

NV Embedded®

A guide for Integration with BMS/BAS

This document describes the different options and methods for integrating the NV Embedded® (NVE) system with a Building Management System (BMS) or a Building Automation System (BAS).

The information in this guide can be useful to NV Embedded® installers wanting to integrate the NVE system with a BMS system, BMS providers having to integrate their system with NVE, or consulting engineers trying to define the requirements for such an integration.

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1 General

Multiple methods and integration levels are available for connecting the NVE system with a BMS. The selection of the appropriate method and level for a specific project must be determined through close coordination and a detailed agreement with the BMS provider.

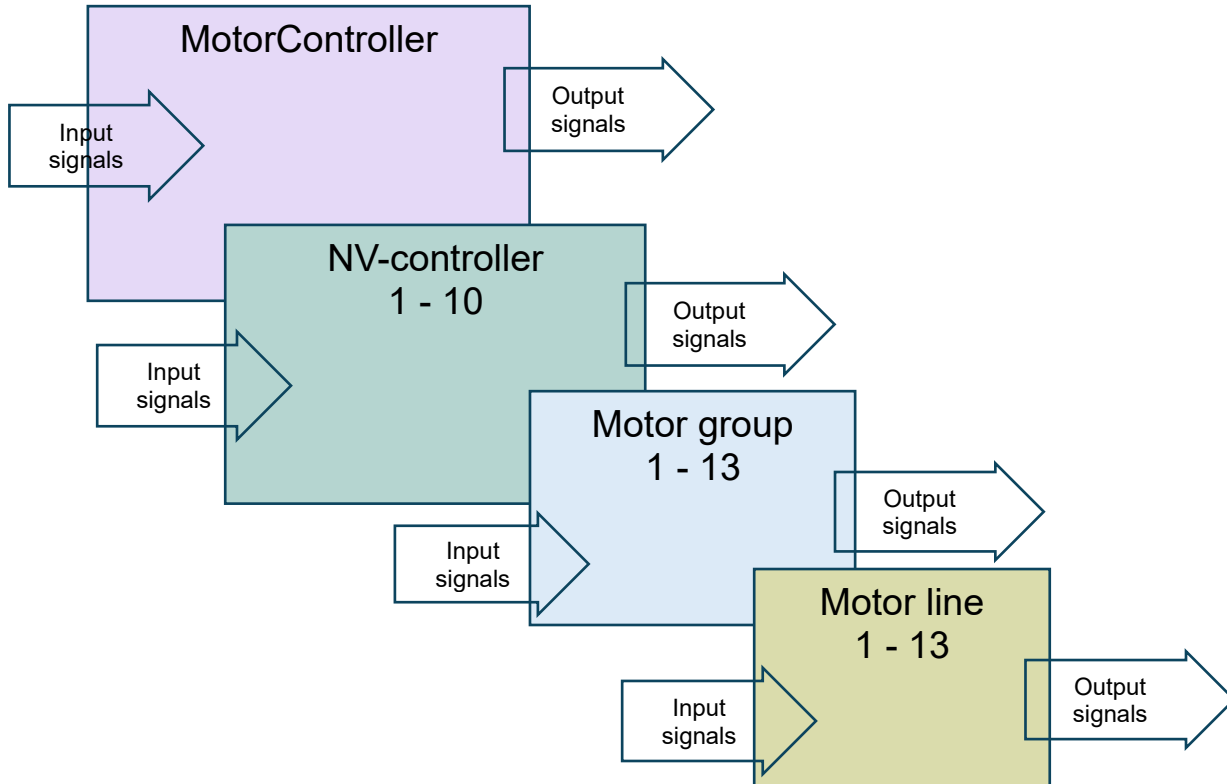
To implement a successful integration, you must agree with the BMS on:

- a. The medium for the signals exchange. For example – BACnet IP.
- b. Allocation of functionality. We recommend that the BMS maintains the general control deciding under what conditions NVE will be active/inactive and that NVE uses its advanced logic to control the indoor climate in the building when it is active.
- c. Source of sensor input. For example - The BMS sends the weather data to NVE. NVE sends actual zone temperatures, CO2 level and relative humidity to BMS.
- d. A list of the specific data points (objects) that NVE sends and receives to/from the BMS in this project.
- e. Enterprise responsibility. For example – The BACnet MS/TP bus cable and connecting it to WindowMaster MotorControllers is the responsibility of the BMS. Configuring, commissioning and maintaining the WindowMaster MotorControllers is the responsibility of WindowMaster.

In Appendix A you can find references to available tools and templates to help you collecting, documenting and sharing the information required for a successful integration.

1.1 The MotorController objects structure

The WindowMaster MotorControllers are designed with an object structure that enables exchanging signals on different levels and for different purposes. Each object provides a set of input signals – signals that the object can receive, and a set of output signals – signals that the object can send. A MotorController has up to 13 instances of each object type, depending on the MotorController and object type.



Motor line objects are assigned to Motor groups and Motor groups objects are assigned to NV-controllers. The MotorController is the hardware NVE is running on.

1.2 Signals (commands) Priority

Signals used to command windows to open, close or stop can be state driven – meaning that they are in force when active and not in force when inactive - or the signals can be event driven – meaning that when being activated, a command is sent to the windows and windows react to the latest received command (signal activation) even when it is received while the previous signal is still in its active state.

The Open, Close, Stop commands to windows have an inbuilt priority.

- Highest priority –
The “High priority open” signal. This signal is only available as a Local Input signal. It is not available as a fieldbus object. The priority of this signal can be configured in each Motor line as higher or lower than the “Safety” and the “Rain” signals. When a Motor line is configured with the signal having highest priority and the signal becomes active, the windows, connected on the Motor line, will open and stay opened as long as the signal is active, regardless of any other signals or commands to the Motor line.
This signal is a state driven On/Off signal.
- High priority –
The “Safety” and the “Rain” signals. When any of these signals is active, windows opening will be limited to the respective configurable ‘Max. opening’ parameter, commonly the “Closed” (0%) position.
These signals are On/Off signals and are state driven signals.
- Middle priority –
The Manual (Hand) Open/Close/Stop signals. When a Hand position command is sent to the windows, the windows will drive to the commanded position, using the configurable ‘Manual speed’, and the lower priority Auto commands will be ignored for a configurable period, default 30 minutes. The Manual commands are intended for people pressing a switch and overriding the automatic system for the configured period.
‘Hand_Absolut_position’ drives the windows to an absolute position between 0% - 100%.
‘Hand_Relative_position’ drives the windows to a position -100% to +100% relative to the current position of the windows.
These signals are event driven.
- Low priority –
The Auto(matic) signals. When an Auto position command is sent to the windows, the windows will drive to this position, using the configurable ‘Auto speed’.
The Auto position commands are intended for use by automatic systems, enabling people to override them by using the ‘Manual position’ commands.
These signals are 0% - 100% commands and are event driven.

2 Integration methods

The NVE system and the MotorControllers can exchange signals with the BMS through the Local Inputs/Outputs or through fieldbus communication.

The WxC 3xx MotorControllers support the KNX, BACnet IP, BACnet MS/TP, Modbus TCP and Modbus RTU fieldbus protocols.

The WSC 5xx Smoke panels support the KNX and BACnet IP protocols.

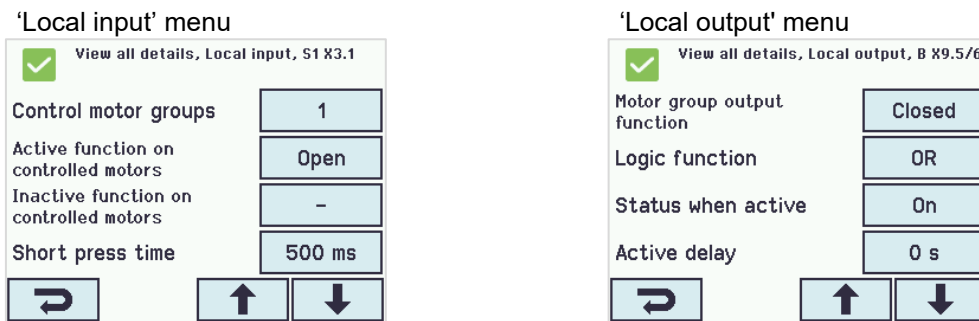
2.1 Integration through Local Inputs/Outputs

Local Inputs are commonly used to send “Open/Close/Stop” commands to Motor lines or Motor groups, as well as sending the “Safety” or the “Rain” signals to Motor groups. There are no Output signals from Motor lines.

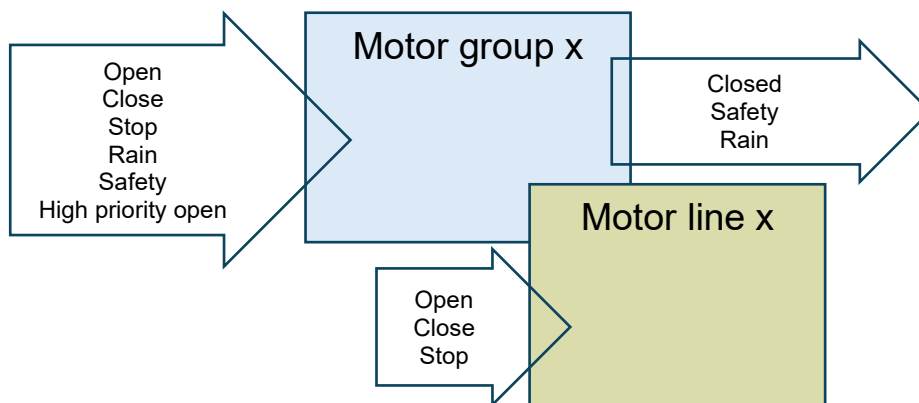
The signal/command sent, when an Input is being activated, (the function of the Input) is configured in the ‘Local Input’ menu.

The destination of the sent signal/command can be Motor line(s), Motor group(s) or NV-controller(s). The destination (association) is also configured in the ‘Local input’ menu.

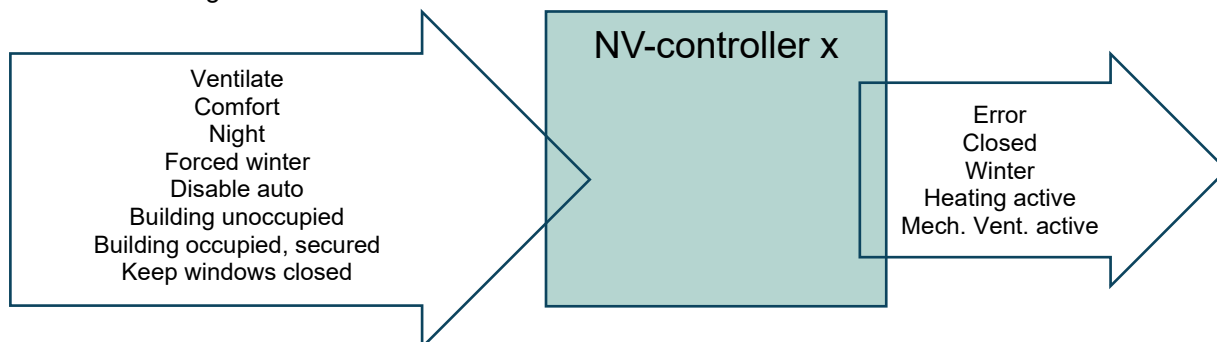
Local Outputs are associated with either Motor group(s) or NV-controller(S) in the 'Local output' menu. The events, in these objects, that are indicated by the Outputs signals are also configured in the 'Local Output' menu.



Most common signals (also called 'Functions') for Motor lines and Motor groups:



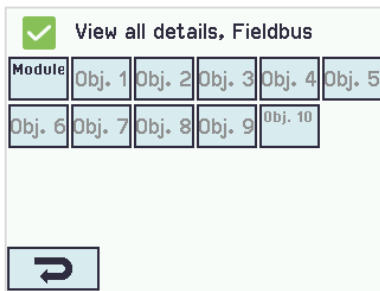
Most common signals for NV-controllers:



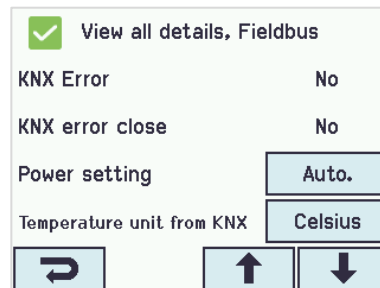
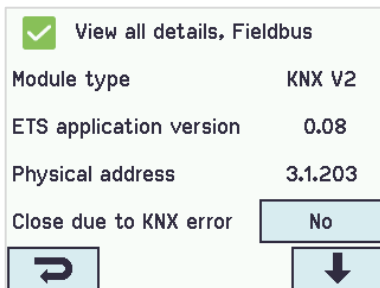
2.2 Integration through KNX

To communicate through KNX the WCA 3FK KNX interface module must be installed on WxC 3xx panels or the WSA 5MC KNX module must be mounted in WSC 5xx panels. The KNX interface must be programmed with ETS for the panels to be able to use it. It is possible to ETS program the WCA 3FK interfaces, when they are connected on a KNX bus, also when they are not plugged on the WxC 3xx panels. This enables off site ETS programming of the interfaces belonging to a Project.

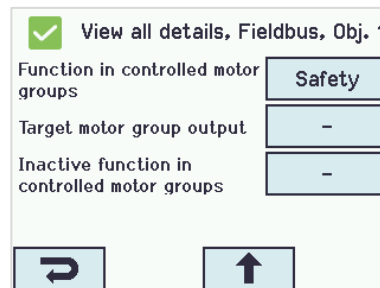
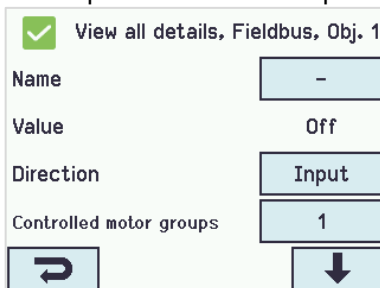
When a KNX interface is connected, the 'Fieldbus' menu becomes visible.



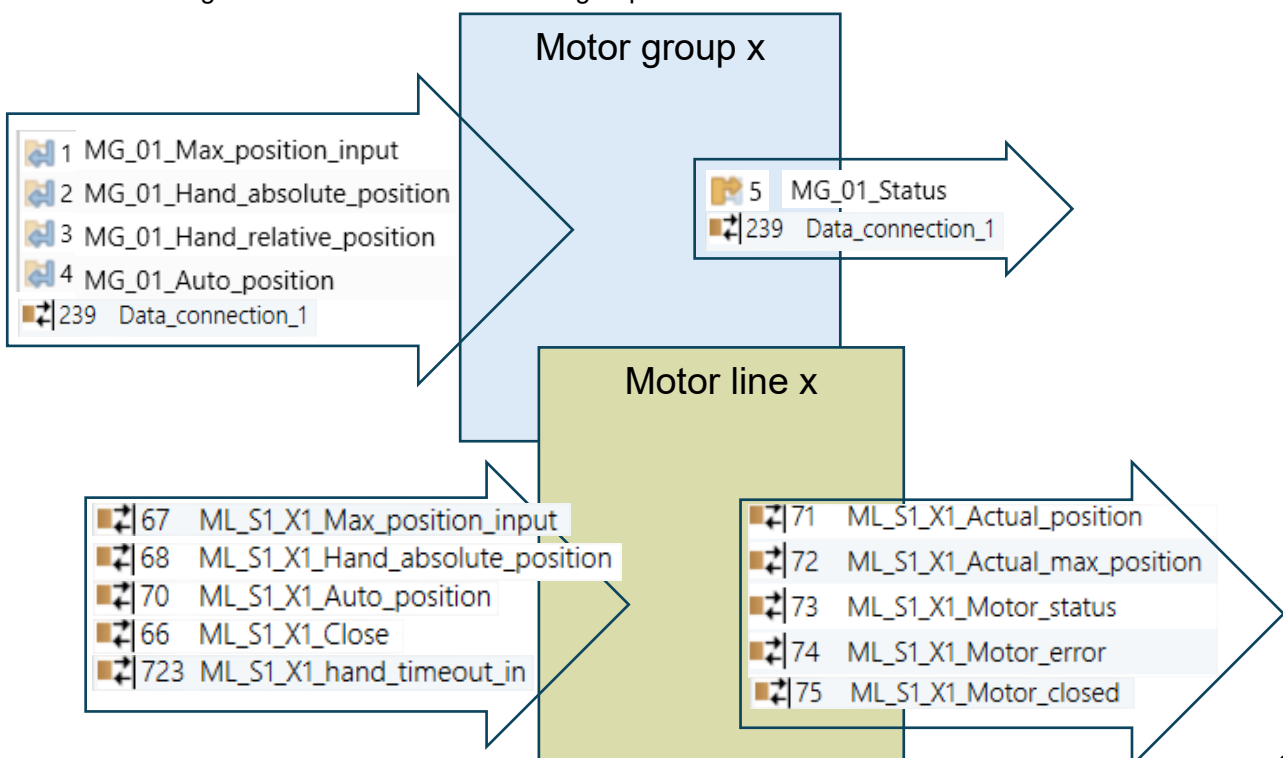
The 'Module' object shows the ETS programming of the interface and enable setting parameters such as 'Close due to KNX error' or the temperature units the interface will send or receive.



The 10 "Obj. x" objects can be configured as Inputs or Outputs and can be used similarly to the physical 'Local Inputs' and 'Local Outputs'

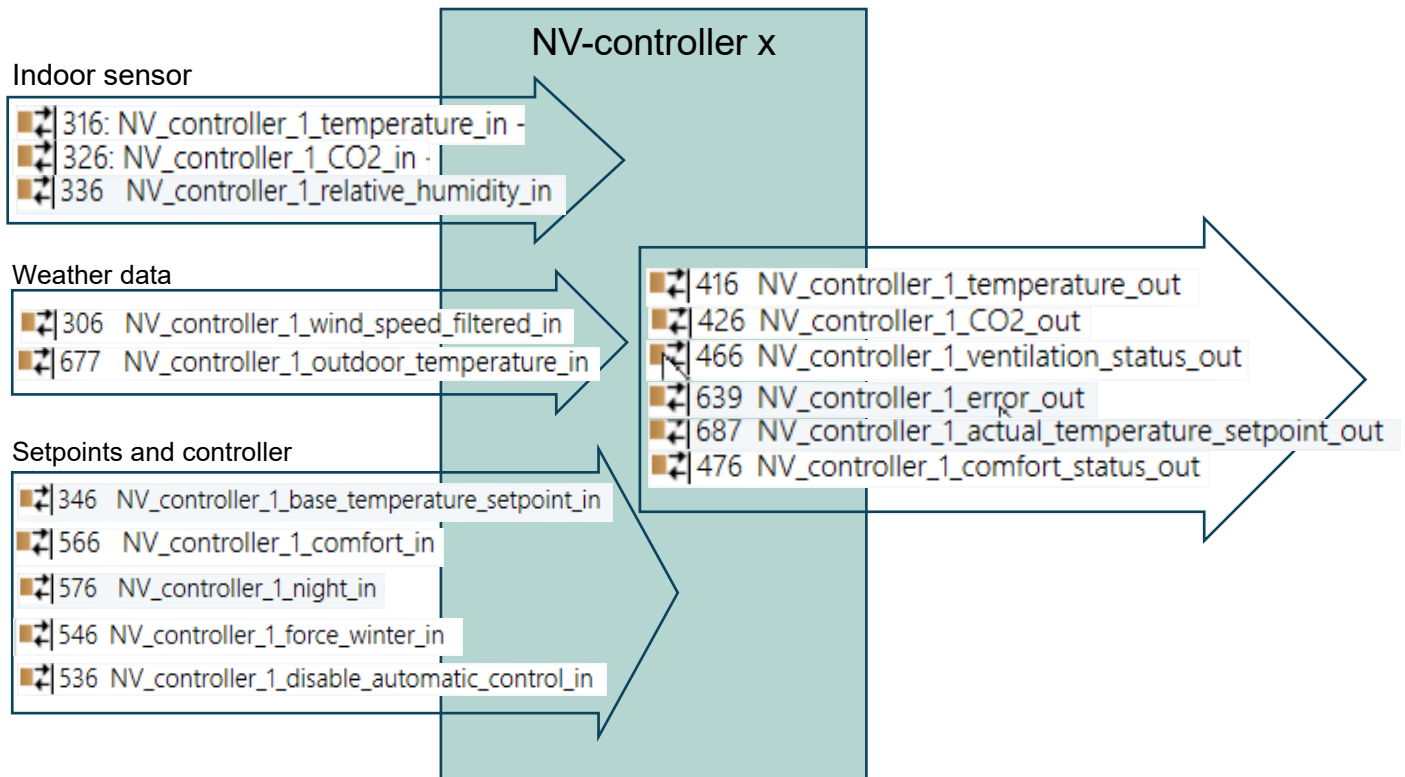


Most common signals for Motor lines and Motor groups:

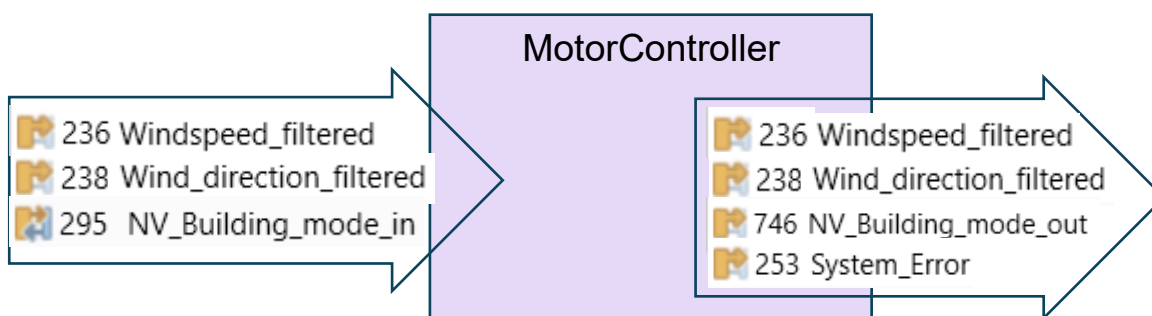


- Note that the Motor group 'Data_connection_x' can be configured as either Input or Output and can be programmed for different functions. See the descriptions of the Local Inputs/Outputs

Most common signals for NV-controllers:



Signals for MotorControllers:



See the 'WxC xxx v2 KNX Application Program Description EN.pdf' document, available on the WindowMaster web site, for a detailed description of all the available KNX group objects.

2.3 Integration through BACnet

BACnet communication can be established using 2 different physical media. BACnet IP is running over Ethernet and using the UDP/IP protocol for transportation. BACnet MS/TP is running over a twisted-pair cable, and the communication is based on the RS-485 standard.

The WxC 3xx panels can run BACnet IP when the WCA 3FB interface is connected and can run BACnet MS/TP when the WCA 3FM interface is connected.

The WSC 5xx panels only running BACnet IP and the WSA 5MC KNX module must be mounted to enable the communication.

BACnet MS/TP interface configuration

When the WCA 3FM BACnet MSTP interface is plugged on a WxC3xx panel, the 'Fieldbus' menu becomes visible.

Select the 'Module' object and select "BACnet MS/TP" for the 'Fieldbus protocol'.

Set a unique 'BACnet MS/TP MAC address' between 1 – 127 for each panel. The MAC addresses must be coordinated with the BMS, so addresses are unique over all the BACnet devices connected on the same subnet and for the BMS to know which physical panel corresponds to what address. For effective communication it is recommended that all WindowMaster panels on a subnet have sequential addresses. The 'BACnet MS/TP baud rate' must also be agreed upon with the BMS to ensure successful communication.

BACnet IP interface configuration

To run BACnet IP on WxC 3xx panels, the WCA 3FB interface (or the WCA 3FM) must be plugged on them. To run BACnet IP on WSC 5xx panels, the WSA 5MC KNX module must be used.

You must configure the inbuilt Network interface of the panels, in the 'Network' menu, to enable IP communication with the BMS. The 'IP address', 'Subnet mask' and 'Default gateway' must be coordinated with the BMS.

When DHCP mode is used, you must contact the network administrator and ask to lock the IP's the panels obtained to the panels, MAC addresses. This will ensure that the IP addresses of the panels will remain unchanged and the BMS will not lose contact with them.

BACnet configuration

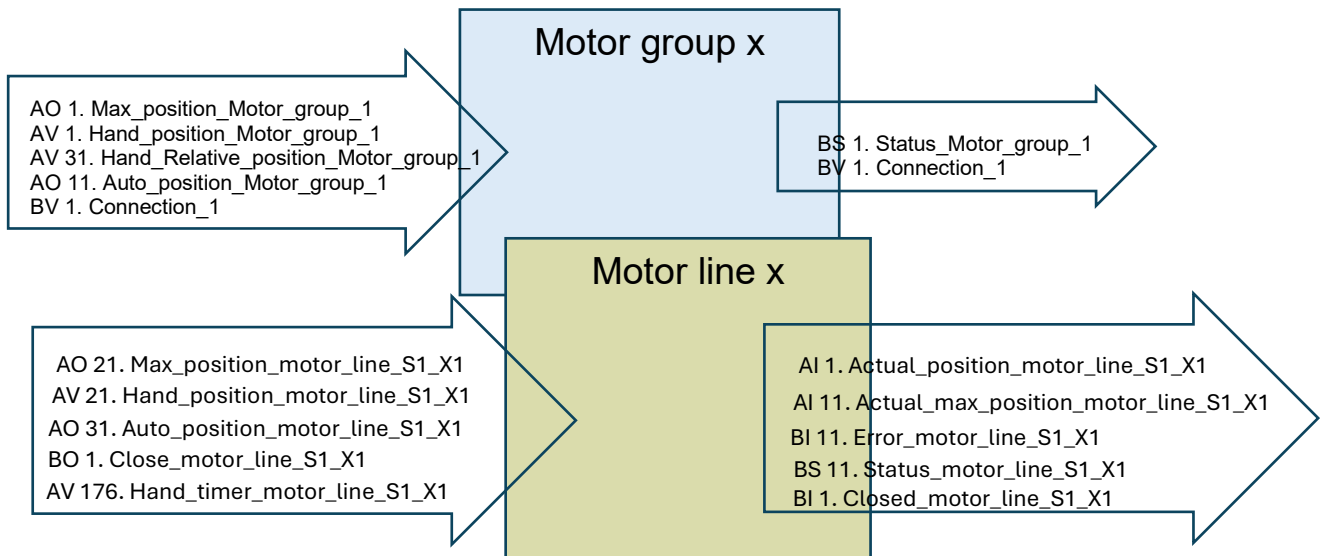
In the 'BACnet menu select the 'Common' object and enable BACnet.

Insert the 'BACnet device instance', a unique number between 1 – 4194302. The 'Name' parameter is optional and can be inserted using WMaMotorParamTool provided a USB stick is plugged on the panel. The name can help operators of the BMS system to identify the panel they are looking at.

The 'BACnet IP UDP port number' must not be changed unless specifically asked to by the BMS.

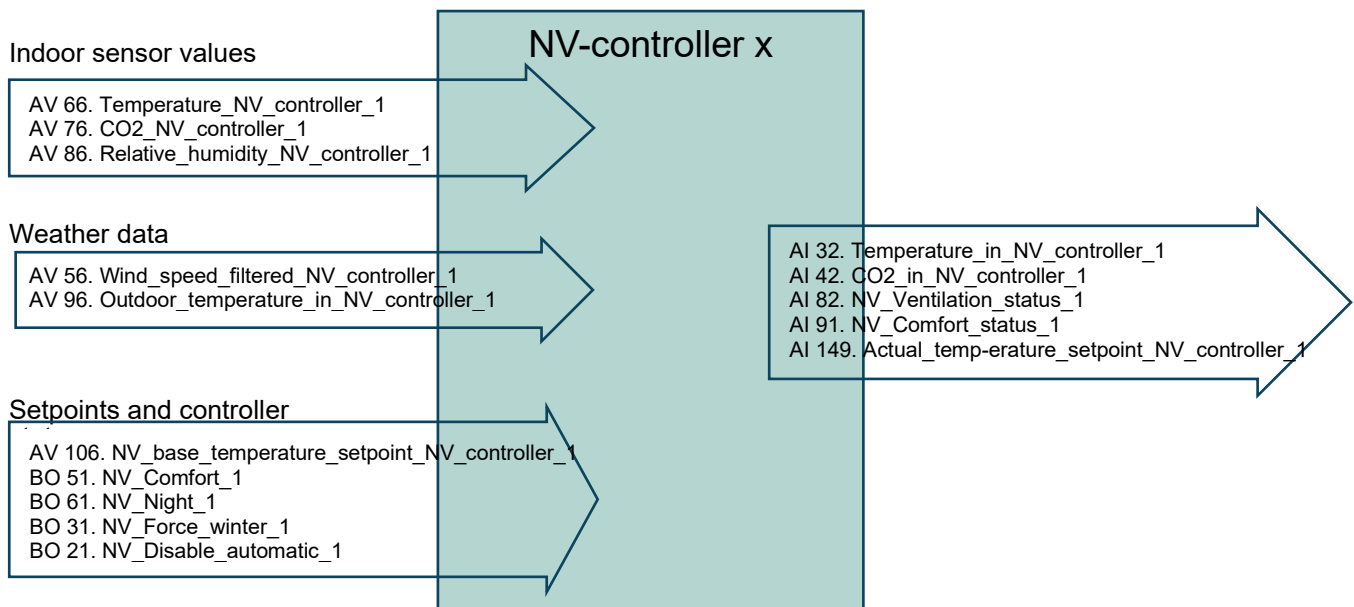
For the configuration of the 10 'Obj. x' objects see the description in the "Integration through KNX" chapter above.

Most common signals for Motor lines and Motor groups:

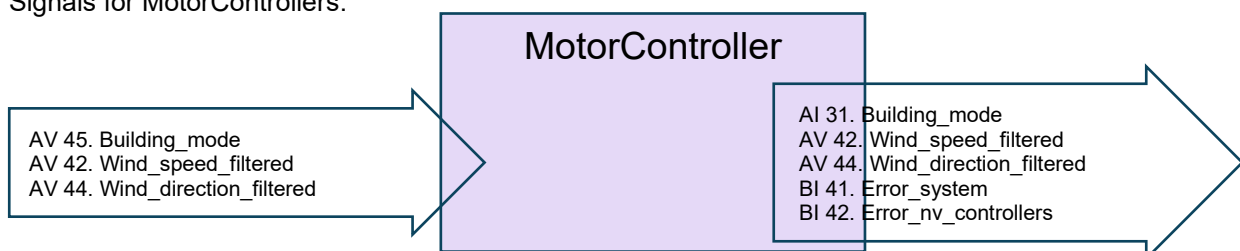


- Note that the Motor group 'Connection_x' can be configured as either Input or Output and can be programmed for different functions. See the descriptions of the Local Inputs/Outputs

Most common signals for NV-controllers:



Signals for MotorControllers:



See the 'PICS WxC 3xx 2.20.pdf' document, available on the WindowMaster web site, for a detailed description of all the available BACnet objects.

Tips to improve BACnet MS/TP communication

The BACnet MS/TP communication is slow with a low throughput. We recommend using BACnet IP instead of BACnet MS/TP if possible.

When BACnet IP is not an option we recommend the following to improve the reliability and stability of the BACnet MS/TP communication:

- a. Decrease the polling rate. Building automation is not sensitive to very fast responses. A polling rate of one second or even 5 seconds is adequate. There is no need for milliseconds polling rates.
- b. Avoid polling all the available objects of the WindowMaster device, there are around 800 of them. Poll only the limited number of objects you are actually interested in.
- c. Assign sequential MAC addresses to the WindowMaster devices on a subnet.

2.4 Integration through Modbus

This document does not describe the integration through Modbus in details. The signals available on Modbus are similar to the signals available on BACnet.

See the 'MODBUS WxC 3xx 2.xx Register Description.pdf' document, available on the WindowMaster web site, for a detailed description of available signals.

APPENDIX A

The following files, available from WindowMaster web site, can support collecting and documenting information regarding integration with BMS and exchanging the information with the BMS system.

A.1 '3.1.9 Project xxxxxx, NVE - Technical System Description xxxxxx.xlsm'

This file is designed to support planning, commissioning, configuring and documenting each MotorController including in a NVE system.

A function in this file automatically creates a .csv file including a default list of the most used BACnet objects, of each MotorController, that the BMS can use to send and receive signal values.

BACnet objects

* Select the BACnet objects you need, depending on the integration requirements, as agreed with the BMS company.
* The Motor controllers names and the BACnet Instance numbers must be filled before creating the BACnet objects list.

<input type="checkbox"/> Include ML objects <input type="checkbox"/> Include MG objects <input type="checkbox"/> Include NV objects <input type="checkbox"/> Include indoor sensor objects from the controller <input type="checkbox"/> Include indoor sensor objects to the controller <input type="checkbox"/> Include zone weather objects <input type="checkbox"/> Include only WOW600 weather objects <input type="checkbox"/> Include only WLA 340 weather objects <input type="checkbox"/> Include Building objects	<p>Creates objects for each used Motor line.</p> <p>Creates objects for each used Motor group.</p> <p>Creates objects for each used NV controller.</p> <p>Creates sensor objects for each zone as info to BMS.</p> <p>Creates sensor objects for each zone to receive from BMS.</p> <p>Creates weather sensor objects for each zone to receive from the BMS.</p> <p>Creates weather sensor objects from WOW 600 to send to BMS.</p> <p>Create weather sensor objects from WLA 340 to send to the BMS.</p> <p>Creates 'Building' objects for each Motor controller to and from BMS.</p>
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Create Default BACnet objects list

A.2 'NVE - Template for BACnet signal exchange list with BMS xxxxxx.xlsx'

This file is designed to register relevant MotorController data and BACnet objects list that which are included in the signal exchange are relevant for both the BMS and the NVE systems.