, property: Present Value;

Reheater mode	Action
AUTO	Set an auto mode (VAV application logic takes control)
OPEN	Fully open
CLOS	Fully closed

PER: allows to force an operating mode to a perimeter;

- PerimeterCommand:
  - Modbus register: 40271;
  - BACnet object: MSV10, property: Present Value.

Perimeter mode	Action
AUTO	Set an auto mode (VAV application logic takes control)
OPEN	Fully open
CLOS	Fully closed

2.5.7 iC Device Manager

Note
Please note that if the switch 1 on the S3 DIP switch is on, than configuration of reheater and perimeter type from any other source is blocked (iC Device Manager), as well as any changes made to the referring parameters (for example, Heater Priority) will not be written to the device.

The iC Device Manager service for Niagara Framework is dedicated for iSMA CONTROLLI VAV14-IP controllers. The service enables configuration of the app parameters in the VAV controller.

Using iC Device Manager

Adding the Module

The iC Device Manager service is a part of the iC Workbench and iC Niagara Expansion Pack (from version 4.14).

Note: For a correct operation of the iC Device Manager service, it is required also to have the latest iClib version.

To start using the iC Device Manager service, go to the Palette window (in iC Workbench or other Niagara tool) and select the Open Palette option.

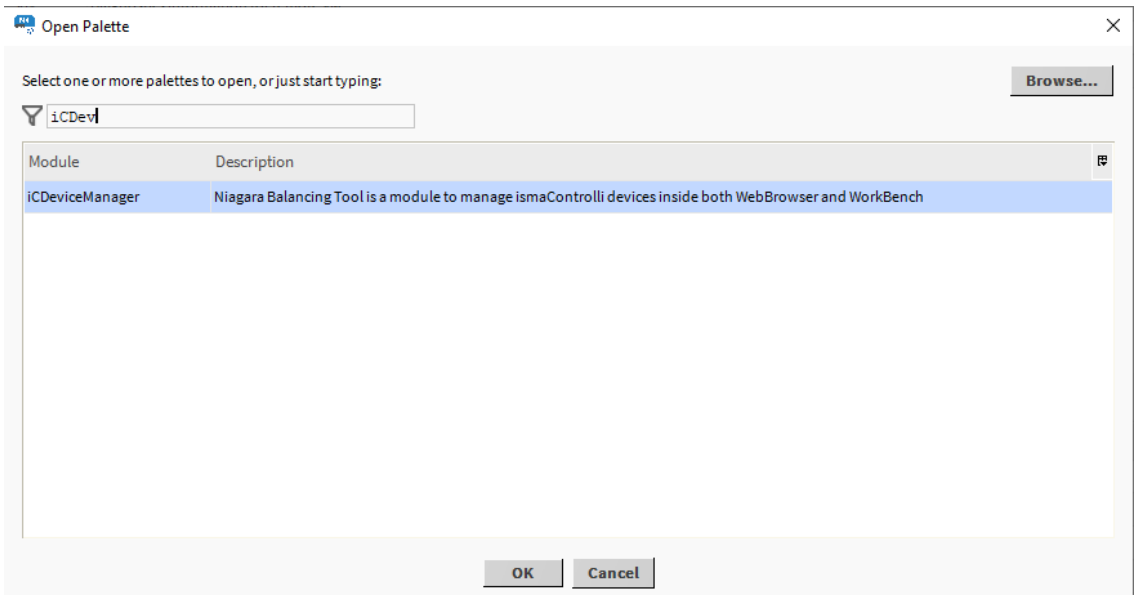


Figure 18. Opening palette

Confirm with OK, the palette is ready to use in the Palette window.

The only location where the service will operate properly is Config → Services.

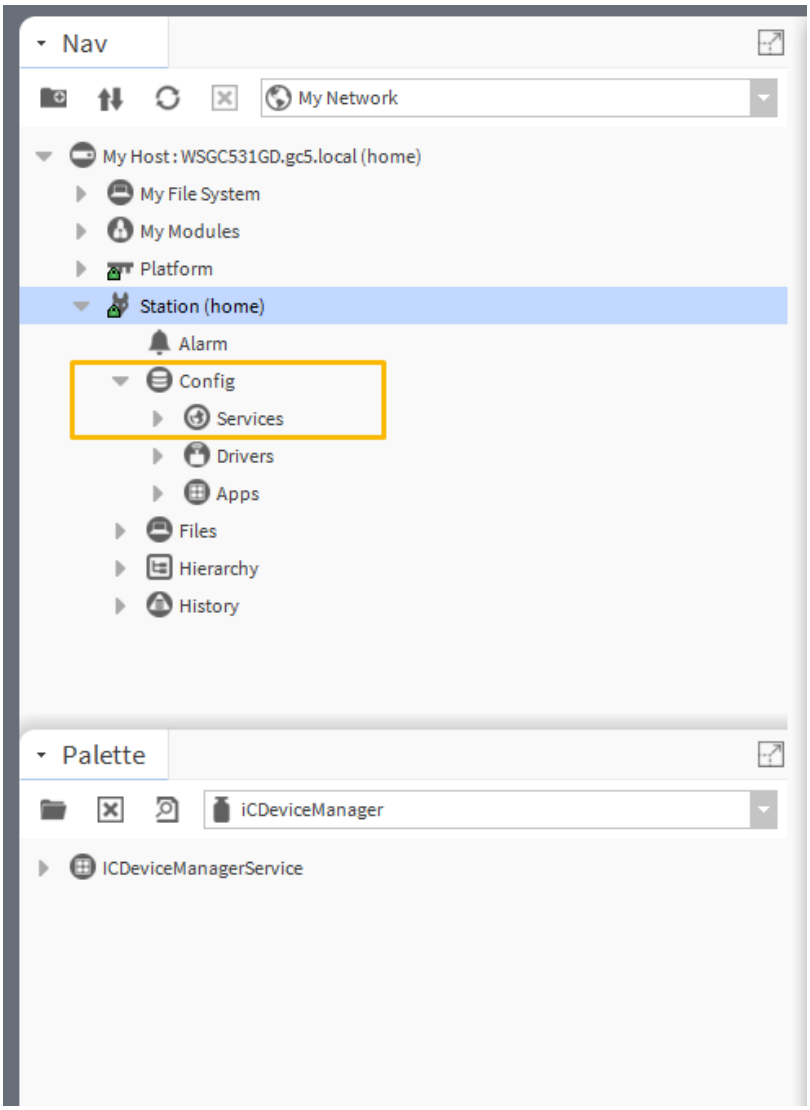
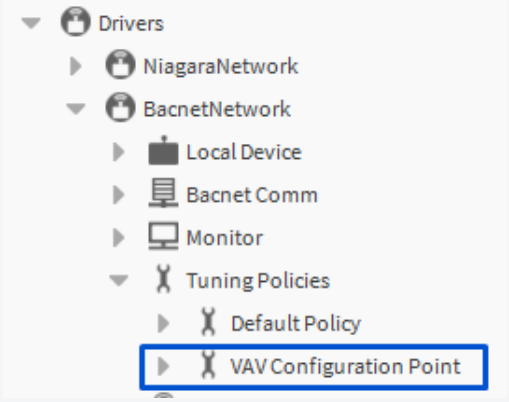


Figure 19. Services location

Drag and drop the iC Device Manager service to Services.

Warning!
For the iC Device Manager service to fully operate, make sure that the VAV14-IP controller is added to the BACnet network in Drivers.
If BACnet has been configured using the default BACnetNetwork module, it is required to add the VAV Configuration Point (from the iSMA_CONTROLLI-Library) to Tuning Policies:



Adding the VAV Device

Offline

1. Add the VAV14-IP device from the iSMA_CONTROLLI_Library (BACnetNetwork → ComfortManagement), according to user requirements: VAV14_CONFIG_POINT or VAV14_PROXY_POINT.
2. Go to BACnetNetwork in the station and invoke the Discover action.
3. Mark the offline device and the device to be matched with it, and confirm with the Match button.

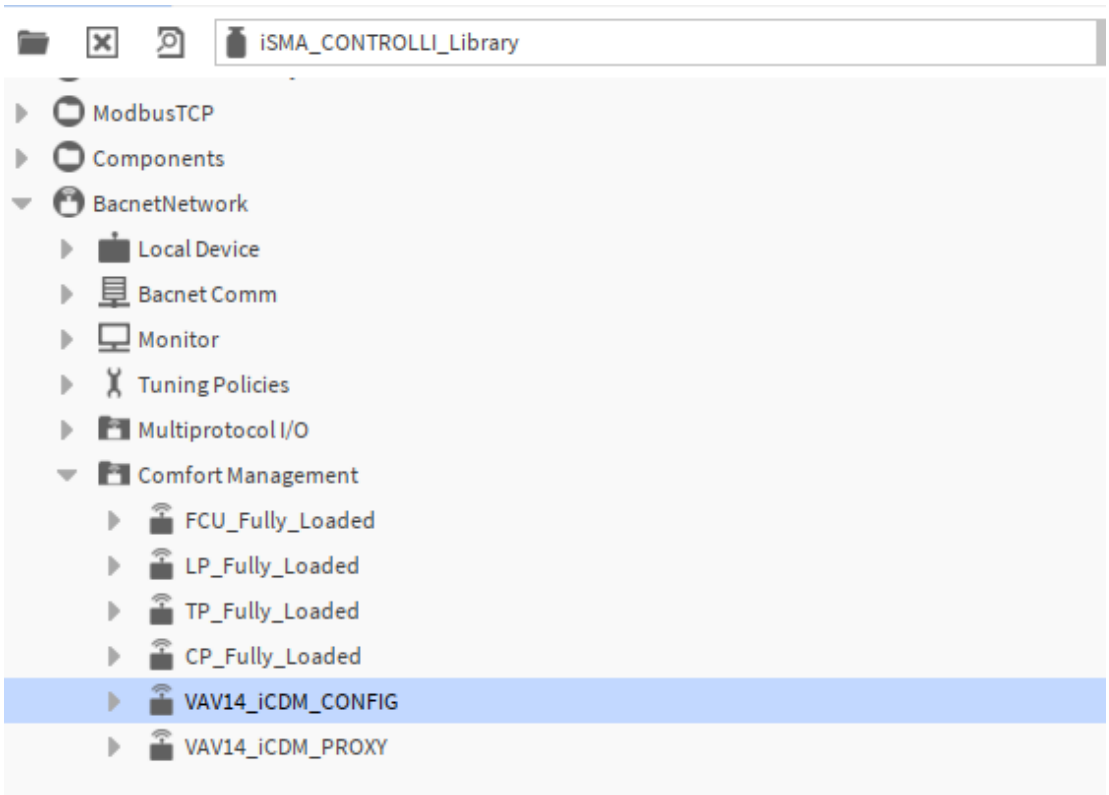


Figure 20. Config and proxy points

Online

1. Go to BACnetNetwork in the station and invoke the Discover action.
2. Add the discovered VAV14-IP device(s).
3. From the iSMA_CONTROLLI_Library select points for devices to be configured as proxy or config points.

Warning!

For a proper recognition of the device, the iC Device Manager verifies its hardware type, firmware version, and application version. From these values, only the application version is read from the AI 100 point. Make sure it is added to the device, otherwise, it may not be visible in the service.

Proxy and config points
Proxy points are BACnet points configured as proxy and placed under the Points folder. These consume Niagara license points.
Config points are BACnet points configured as config and placed under the Config folder. These points **do not** consume Niagara license points.

App Configuration

The first tab of the iC Device Manager service is the App Configuration tab. Here, it is possible to execute three basic actions and configure VAV application parameters.

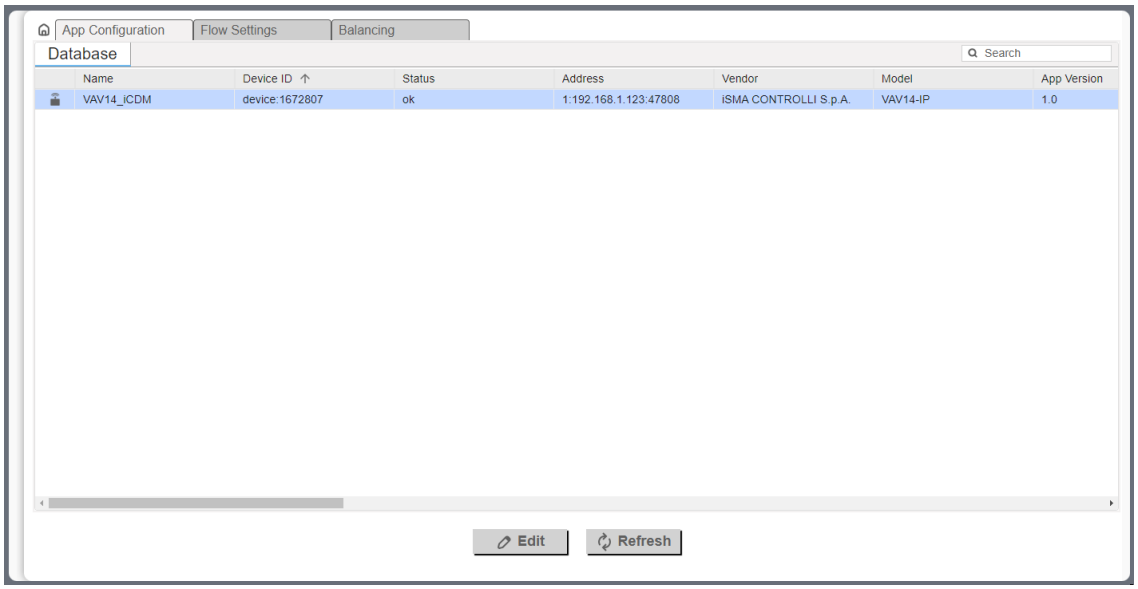


Figure 21. Application configuration main view

The main view of the tab shows data read from the device.

To make sure that the data are up to date, click the Refresh button.

To enter the application settings, click the Edit button. The configuration window pops up, where it is possible to set new values to the VAV application parameters, send them to the device (or download current settings).

Worth to notice
The configuration windows contains all parameters available to set and available actions. If any parameter from the list is meant to be left **as is** and **not** to be set to a new value, check the null option. If the null option is checked, then this parameter will be omitted when sending new values to the controller.

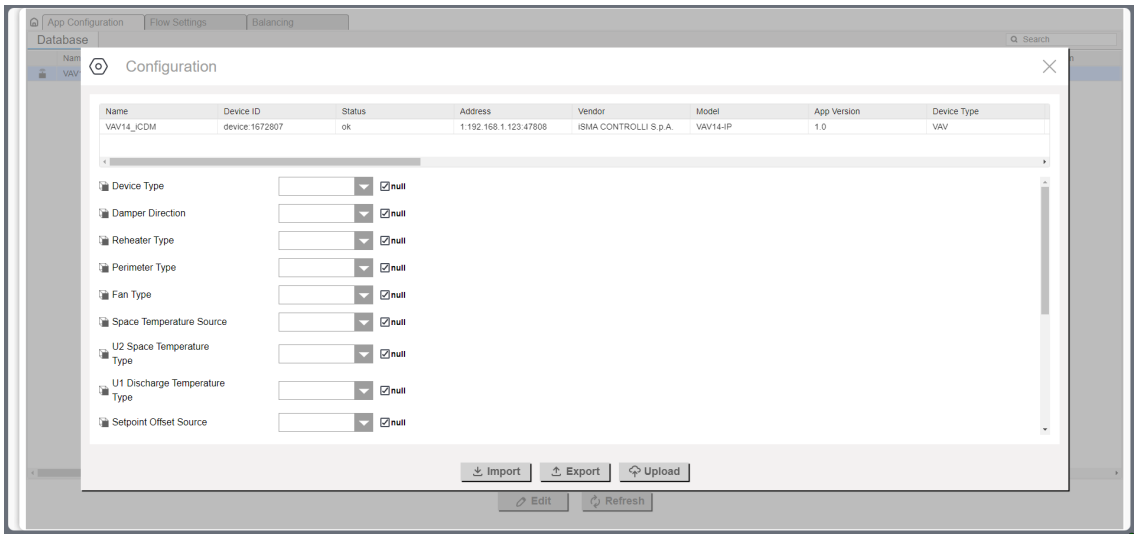


Figure 22. Application configuration details

The three actions available in the configuration tab are:

- **Import:** allows to upload application parameters from a previously saved file (*.json);
- **Export:** allows to save current application settings to a .json file;
- **Upload:** sends new settings the the device.

Warning!
Please note that if the switch 1 on the S3 DIP switch is on, the Upload action will take no effect.

The VAV application parameters available to configure are:

- **Device Type:** unused;
- **Damper Direction:** allows to set a damper direction to clockwise or counterclockwise;
- **Reheater Type:** allows to set a reheater type;
  - Available settings: none, TimeProp (PWM), staged, float;
- **Perimeter Type:** allows to set a perimeter type;
  - Available settings: none, TimeProp (PWM), digital, float – not allow;
- **Fan Type:** unused;
- **Space Temperature Source:** allows to set a source for temperature readings;
  - Available settings: panel, input, network;
- **U1 Discharge Temperature Type:** allows to set a discharge temperature type on the universal input 1;
  - Available settings: voltage measurement, current, resistance input, specific temperature sensor;
- **U2 Space Temperature Type:** allows to set a space temperature type on the universal input 2;
  - Available settings: voltage measurement, current, resistance input, specific temperature sensor;
- **Setpoint Offset Source:** allows to set a source for setpoint offset settings;
  - Available settings: panel, input, network;
- **Setpoint Offset Range:** allows to set a range for setpoint offset settings;
- **CO2 Source (Pressure Source):** allows to set a source for pressure readings;
  - Available settings: panel - unused, input, network;
- **CO2 Range (Pressure Range):** allows to set a relative range for pressure sensor readings;
- **Heater Priority:** allows to select a priority order for the heat source;
  - Available settings: reheater, perimeter, simultaneous;
- **Dual Heat:** allows to enable a possibility to use one or two heat sources;
  - Available settings: no, yes;
- **Occupancy Contact Type:** allows to select an occupancy contact type;
  - Available settings: normal, invert;
- **Window Contact Type:** allows to select a window contact type;
  - Available settings: normal, invert;
- **Units:** allows to select a units system;
  - Available settings: imperial, metric.

Mode Override from Balancing tab

The Mode Override action allows to force an operating mode to a damper. Available modes are:

- **Auto:** sets auto mode (Pressure Control example application logic takes control),
- **Max flow:** no action,
- **Min flow:** no action,
- **User flow:** no action,
- **User position:** goes to a user-set position (% of damper opening),
- **Full open:** damper fully open,
- **Full close:** damper fully closed,
- **Calibrate:** performs a damper calibration (the damper goes to 100%, than to 0%, and goes back to the control loop output).

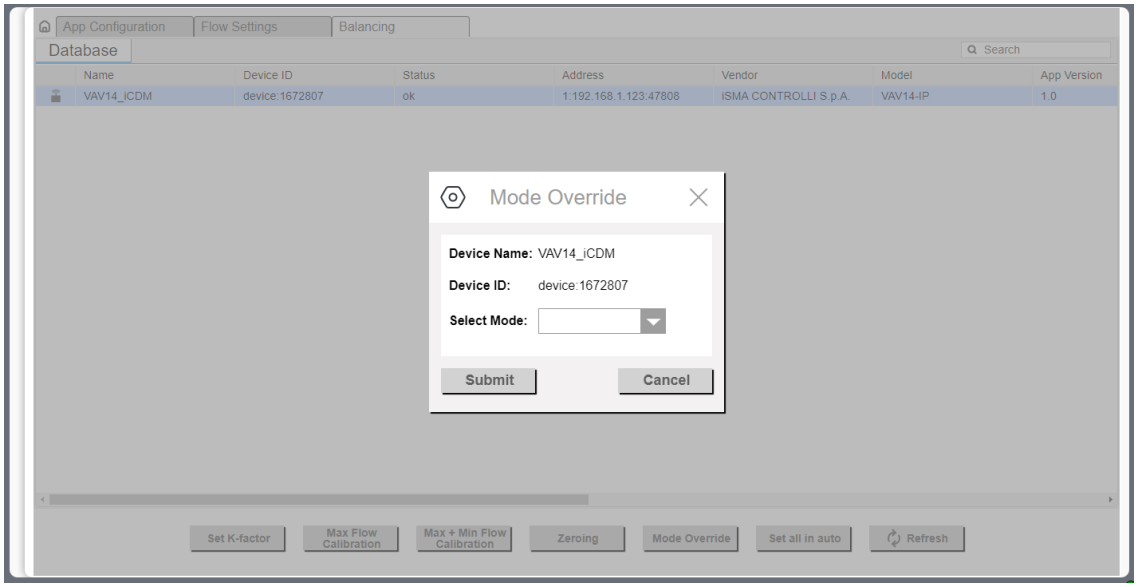


Figure 23. Mode override pop-up

Set All in Auto

The Set All in Auto action forces all dampers to the Auto operating mode.

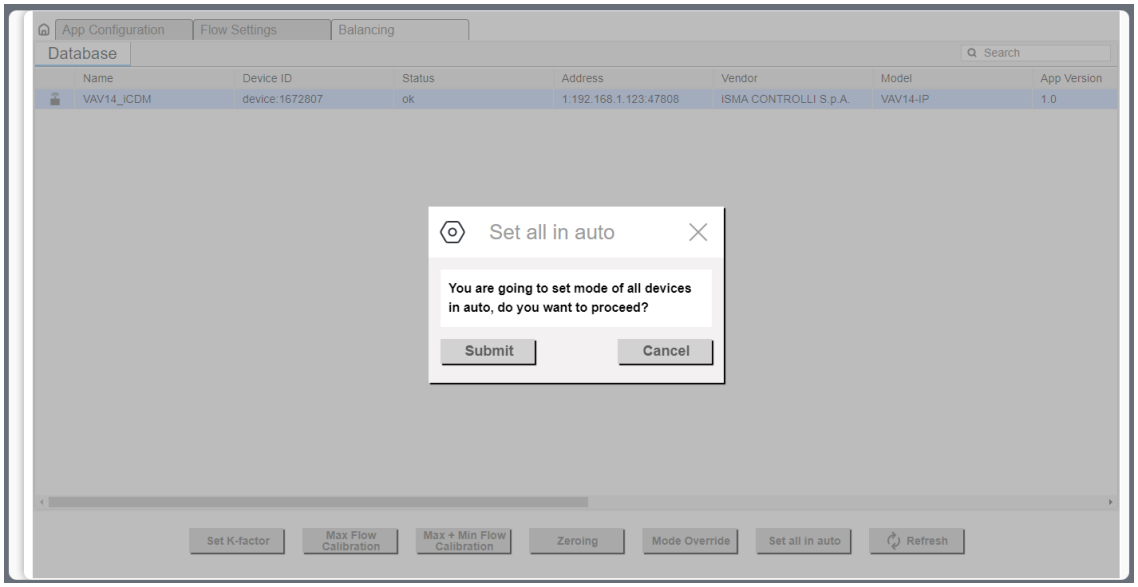


Figure 24. Set all in auto pop-up

2.6 List of Variables in Application

The below table lists all Data Points used in the VAV application as variables.

The application employs 82 licensed Data Points.

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
OccupancyCalculator								
OccupancyStatus	MDP	Unocc.	N/a	True	MSI2	22	No	Current occupancy status: 1: occupied 2: unoccupied 3: bypass 4: standby
OccupancyMode	MDP	Unocc.	N/a	True	MSV2	262	No	Allows to set room the occupancy mode from the BMS system: 1: occupied 2: unoccupied 3: bypass 4: standby
PanelOccupancyStatus	MDP	Unocc.	N/a	True	MSV3	700	No	Current room occupancy status dedicated to Control Point room panel 1: unoccupied 2: occupied 3: standby 4: bypass
PanelOccupancyMode	MDP	Unocc.	N/a	True	MSV4	701	No	Status of set room occupancy mode from Control Point room panel 1: unoccupied 2: occupied
PresenceSensor	BDP	N/a (derived from the app)	True/ false	True	BI0	301	No	Actual presence sensor state from the I1 input

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
WindowContact	BDP	N/a (derived from the app)	True/ false	True	BI1	303	No	Actual window contact state from the I2 input
BypassTimeOverride	ADP	120	s	True	AV34	234	Yes	Time required to maintain the bypass occupancy status (after expiration it returns to the previous status)
StandbyTimeOverride	ADP	15	s	True	AV35	235	Yes	Time required to change the occupancy status to standby (after motion detection disappears)
PanelOccupancyReset	MDP	Unocc.	N/a	True	MSV5	702	No	Resetting the room occupancy mode from occupied to unoccupied in the Control Point room panel 1: unoccupied 2: occupied
PresenceSensorInvert	BDP	Invert	True/ false	True	BV4	104	Yes	Allows to invert the I1 input signal if required: false (normal), true (invert)
WindowContactInvert	BDP	Normal	True/ false	True	BV5	105	Yes	Allows to invert the I2 input signal if required: false (normal), true (invert)
TemperatureSelector								
SpaceTemperature	ADP	N/a (derived from the app)	°C/°F	True	AI1	4	No	Calculated space temperature
NetTemperature	ADP	-327	°C/°F	True	AV10	210	No	Temperature sensor value from the network

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
U2SpaceTemperature	ADP	N/a (derived from the app)	°C/°F	True	AI3	3	No	Actual temperature sensor value from the local U2 input
PanelTemperature	ADP	N/a (derived from the app)	°C/°F	True	AI4	300	No	Actual temperature sensor value from the room panel
DischargeTemperature	ADP	N/a (derived from the app)	°C/°F	True	AI13	13	No	Calculated discharge temperature
NetDuctInTemp	ADP	-327	°C/°F	True	AV18	218	No	Discharge temperature sensor value from the network
U1DischTemperature	ADP	N/a (derived from the app)	°C/°F	True	AI16	16	No	Actual discharge temperature sensor value comes from the U1 input

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
U2SpaceTempType	MDP	10K3A1 NTC	°C/°F	True	MSV22	282	Yes	Allows to select the space temperature type: 1: Voltage measurement 2: Current 3: Resistance input 4: 10K3A1 NTC 5: 10K4A1 NTC 6: 10K NTC Carel 7: 20K6A1 NTC 8: 2,2K3A1 NTC 9: 3K3A1 NTC 10: 30K6A1 NTC 11: SIE1 12: TAC1 13: SAT1 14: PT1000 15: NI1000 16: NI1000 21C 17: NI1000 LG F 18: 10K Type2 NTC F 19: 10K Type3 NTC F 20: 20K NTC F 21: 3K NTC F 22: PT1000 F 23: NI1000 32F 24: NI1000 70F

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
U1DischargeTempType	MDP	10K3A1 NTC	°C/°F	True	MSV21	281	Yes	Allows to select the discharge temperature type: 1: Voltage measurement 2: Current 3: Resistance input 4: 10K3A1 NTC 5: 10K4A1 NTC 6: 10K NTC Carel 7: 20K6A1 NTC 8: 2,2K3A1 NTC 9: 3K3A1 NTC 10: 30K6A1 NTC 11: SIE1 12: TAC1 13: SAT1 14: PT1000 15: NI1000 16: NI1000 21C 17: NI1000 LG F 18: 10K Type2 NTC F 19: 10K Type3 NTC F 20: 20K NTC F 21: 3K NTC F 22: PT1000 F 23: NI1000 32F 24: NI1000 70F Connected to CP MSV12
TemperatureInputSelector	MDP	Panel	N/a	True	MSV23	283	Yes	Allows to choose the temperature source for control logic: 1: panel 2: input 3: network
OffsetCalculator								
OffsetTempSetpoint	ADP	N/a (derived from the app)	°C/°F	True	AV58	503	No	Temperature offset for setpoint from the room panel

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
SetpointOffsetRange	ADP	3	N/a	True	AV37	237	Yes	Sets the setpoint offset range to be changed by the user (e.g., a value of 5 means a range from -5 to +5), (min = 0, max = 10)
U3SetpointOffset	ADP	N/a (derived from the app)	°C/°F	True	AI17	17	No	Actual setpoint offset value (calculated from resistance) from the U3 input
PanelSetpointDisplay	BDP	N/a (derived from the app)	True/ false	True	BO56	156	Yes	Allows to select which value to be displayed during the offset editing according to the set Panel Setpoint Mode false (offset), true (setpoint)
NetOffsetSetpoint	ADP	0	°C/°F		AV41	241	No	Offset temperature setpoint value from the network
SetpointOffsetSelector	MDP	Panel	N/a		MSV24	284	Yes	Allows to choose the setpoint offset source for control logic: 1: panel 2: input 3: network
TemperatureSetpointSelector								
PanelSetpointMode	BDP	N/a (derived from the app)	True/ false	True	BO55	155	Yes	Sets the temperature setpoint mode in the Control Point room panel - directly or as an offset false (offset), true (setpoint)
OccHeatTempSetpoint	ADP	21°C/70°F	°C/°F	True	AV1	201	Yes	Temperature setpoint for heating in the occupied state

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
StandbyHeatTempSetpoint	ADP	19°C/67°F	°C/°F	True	AV3	203	Yes	Temperature setpoint for heating in the standby state
UnoccHeatTempSetpoint	ADP	16°C/64°F	°C/°F	True	AV5	205	Yes	Temperature setpoint for heating in the unoccupied state
EffectiveTempSetpoint	ADP	N/a (derived from the app)	°C/°F	True	AI9	9	No	Calculated effective temperature setpoint based on occupancy status and heating or cooling temperature setpoints (depending on demand)
CentralTempSetpoint	ADP	N/a (derived from the app)	°C/°F	True	AI10	10	No	Calculated Central Temperature Setpoint based on setpoints and occupancy status
PanelTempSetpoint	ADP	N/a (derived from the app)	°C/°F	True	AV56	501	No	Temperature setpoint from the room panel
MaxDischTempSetpoint	ADP	32°C/90°F	°C/°F	True	AV7	207	Yes	High limit of discharge temperature supplied to the room
ActDischTempSetpoint	ADP	N/a (derived from the app)	°C/°F	True	AI14	14	No	Calculated discharge temperature setpoint based on the effective temperature setpoint and heating demand for high-limiting discharge temperature
MinDischTempSetpoint	ADP	13°C/55°F	°C/°F	True	AV8	208	Yes	Low limit of discharge temperature supplied to the room
PressureSelector								
NetPressure	ADP	-327	Pa/"WC	True	AV40	240	No	Pressure sensor value comes from the network

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
U4PressureSensor	ADP	N/a (derived from the app)	Pa/"WC	True	AI8	8	No	Actual CO_2 sensor value from the local U4 input
SpacePressure	ADP	N/a (derived from the app)	Pa/"WC	True	AI5	5	Yes	Calculated space CO_2
U4PressureSensorRange	ADP	100	Pa/"WC	True	AV38	238	Yes	Sets the range of the pressure sensor used (min = 0, max = 1000)
PressureInputSelector	MDP	Input	N/a		MSV25	285	Yes	Allows to select the CO2 source for control logic: 1: panel - unused 2: input 2: network
U4PressureSensorMin	ADP	0	Pa/"WC	True	AV27	227	Yes	Sets the min value of range of the pressure sensor used
HeatLoop								
HVACMode	MDP	Auto	N/a	True	MSV1	261	No	Allows to set the operating mode for the VAV device: 1: Auto 2: Heat 3: Morning WarmUp 4: Cool 5: Night Purge 6: PreCool 7: Off (depressurize) 8: Fire (pressurize)
PanelHeating	BDP	N/a (derived from the app)	True/ false	True	BO16	116	No	Heating mode status to be displayed as an icon on the Control Point room panel false (no heating), true (heating)
DAT/PressureLoops								

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
SpacePressureSetpoint	ADP	0	Pa/"WC	True	AV6	206	Yes	Pressure setpoint for the room (regardless of the occupancy status)
DamperControl								
MaxDamperPosition	ADP	100	%	True	AV21	221	Yes	Maximum damper open position limit (min = 0, max = 100)
MinDamperPosition	ADP	0	%	True	AV22	222	Yes	Minimum damper open position limit (min = 0, max = 100)
UserSetPosition	ADP	0	%	True	AV64	291	No	User-set damper opening level (after selecting the User Position mode in the Damper Command variable) (min = 0, max = 100)
DamperPosition	ADP	N/a (derived from the app)	%	True	AO0	250	No	Actual damper opening level coming from the Rotary Actuator component (Position Feedback signal)
DamperResponse	ADP	2	%	True	AV26	226	Yes	Sets the value of how much the control signal must change to perform the next damper movement
DamperDriveTime	ADP	90	s	True	AV25	225	Yes	Time required to reach full damper open position (from 0% to 100%) (min = 0)
DamperDirection	BDP	Clockwise	True/ false	True	BV9	109	Yes	Sets the damper opening direction: false (CW), true (CCW)
DamperControl	ADP	0	%	True	AV67	294	No	Damper opening level control resulting from the application

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
DamperCommand	MDP	None	N/a	True	MSV7	267	No	Allows to set different damper command modes for calibration, balancing, or testing: 1: Auto/none (null) 2: Max flow 3: Min flow 4: User flow 5: User position 6: Full open 7: Full close 8: Calibrate
ReheaterControl								
LoadShedding	ADP	0	%	True	AV20	220	No	Load-shedding level required from the network (min = 0, max = 100)
ReheaterCommand	MDP	Auto	N/a	True	MSV9	269	No	Allows to set different reheater command modes for testing 1: Auto/none (null) 2: Full open 3: Full close
DualHeat	BDP	No	True/false	True	BV8	108	Yes	Allows to enable dual heating mode with repeater and perimeter: false (no), true (yes)
HeaterPriority	MDP	Reheater	N/a	True	MSV14	274	Yes	Possibility to select heating priority for heating sources: 1: reheater 2: perimeter 3: simultaneous
WarmUpHeater	BDP	Disabled	True/ false	True	BV1	101	Yes	Allows to use the reheater also in the Morning WarmUp mode (in the HVAC Mode variable): false (disabled), true (enabled)

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
ReheaterControl	ADP	N/a (derived from the app)	%	True	AO1	251	No	Reheater valve opening level control resulting from the application
TimePropReheaterPeriod	ADP	60	s	True	AV32	232	Yes	Time required for a PWM valve for a full cycle time of a reheater
FloatReheaterValveDriveTime	ADP	120	s	True	AV30	230	Yes	Time required for a floating valve for a full cycle time of a reheater
ReheaterStatus	MDP	Off	N/a	True	MSO0	290	No	Reheater staged control status (if configured as digital or staged) from application: 1: off 2: stage 1 on 3: stage 2 on
PerimeterControl								
PerimeterCommand	MDP	Auto	N/a	True	MSV10	270	No	Allows to set different perimeter command modes for testing 1: Auto/none (null) 2: Full open 3: Full close
PerimeterControl	ADP	N/a (derived from the app)	%	True	AO3	253	No	Perimeter valve opening level control resulting from the application
PerimeterStatus	BDP	Off	True/ false	True	BO0	120	No	Perimeter digital control status (if configured as digital) from the application: false (off), true (on)
TimePropPerimeterPeriod	ADP	60	s	True	AV33	233	Yes	Time required for a PWM valve for a full cycle time of a perimeter

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
FloatPerimeterValveDriveTime	ADP	120	s	True	AV31	231	Yes	Time required for a floating valve for a full cycle time of a perimeter
OutsideTemperatureControl								
MaxOatReheater	ADP	32°C/90°F	°C/°F	True	AV28	228	Yes	Maximum outside air temperature limit that allows the use of a reheater
MaxOatPerimeter	ADP	18°C/65°F	°C/°F	True	AV29	229	Yes	Maximum outside air temperature limit that allows the use of a perimeter
NetOutdoorTemp	ADP	-327	°C/°F	True	AV19	219	No	Outside air temperature sensor value from the network
DeviceConfiguration								
DeviceConfigurationSource	BDP	BACnet	True/ false	True	BV12	112	Yes	Allows to choose to set a source of the device application configuration: false (BACcnet), true (DIP switch)
PerimeterType	MDP	None	N/a	True	MSV13	273	Yes	Allows to set the perimeter type: 1: none 2: TimeProp 3: digital 4: float
ReheaterType	MDP	None	N/a	True	MSV12	272	Yes	Allows to set the reheater type: 1: none 2: TimeProp 3: staged 4: float

Name	DP type	Def. Out value	Units	Exposed on BACnet/ Modbus	BACnet ID	Modbus dec. addr.	Conf. data ext.	Description
Units	BDP	Metric	True/ false	True	BO2	122	Yes	Allows to change the unit in the application provided that the BACnet configuration is allowed in the Device Configuration Source variable: false (metric), true (imperial)
UpTime	ADP	N/a (derived from the app)	s	True	AI0	0	No	Device's up time
AppVersion	ADP	1.0	N/a	True	AI100	102	No	Current application version
TriacOutputsConfig								
TO4	ADP	0		False	996	996	No	
TO3	ADP	0		False	997	997	No	
TO2	ADP	0		False	998	998	No	
TO1	ADP	0		False	999	999	No	

2.6.1 List of I/Os

I/O number	Signal
U1	Discharge air temperature
U2	Space temperature
U3	Setpoint offset

I/O number	Signal
U4	Pressure sensor
I1	Presence detection
I2	Window contact
A1	Reheater analog
A2	Perimeter analog
A3	
TO1	Reheater PWM/reheater digital/reheater 1-stage/reheater close
TO2	Reheater 2-stage/reheater open
TO3	Perimeter PWM/perimeter digital/perimeter close
TO4	Perimeter open

2.7 App Display in nanoWebUI™

nanoWebUI™
From the nano EDGE ENGINE OS V1.9.0, the functionalities of tagging and web server display (nanoWebUI™) are available for Data Points management.
The nanoWebUI™ is a modern HTML5 web user interface that presents live nano EDGE ENGINE-controller data from applications, Equipment components and Data Points. The view is automatically generated during controller programming.
The nanoWebUI™ is based on the Haystack HTTP API and creates a fully functional, responsive UI the moment a control logic is deployed. It provides a structured real-time visualization, enabling an effective time-saving monitoring and direct control of system data. The web interface is easily accessible from an HMI panel or a standard web browser on PC and mobile devices.
Learn more about:
- tagging Data Points,
- nanoWebUI™.

The nanoWebUI™ display of Data Points is based on tagging—if the Data Point has the auto-tag function enabled and the web:expose tag's value is true, then it is visible and manageable in the nanoWebUI™. In the VAV14-IP application, the following Data Points have the auto-tag function enabled and are therefore by default displayed in the nanoWebUI™:

- OccupancyStatus,
- SpacePressure
- SpaceTemperature,
- EffectiveTempSetpoint,
- DamperPosition,
- OccupancyMode,
- OccHeatTempSetpoint,
- UnoccHeatTempSetpoint,
- PanelTempSetpoint.

Note: Six Data Points are set to be displayed on the nanoWebUI™ homepage: OccupancyStatus, SpacePressure, EffectiveTempSetpoint, SpaceTemperature, OccHeatTempSetpoint, UnoccHeatTempSetpoint.

Adding Data Points to the nanoWebUI™

It is possible to add more Data Points from the VAV14-IP application to be displayed in the nanoWebUI™. To this end, go to the Data Point and enable the auto-tagging function. The exact method depends on the tool used to connect to the VAV14-IP controller:

- iC Tool: Tag Manager,
- nE2 Link module in the iC Workbench: Tagging service.

Editing Data Points in the nanoWebUI™

Editing Data Points in the nanoWebUI™ involves a possibility to change Data Point's value and is dependent on the widget used to display the Data Point. Types of widgets and their usability for different types of Data Points are described here: nanoWebUI™.