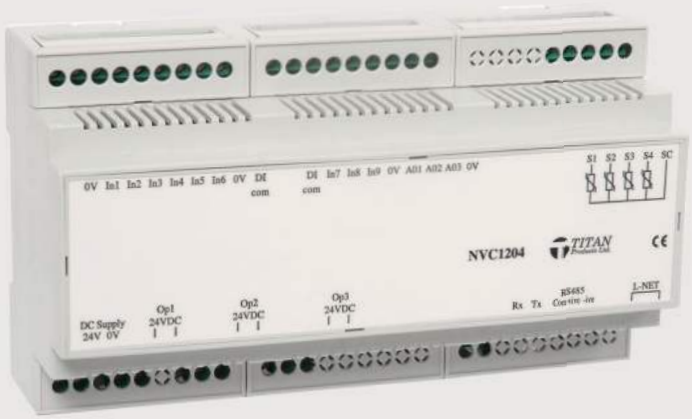


24VDC REVERSE DRIVE NATURAL VENTILATION CONTROL

The NVC1204 provides ventilation on demand control of 3 x 24VDC reverse drive outputs for natural ventilation applications.

NVC1204 FEATURES

- Up to 3 zones of 24VDC control
- Flexible CO2 and temperature control options
- Control interlocks for external temperature, heat, wind, rain and fire
- BACnet MS/TP communications

The outputs can be driven in unison for banks of windows / ventilation dampers, or individually providing up to 3 zones of control depending on the temperature and CO2 conditions within the controlled space(s).

Digital inputs can be allocated or written to via the native BACnet communications for wind, rain, fire and heating to ensure the windows or dampers are closed, or set to a minimum position, should the application require.

Temperature and CO2 values derived from either 0-10V sensor inputs or written values via the native BACnet communications, allow the controller to position the windows / dampers either based on the temperature within the space, or on a priority demand basis of both the temperature and CO2 values.

A Titan ACO window interface unit can be allocated to each zone to provide manual override of the auto control to close or open the windows.

SPECIFICATION

Power Supply:	24VDC +/- 10% Ensure PSU is rated for total output load.
Power Consumption:	150mA (excluding RDU) 400mA (including RDU)
Inputs / Outputs:	3 x 24VDC relay outputs 3 x 0-10V outputs 9 x Digital / 0-10V inputs 4 x 10K3A1 temperature sensor inputs
24VDC relay outputs:	5A max at 240V (ensure total output load across all 3 x outputs must not exceed 9A max at 240V)
0-10V outputs:	5mA max
Temperature inputs:	10K3A1
Communications:	BACnet MS/TP (RS485)
Indication:	Tx/Rx
Operating temperature:	5-40 °C
Operating humidity:	20-80% RH non-condensing
IP rating:	IP20
Mounting:	Din Rail
Dimensions:	159 (w) x 90 (h) x 58 (d) mm
Country of origin:	UK
Product Code:	NVC1204

CONTROL OPERATION

The control action of the outputs is Time Proportional Control (TPC) based on the measurement of the respective CO2 and temperature values within the zone.

Temperature sensors can be either 0-10V input (scaled 0-50°C) or 10K3A1 thermistor. Each zone is set to operate the controller outputs on a rise in temperature for comfort ventilation control.

S4 temperature sensor input is allocated to the measurement of the external temperature. The external temperature and respective internal temperature values are also used for determining summer/winter seasonal conditions as well as the night Free Cooling (Purge) cycle.

CO2 sensors are allocated to an analogue input with the option for each zone to have its own dedicated CO2 sensor.

All temperature and CO2 sensor inputs can be written to via BACnet sensors if preferred over wired connections.

On power up the controller will synchronise the outputs to a closed condition for the duration of the set actuator drive time plus a percentage of overrun time. The overrun time is to ensure a datum point can be established on power up since the position of the vents is not known at this time. The overrun time setting is added to the close signal each time a call is made for the vent actuators to be fully closed.

A signal to open the vents during the synchronisation period will be ignored until the synchronised process is complete.

Each output is individually fused with PCB mounted resettable fuses and the three outputs are fed from the high current 24V DC controller supply.

The output drive status is indicated by a tri-state LED showing:

Output LED status	**Description**
OFF	No window drive
Green	Window opening
Red	Window closing

SETUP

The settings listed describe a range of standard options and operational features that are available from the applications library that is resident in the Natural Ventilation Controller software.

All settings are passcode protected and set via a Titan PID field programming tool at commissioning or can be pre-programmed in the factory prior to despatch.

Control settings can also be adjusted via BACnet communications if required.

BACNET MS/TP NETWORK SETTINGS

Network:	Native BACnet (RS485 MS/TP) or Stand-alone
Unit address:	Sets the controller unit MAC address on MS/TP bus. **Range 1 to 127**
Baud Rate:	Communication baud rate **Range Options: - 9,600 19,200 38,400 or 76,800**
Dev Object ID:	Allows the setting of the device object ID. **Range 0 to 4194302**
Group Control:	Allows individual controllers to be set-up as a **Group Master** or **Group Slave**. This sets groups of controllers to take control information and instructions such as temperatures, Global Setpoint, occupancy, Heat, Rain and Fire inputs from a common Master (125 Slaves max). Any number of Groups can be set within the limit of 126 controllers on the MS/TP network

CONTROL INPUT SETTINGS

Global Input Settings

The external temperature can be written to the controller via BACnet communications or connected to the S4 input of the NVC1204 using a 10K3A1 outputs temperature sensor.

The external temperature sensor/value is used for a number of control options.

a) Used for a low limit to reset the temperature control to minimum fresh air should the external temp fall below a preset level (See External Low Limit). CO2 control of the ventilation can be set to take priority in low limit temperature conditions.

b) Used to monitor the external temperature in un-occupied modes to activate or inhibit free cooling (see Free Cooling).

c) Used to adjust the Global Temperature Setpoint in compensated control mode.

If the External temperature value is supplied from the BMS then the controller physical input must be taken out of service (OOS).

Additional Global Inputs

The NVC1204 supports several global inputs that can be written to or allocated to a digital input:

Input Type	**Control Action**
Adverse weather / wind	Close all vents / windows fully or to min position
Fire	Close all vents / windows
Unoccupied	Close all vents / windows
Occupied	Auto control of vents / windows
Night purge	Open selected vents / windows

Zonal Inputs

Zone Tempetaure 0-10V (scaled 0-50°C), 10K3A1 thermistor input or written to via BACnet communications.

Zone CO2 0-10V (scaled 0-2000ppm) or written to via BACnet communications.

Manual Control (ACO) 0-10V control signal from ACO to manually open or close window / vent position.

GLOBAL APPLICATION SETTINGS

Control Overrides

External Low Limit If the external temperature falls below a set threshold, the normal temperature control is inhibited and the vents are reset to minimum position (option selectable). The CO2 level is still allowed to control the ventilation under low external temperature conditions.

Internal Low Limit If the internal temperature falls below a set threshold, the CO2 control and/or Manual Open signals can be inhibited (if required).

Manual Control Use a Titan ACO room interface unit.

Free Cooling

During the unoccupied periods the ventilation should normally be fully closed. Free cooling is dictated by the Controller or BMS and this will allow the vents to be pre-positioned to any of the 4 vent positions for night cooling.
The Free Cooling will be inhibited if the external temperature is below the low limit threshold.

Time Control

The occupancy times can be transmitted to the controllers by the BMS or if required the NV1204 can be programmed via its own internal calendar time scheduler. In a Group Master/ Slave setup the group occupancy can be transmitted from the designated NV1204 Master.

Output Control

Determines the number of individual controlled zones and the number of outputs that can be attached to a single zone.

Note: if 3 selected then the following options are not allowed:

- DC Outputs for Zone 1 – (op1, or + op2, or + op3, or all)
- DC Outputs for Zone 2 – (op2, or op2 + op3)

Global Temperature Setpoint

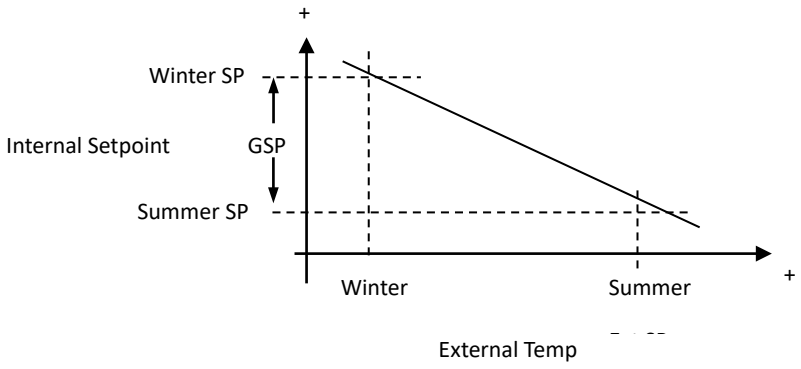
GSP Type

Fixed or externally compensated.

The Global Temperature Setpoint (GSP) is determined by the external temperature compensation or Fixed. The GSP is used for the base temperature setting of the zone control point.

If a Fixed setpoint is selected, then this is set at setup or over the network and this value will become the controller's fixed default value.

If externally compensated, then a continuous temperature compensated adjustment of the GSP is exerted within the controller using the internal Winter and Summer SP with the Winter and Summer Ext SP. (see fig below). The value of the external temperature can be derived from a sensor input or via the network.



The following settings need to be entered if externally compensated adjustment is used for the GSP

Winter SP
The maximum internal temperature setpoint to be used during winter conditions.
Range: 0 – 30°C

Summer SP
The minimum internal temperature setpoint to be used during winter conditions.
Range: 0 – 30°C

Win Ext SP
The external temperature that corresponds to the maximum winter control setpoint when using external temperature compensation to define the global setpoint.
Range: 0 – 30°C

Sum Ext SP
The external temperature that corresponds to the minimum summer control setpoint when using external temperature compensation to define global setpoint.
Range: 0 – 30°C

If GSP is set for temperature compensation, then each zone setpoint can be adjusted plus or minus providing an adjustment to the calculated setpoint that is derived from the compensated schedule.

Rain Vent Position — If rain is detected by the controller then automatic control is inhibited and the ventilation dampers are driven to the minimum % setting (ZN Min % if set) until the rain detection is cleared.

CO2 Setpoint — Defines the point at which the CO2 value begins to open the ventilation using its own Proportional control function and this setting is common to the 3 controlled zones.
Range: 0 – 2000ppm

Ext LL Position — Defines whether the vents should be fully closed or set to Min% when the external temperature falls below the low limit setting. If disabled then the natural ventilation temperature control is not inhibited or reset by low external temperature conditions.
Range: Min%/Closed/Disabled

Ext LL Thres. — Defines the external low limit threshold below which the ventilation dampers will be closed.
Range: 0 – 30°C

Int LL CO2 — Defines whether an internal low limit temperature will inhibit CO2 ventilation control.
Range: Enabled/Disabled

Int LL Man — Defines whether an internal low limit temperature will inhibit CO2 control or manual open override from the ACO room unit
Range: Enabled/Disabled

Int LL Thres — The internal low limit temperature value that will inhibit the activation of the CO2 control and manual override from the ACO. The use of the inhibit action on both conditions can be individually selected.
Range: 0 – 30°C

Heat Position — The ventilation position will automatically go to the closed or minimum % setting if Heat On is detected.

CO2 — Defines whether CO2 control is required. If Crtl is selected then the output control is based on the greater of the temperature or CO2 values also if selected the CO2 values are displayed on the RDU
Range: No Ctrl/Ctrl

Free Cool — Selects the position of the vents for Free Cooling. There are 4 positions plus closed as described in the control section. Free cooling will also be dictated by the BMS as and when required.

Free Cool Int — The internal temperature limit above which the action of Free Cooling in the un-occupied period will be allowed by the controller.
Range: 0 – 30°C

Occ Override Time — Allows occupancy extension outside normal hours of operation. The controller will automatically time out and reset to the desired operation after the elapse of override time setting.
Range: 0 – 8 hours

ZONAL APPLICATION SETTINGS

Relay Drive Time	The time taken by the ventilation drive motors to run from fully closed to fully open and is used to provide the positional adjustment of the vent to match the control voltage signal input. There will be a setting for each output and the ability to select a common time base for all 3 outputs. **Range: 5 – 300 seconds**
Relay Delay Overrun Timer	Used to add additional drive time to the close signal to ensure the vents are fully closed each time a 0V input is seen or on start up or when the controller is switched Off or on actual power up. **Range: 0 – 300% of drive time**
Zn RSP Range	This is the + and - adjustment of offset of the zone GSP allowed by the BMS or RDU/FPT **Range: 0 – 5°C**
Zn Temp PB	Defines the proportional band for the temperature control. **Range: 1 – 5°C**
Zn CO2 PB	This defines the proportional band for the CO2 control. **Range: 100 – 1000ppm**

CONTROLLER PHYSICAL IO

9 x Analogue Inputs	Used for the CO2 sensors, temp sensors and ACO manual override units.
4 x Temperature Sensors	Used for the internal temperature measurement of the controlled zones and the external temperature.
3 x 0-10V Analogue Outputs	Outputs are configured to provide the following control options: - Zone 1 - ACO Zone 2 - ACO Zone 3 - ACO
3 x 24VDC Outputs	24V DC outputs for each of the three zones or can be used for one common zone in unison.

CONTROLLER TERMINAL LAYOUT