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Valve Positioner for HVAC Applications: 81.31



LONMARK[®] Functional Profile: Valve Positioner for HVAC Applications

SFPT HVAC Valve Positioner

Overview

This document describes the Functional Profile of an HVAC¹-specific Valve Positioner functional block.

The valve positioner (also known as a “valve actuator”) converts the output signal of a controller into a mechanical, linear action to control fluid flow through a control valve.

LONMARK functional blocks are defined in this document (by profile-specific usage designator) for the following types of valve positioner devices:

Usage

| <i>Designator</i> | <i>Description</i> |
|-------------------|---|
| 00 — | Programmed Actuator Characteristic |
| 01 — | Programmed Actuator Characteristic with Emergency Mode function |
| 20 — | Calculated Actuator Characteristic |
| 21 — | Calculated Actuator Characteristic with Emergency Mode function |

The profile-specific usage designator of “00” is for an economical and simple valve positioner with limited resources. The usage designator of “20” is for a valve positioner with more user-friendly parameter settings. The main difference is the calculation of the positioner transfer function (actuator characteristic).

For a valve positioner with an emergency position, or spring-return function, a usage designator of “01” or “21” should be used.

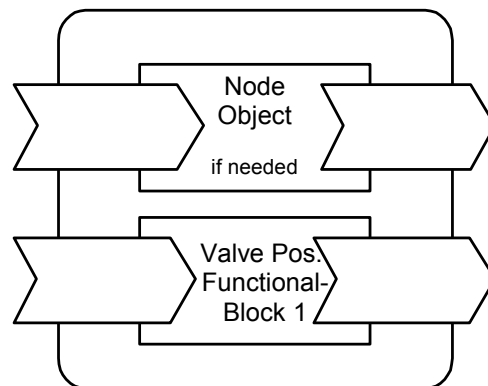


Figure 1 Device Concept

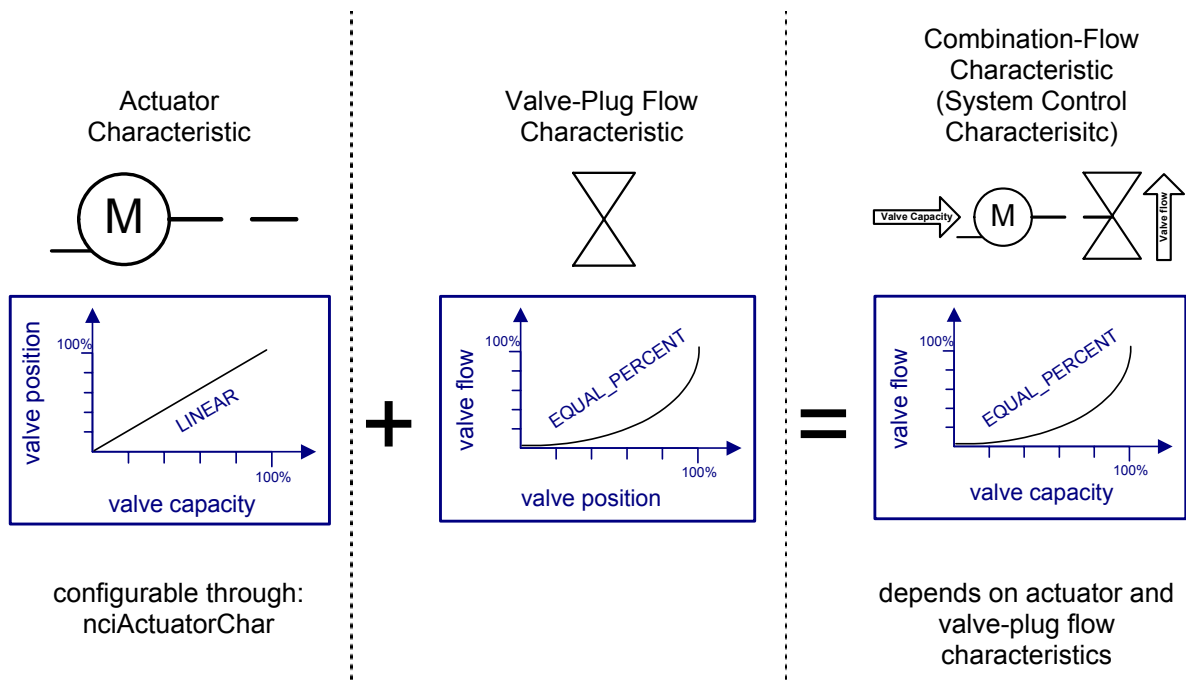
¹ HVAC (Heating, Ventilating, and Air-Conditioning).

Profile-Specific Usage Designators “00” and “01”

This type of valve positioner calculates the valve position depending on the given actuator characteristic.

In this example, the positioner does not know the valve characteristic. The user must calculate the system-control characteristic, which is the combination of the actuator characteristic and valve-plug flow characteristic. The system characteristic is also called the combination flow characteristic.

Example:



The following overview shows the signal flow and defines which information is available in which network variable. It also shows the influence of the network variables on the valve behaviour.

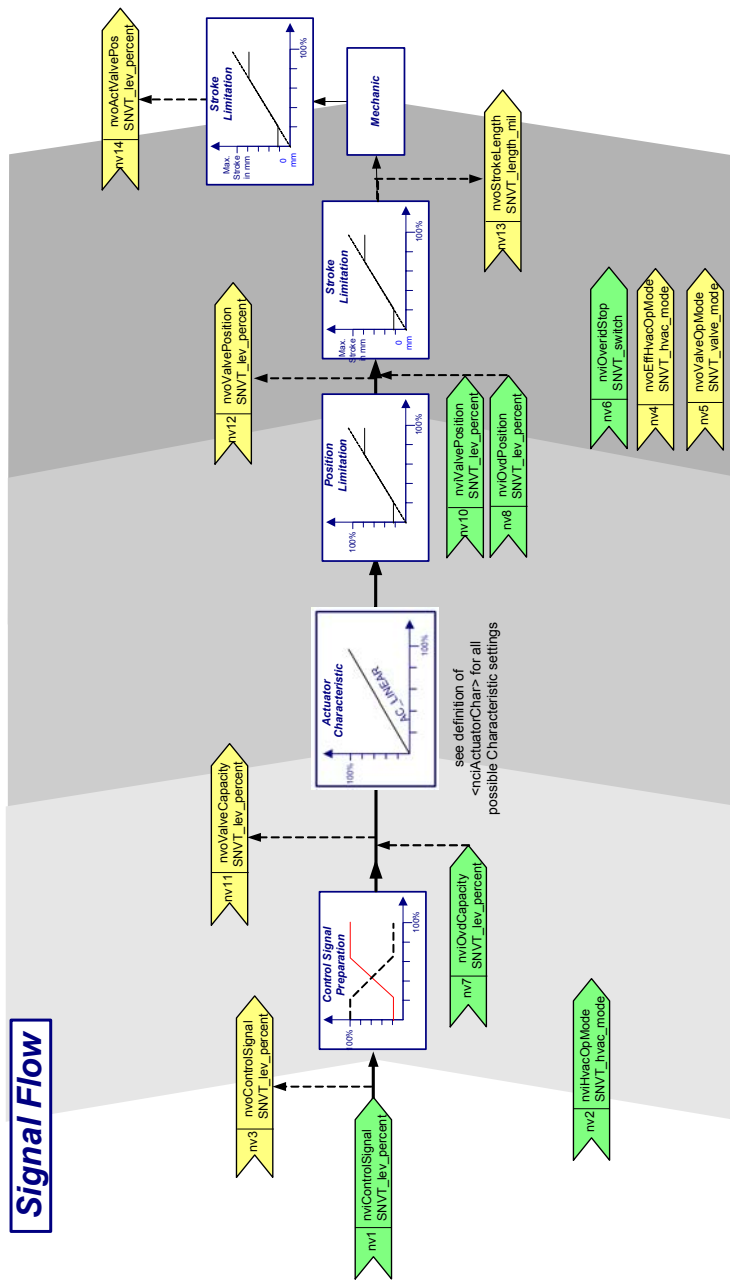


Figure 2 Signal Flow for Pre-Determined-Characteristic Valves

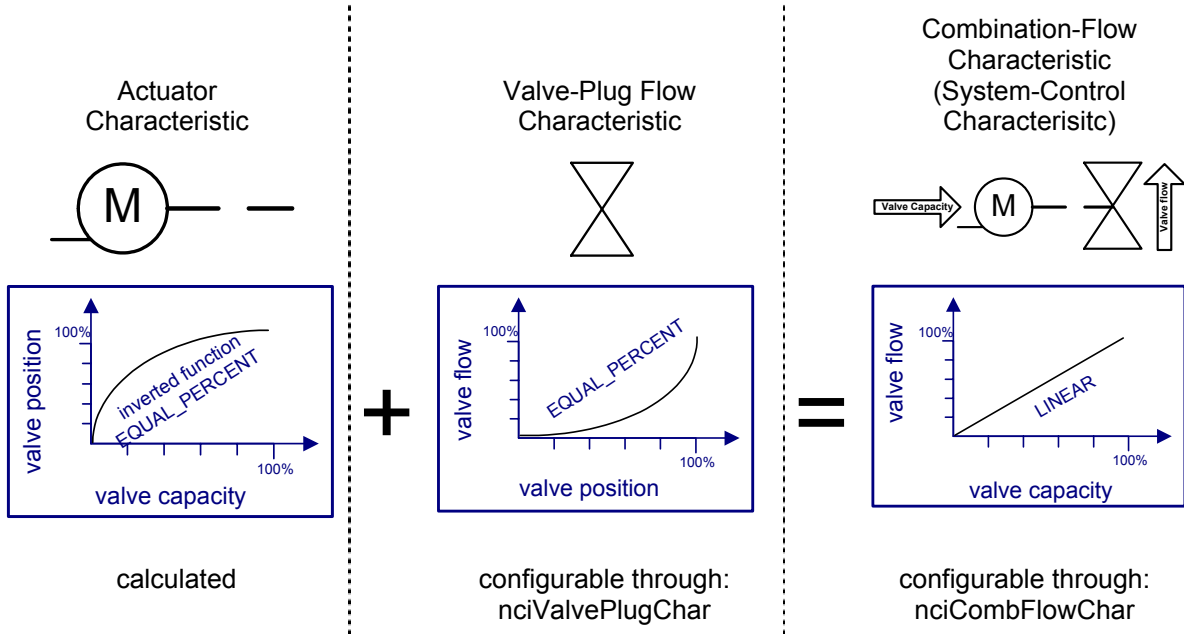
Profile-Specific Usage Designators “20” and “21”

These types of valve positioner can determine their own actuator characteristic. The actuator characteristic is calculated from the desired system-control characteristic (actuator with valve) and the valve-plug flow characteristic.

The system-control characteristic is a function of the actuator characteristic (calculated) and the valve-plug flow characteristic. The system control characteristic is also called the combination flow characteristic.

The system-control characteristic and valve-plug flow characteristic must be defined in the Valve Positioner functional block by the user.

Example:



The following overview shows the signal flow and defines which information is available in which network variable. It shows also the influence of the network variables on the valve behavior.

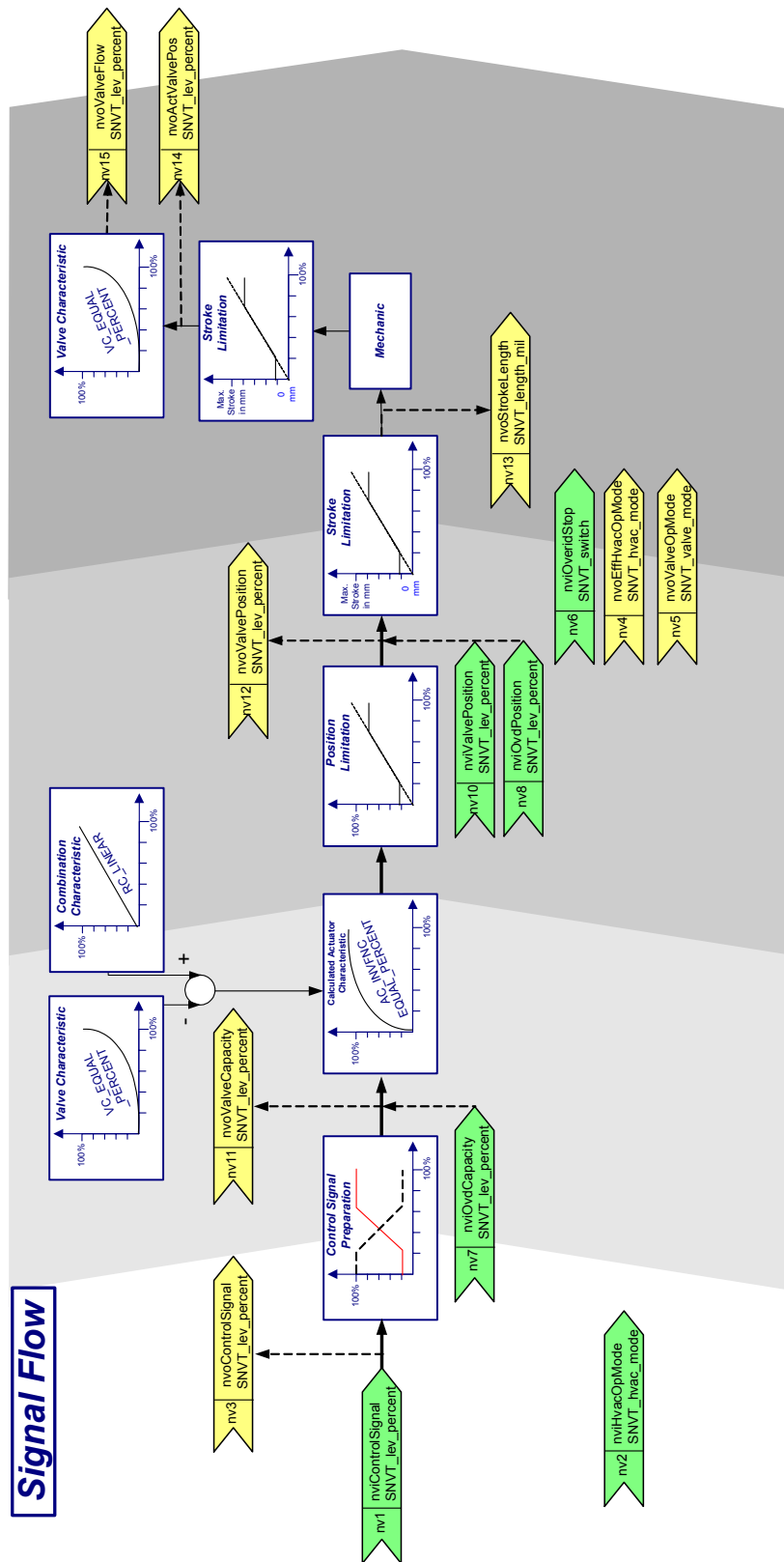


Figure 3 Signal Flow for Self-Determined-Characteristic Valves

Example Usage

Utilization of the Valve Positioner profile facilitates interoperability between the valve and other control devices from multiple vendors. The Valve Positioner functional block will reside in a device on the network, and its network variables can be bound to other controllers, operator-interface devices, energy-management systems, *etc.*

For example, an air-handling unit (AHU) controller may send messages over the network to open and close the valve. The valve positioner may output messages—such as the actual stroke and status information—to the controller, operator-interface devices, and energy-management systems. A network-management tool will be used to install the valve-positioner device on the network, and to bind the network variables to other devices on the network.

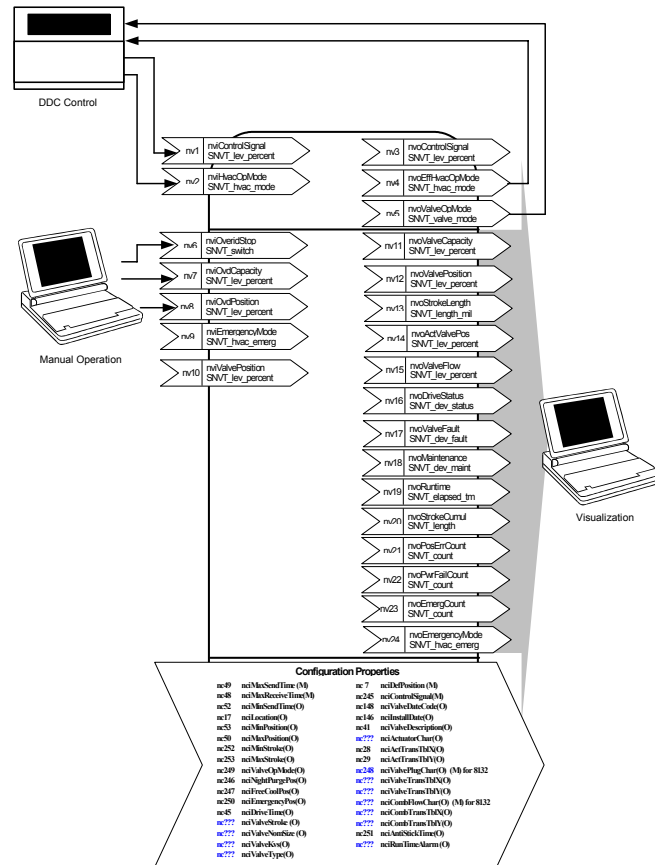


Figure 4 Example Usage of the Functional Block

HVAC Operating Modes

The valve can work as a “Normal Control Valve,” as a “Heating Valve,” or as a “Cooling Valve.” Depending on this Valve Operating Mode, the operation in the various HVAC Operating Modes is different:

| | VALVE_NORMAL | VALVE_COOLING | VALVE_HEATING |
|------------------|----------------------|----------------------|----------------------|
| HVAC_AUTO | <nviControlSignal> | <nviControlSignal> | <nviControlSignal> |
| HVAC_HEAT | <nviControlSignal> | Closed | <nviControlSignal> |
| HVAC_MRNG_WRMUP | <nviControlSignal> | Closed | Manufacturer defined |
| HVAC_COOL | <nviControlSignal> | <nviControlSignal> | Closed |
| HVAC_NIGHT_PURGE | <nciNightPurgePos> | Closed | <nciNightPurgePos> |
| HVAC_PRE_COOL | Not used | Not used | Not used |
| HVAC_OFF | Closed | Closed | Closed |
| HVAC_TEST | Manufacturer defined | Manufacturer defined | Manufacturer defined |
| HVAC_MAX_HEAT | Manufacturer defined | Closed | Fully open |
| HVAC_MAX_COOL | Manufacturer defined | Fully open | Closed |
| HVAC_FAN_ONLY | Closed | Closed | Closed |
| HVAC_FREE_COOL | <nciFreeCoolPos> | <nciFreeCoolPos> | N/a |
| HVAC_ICE | Not used | Not used | Not used |
| HVAC_ECONOMY | Not used | Not used | Not used |
| HVAC_NUL | <nviControlSignal> | <nviControlSignal> | <nviControlSignal> |

Figure 5 Table of HVAC Operating Modes

Overrides

The Valve Positioner profile includes input network variables to manually override the operation of the valve. A valid value on any one of these input variables sets the valve positioner into the override mode. The valve will not return to normal control until all manual-override inputs are invalid. The priority of the various override inputs can be seen in the following diagram:

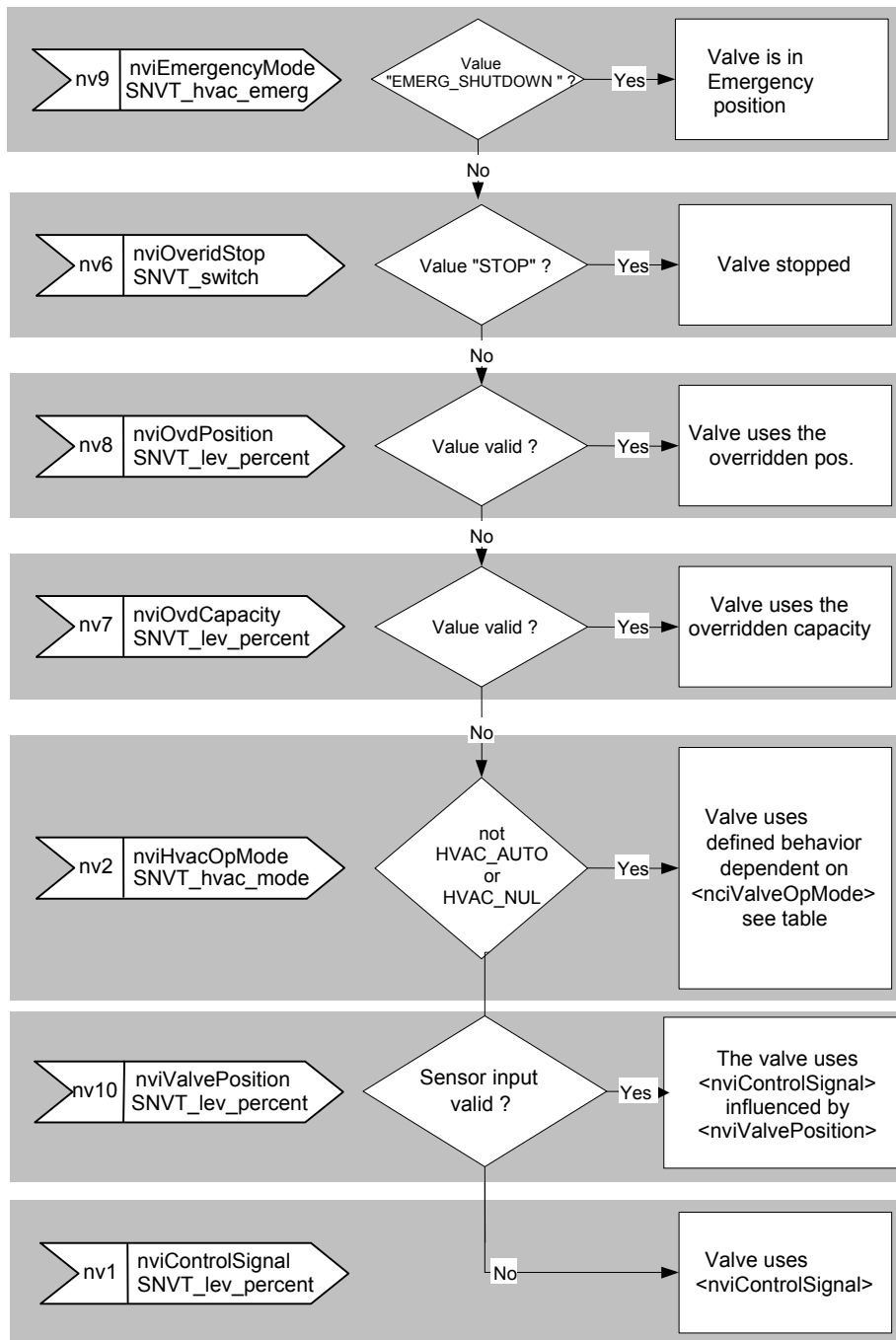


Figure 6 Logical Flow of Valve-Operation Hierarchy

Functional-Block Details

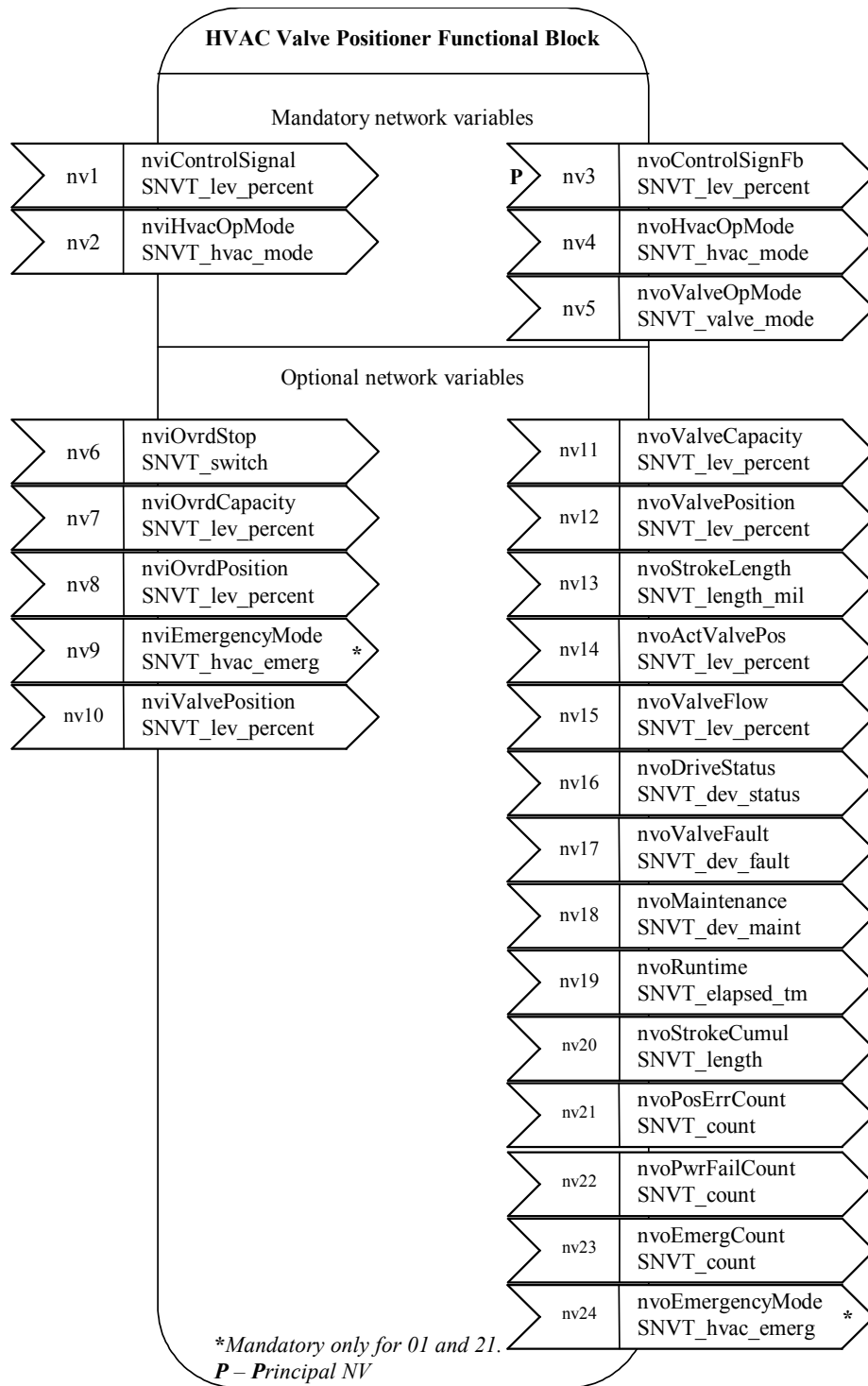


Figure 7 Functional-Block Details (NVs)

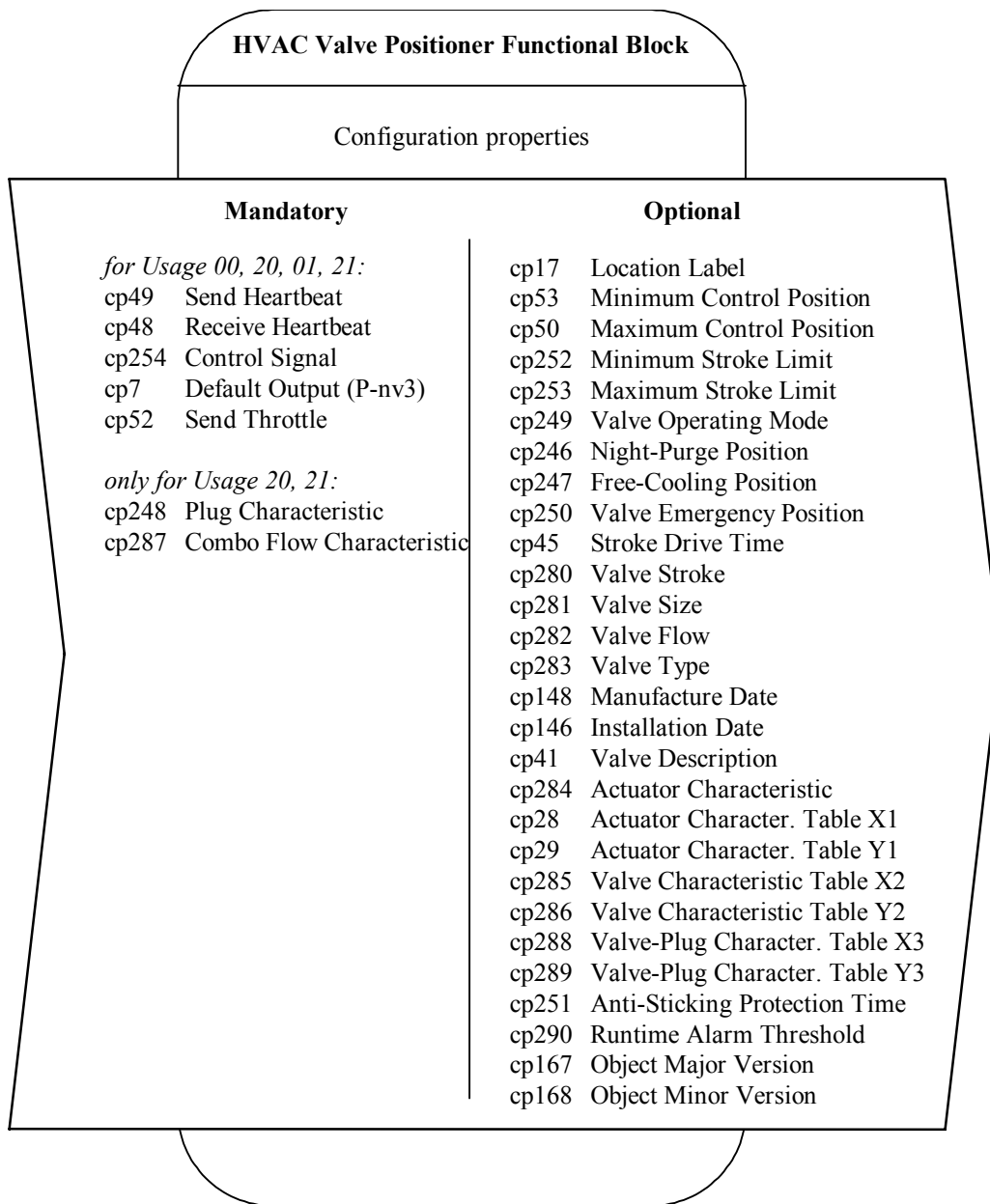


Figure 8 Functional-Block Detail (CPs)

Table 1 SNVT Details

| NV # (M/O)* 00 / 20 | NV # (M/O)* 01 / 21 | Variable Name | SNVT Name | SNVT Index | Description |
|------------------------------------|------------------------------------|--------------------------|----------------------|-----------------------|---|
| 1 (M) | 1 (M) | nviControlSignal | SNVT_lev_percent | 81 | Valve Control Signal Input |
| 2 (M) | 2 (M) | nviHvacOpMode | SNVT_hvac_mode | 108 | Desired HVAC Operating Mode |
| 3 (M) | 3 (M) | nvoControlSignFb | SNVT_lev_percent | 81 | Valve Control Signal Output |
| 4 (M) | 4 (M) | nvoHvacOpMode | SNVT_hvac_mode | 108 | Effective HVAC Operating Mode |
| 5 (M) | 5 (M) | nvoValveOpMode | SNVT_valve_mode | 163 | Effective Valve Operating Mode |
| 6 (O) | 6 (O) | nviOvrdStop | SNVT_switch | 95 | Valve-Override Stop |
| 7 (O) | 7 (O) | nviOvrdCapacity | SNVT_lev_percent | 81 | Override Calculated Valve Capacity |
| 8 (O) | 8 (O) | nviOvrdPosition | SNVT_lev_percent | 81 | Override Valve-Stroke Position |
| 9 (O) | 9 (M) | nviEmergencyMode | SNVT_hvac_emerg | 103 | Emergency-Mode Safety Position |
| 10 (O) | 10 (O) | nviValvePosition | SNVT_lev_percent | 81 | Actual Valve-Position Feedback Input |
| 11 (O) | 11 (O) | nvoValveCapacity | SNVT_lev_percent | 81 | Valve Capacity |
| 12 (O) | 12 (O) | nvoValvePosition | SNVT_lev_percent | 81 | Valve-Stroke Position |
| 13 (O) | 13 (O) | nvoStrokeLength | SNVT_length_mil | 19 | Valve-Stroke Length |
| 14 (O) | 14 (O) | nvoActValvePos | SNVT_lev_percent | 81 | Actual Valve Position |
| 15 (O) | 15 (O) | nvoValveFlow | SNVT_lev_percent | 81 | Valve Flow |
| 16 (O) | 16 (O) | nvoDriveStatus | SNVT_dev_status | 173 | Valve Status |
| 17 (O) | 17 (O) | nvoValveFault | SNVT_dev_fault | 174 | Valve Fault Status |
| 18 (O) | 18 (O) | nvoMaintenance | SNVT_dev_maint | 175 | Valve-Maintenance States |
| 19 (O) | 19 (O) | nvoRuntime | SNVT_elapsed_tm | 87 | Drive Motor Runtime |
| 20 (O) | 20 (O) | nvoStrokeCumul | SNVT_length | 17 | Cumulative Stroke Distance |
| 21 (O) | 21 (O) | nvoPosErrCount | SNVT_count | 8 | Position-Errors Count |
| 22 (O) | 22 (O) | nvoPwrFailCount | SNVT_count | 8 | Power-Failures Count |
| 23 (O) | 23 (O) | nvoEmergCount | SNVT_count | 8 | Emergency-Positioning Count |
| 24 (O) | 24 (M) | nvoEmergencyMode | SNVT_hvac_emerg | 103 | Emergency-Mode Output |

* M = mandatory, O = optional

Table 2 SCPT Details

| Man Opt * 00 / 20 | Man Opt * 01 / 21 | SCPT Name NV Name Type or SNVT | SCPT Index | Associated NVs ** | Description |
|--|--|---|-----------------------|--|--|
| Man | Man | SCPTmaxSendTime nciMaxSendTime SNVT_time_sec (107) | 49 | nv3(M), nv4(M), nv5(M), nv11(M), nv24(M) | Maximum period of time that expires before the NVs will automatically update their values |
| Man | Man | SCPTmaxRcvTime nciMaxReceiveTime SNVT_time_sec (107) | 48 | nv1(M), nv2(M), nv9(M) | Maximum period of time that expires before the NVs will use their default values |
| Man | Man | SCPTcontrolSignal nciControlSignal structure | 245 | Entire Functional Block | Sets control-signal preparation for sequencing |
| Man | Man | SCPTdefOutput nciDefPosition SNVT_lev_percent (81) | 7 | Entire Functional Block | Defines the default valve position to assume upon timeouts |
| Man | Man | SCPTminSendTime nciMinSendTime SNVT_time_sec (107) | 52 | nv3(M), nv4(M), nv5(M), nv11(O), nv12(O), nv13(O), nv14(O), nv15(O), nv16(O), nv17(O), nv18(O), nv19(O), nv20(O), nv21(O), nv22(O), nv23(O), nv24(M) | Minimum period of time that must expire before the NVs are allowed to propagate their values |
| Opt | Opt | SCPTlocation nciLocation SNVT_str_asc (36) | 17 | Entire Functional Block | Used to provide physical location of the functional block, or of the device |
| Opt | Opt | SCPTminSetpoint nciMinPosition SNVT_lev_percent (81) | 53 | Entire Functional Block | Defines the minimum control-position of the Valve |
| Opt | Opt | SCPTmaxSetpoint nciMaxPosition SNVT_lev_percent (81) | 50 | Entire Functional Block | Defines the maximum control-position of the Valve |
| Opt | Opt | SCPTminStroke nciMinStroke SNVT_length_mil (20) | 252 | Entire Functional Block | Defines the minimum stroke-distance of the valve in millimeters (mm) |
| Opt | Opt | SCPTmaxStroke nciMaxStroke SNVT_length_mil (20) | 253 | Entire Functional Block | Defines the maximum stroke-distance of the valve in millimeters (mm) |
| Opt | Opt | SCPTvalveOpMode nciValveOpMode SNVT_valve_mode (163) | 249 | Entire Functional Block | Defines the valve's operating mode |
| Opt | Opt | SCPTnightPurgePosition nciNightPurgePos SNVT_lev_percent (81) | 246 | Entire Functional Block | Defines the night-purge valve position |
| Opt | Opt | SCPTfreeCoolPosition nciFreeCoolPos SNVT_lev_percent (81) | 247 | Entire Functional Block | Defines the free-cooling valve position |
| Opt | Opt | SCPTemergencyPosition nciEmergencyPos SNVT_lev_percent (81) | 250 | Entire Functional Block | Valve's emergency-mode position |

| Man Opt * 00 / 20 | Man Opt * 01 / 21 | SCPT Name NV Name Type or SNVT | SCPT Index | Associated NVs ** | Description |
|--|--|--|-----------------------|----------------------------|---|
| Opt | Opt | SCPTdriveTime nciDriveTime SNVT_time_sec (107) | 45 | Entire Functional Block | The drive time for a full stroke |
| Opt | Opt | SCPTvalveStroke nciValveStroke SNVT_length_mil (20) | 280 | Entire Functional Block | Defines the stroke for a fully open valve |
| Opt | Opt | SCPTvalveNominalSize nciValveNomSize SNVT_length_mil (20) | 281 | Entire Functional Block | Defines the nominal size of the valve |
| Opt | Opt | SCPTvalveKvs nciValveKvs SNVT_flow_p (161) | 282 | Entire Functional Block | Valve flow with 1 bar of pressure |
| Opt | Opt | SCPTvalveType nciValveType SNVT_dev_c_mode (162) | 283 | Entire Functional Block | Type of valve (2-way, etc.) |
| Opt | Opt | SCPTmanfDate nciValveDateCode SNVT_time_stamp (84) | 148 | Entire Functional Block | Valve's manufacture date |
| Opt | Opt | SCPTinstallDate nciInstallDate SNVT_time_stamp (84) | 146 | Entire Functional Block | Valve's installed date |
| Opt | Opt | SCPTactuatorType nciValveDescr SNVT_str_asc (36) | 41 | Entire Functional Block | Valve Description |
| Opt | Opt | SCPTactuatorCharacteristic nciActuatorChar SNVT_dev_c_mode (162) | 284 | Entire Functional Block | Define the actuator characteristic |
| Opt | Opt | SCPTtrnsTblX nciActTransTblX SNVT_trans_table (96) | 28 | Entire Functional Block | Freely definable characteristic of the valve actuator |
| Opt | Opt | SCPTtrnsTblY nciActTransTblY SNVT_trans_table (96) | 29 | Entire Functional Block | Freely definable characteristic of the valve actuator |
| 00-Opt 20-Man | 01-Opt 21-Man | SCPTvalveFlowCharacteristic nciValvePlugChar SNVT_dev_c_mode (162) | 248 | Entire Functional Block | Defines the plug characteristic |
| Opt | Opt | SCPTtrnsTblX2 nciValvTransTblX SNVT_trans_table (96) | 285 | Entire Functional Block | Freely definable characteristic of the valve plug |
| Opt | Opt | SCPTtrnsTblY2 nciValvTransTblY SNVT_trans_table (96) | 286 | Entire Functional Block | Freely definable characteristic of the valve plug |
| 00-Opt 20-Man | 01-Opt 21-Man | SCPTcombFlowCharacteristic nciCombFlowChar SNVT_dev_c_mode (162) | 287 | Entire Functional Block | Flow characteristic of the combination |
| Opt | Opt | SCPTtrnsTblX3 nciCombTransTblX SNVT_trans_table (96) | 288 | Entire Functional Block | Freely definable characteristic of the combination |
| Opt | Opt | SCPTtrnsTblY3 nciCombTransTblY SNVT_trans_table (96) | 289 | Entire Functional Block | Freely definable characteristic of the combination |

| Man Opt * 00 / 20 | Man Opt * 01 / 21 | SCPT Name NV Name Type or SNVT | SCPT Index | Associated NVs ** | Description |
|--|--|---|-----------------------|----------------------------|--|
| Opt | Opt | SCPTblockProtectionTime nciAntiStickTime SNVT_time_hour (124) | 251 | Entire Functional Block | Interval for the anti-sticking protection |
| Opt | Opt | SCPTrunTimeAlarm nciRunTimeAlarm SNVT_elapsed_tm (87) | 290 | Entire Functional Block | Defines threshold for the runtime alarm |
| Opt | Opt | SCPTobjMajVer nciObjMajVer unsigned short | 167 | Entire Functional Block | Defines the major version number of the functional block |
| Opt | Opt | SCPTobjMinVer nciObjMinVer unsigned short | 168 | Entire Functional Block | Defines the minor version number of the functional block |

* “Man” = mandatory, “Opt” = optional.

It should be Mandatory for CPs that are Mandatory for an NV that is also Mandatory. This is also valuable for CPs that apply to the Entire Functional Block.

** List of NVs to which this configuration property applies.

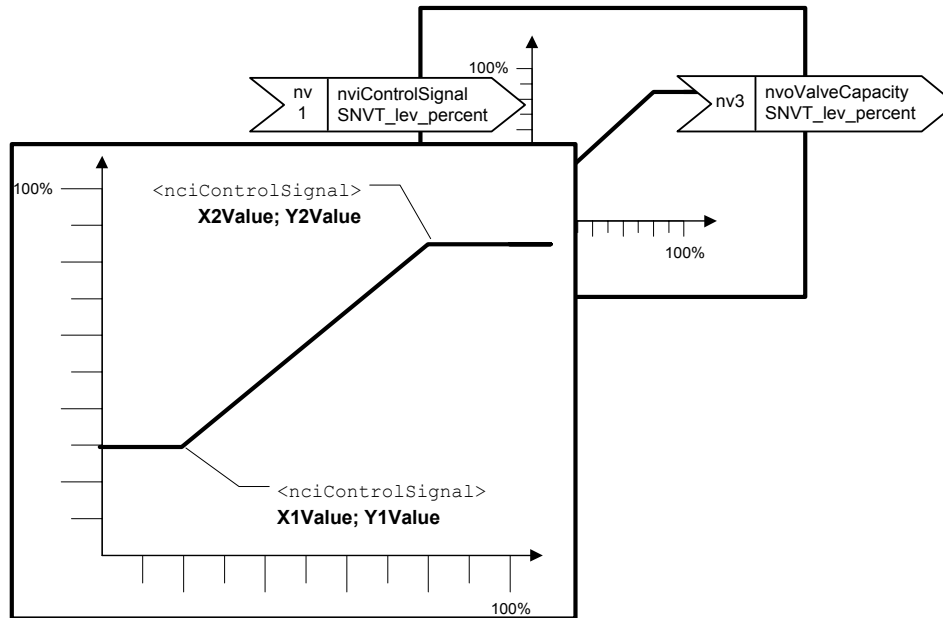
An “(M)” means that the CP is Mandatory if the NV (to which it applies) is implemented. An “(O)” means that the CP is Optional if the NV (to which it applies) is implemented.

Mandatory Network Variables

Valve Control Signal — Input

```
network input sd_string("@p|1") SNVT_lev_percent  
nviControlSignal;
```

This input network variable provides a control setpoint. The setpoint is given as a percentage of the total required flow or heating/cooling energy. An advanced valve positioner has the possibility to convert the control signal into a mechanical, linear movement by one of the four, fixed flow characteristics, or a freely definable flow characteristic. The control signal can also be conditioned for sequencing using `nciControlSignal` where the valve will only provide a limited part of the total required flow or energy.



Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Anything outside this range is an Invalid Value. Invalid Values should be range-limited so that a value of 0 is used for any input value below 0; and 100% is used for any value above 100%.

Default Value

Default value is 0x7FFF representing invalid data. This value will be adopted at power-up and the valve position will be set to `nciDefPosition` until a valid value is received.

Configuration Considerations

This network variable is subject to the receive heartbeat time: nciMaxReceiveTime.

Desired HVAC Operating Mode — Input

```
network input sd_string("@p|2") SNVT_hvac_mode  
nviHvacOpMode;
```

A supervisory controller typically uses this input network variable to set the valve operating mode. If a mode is requested that is not supported by the unit, the unit will treat it as an invalid value. When a valid value is present (other than HVAC_AUTO), it will take precedence over any locally wired input that calls for a different mode, and the requested mode will be shown as the Effective HVAC Operating Mode (nvoHvacOpMode).

The following table defines the behavior depending on the defined valve operating mode, which is indicated at the nvoValveOpMode.

For test purposes the mode HVAC_TEST may be used. The actual behavior in this mode is manufacturer defined.

Valid Range

| | VALVE_NORMAL | VALVE_COOLING | VALVE_HEATING |
|------------------|----------------------|----------------------|----------------------|
| HVAC_AUTO | nviControlSignal | nviControlSignal | nviControlSignal |
| HVAC_HEAT | nviControlSignal | Closed | nviControlSignal |
| HVAC_MRNG_WRMUP | nviControlSignal | Closed | Manufacturer defined |
| HVAC_COOL | nviControlSignal | nviControlSignal | Closed |
| HVAC_NIGHT_PURGE | nciNightPurgePos | Closed | nciNightPurgePos |
| HVAC_PRE_COOL | Not Used | Not Used | Not Used |
| HVAC_OFF | Closed | Closed | Closed |
| HVAC_TEST | Manufacturer defined | Manufacturer defined | Manufacturer defined |
| HVAC_MAX_HEAT | Manufacturer defined | Closed | Fully Open |
| HVAC_MAX_COOL | Manufacturer defined | Fully open | Closed |
| HVAC_FAN_ONLY | Closed | Closed | Closed |
| HVAC_FREE_COOL | nciFreeCoolPos | nciFreeCoolPos | — |
| HVAC_ICE | Not Used | Not Used | Not Used |
| HVAC_ECONOMY | Not Used | Not Used | Not Used |
| HVAC_NUL | nviControlSignal | nviControlSignal | nviControlSignal |

Default Value

Default value is HVAC_AUTO. This value will be adopted at power-up.

Configuration Considerations

This network variable is subject to the receive heartbeat time: nciMaxReceiveTime.

Valve-Control Signal Mirror — Output

```
network output sd_string("@p|3") bind_info(unackd)
SNVT_lev_percent nvoControlSignFb;
```

This output network variable mirrors the actual value of `nviControlSignal`. This can be used for multiple valve-positioner applications.

It is also the profile's principal network variable (being the base type for inherited configuration properties in the profile).

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The value on the input `nviControlSignal`, range-limited if necessary.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (`nciMinSendTime`) configuration property, if used.

When Transmitted

The output variable is transmitted:

- ❑ When the value has changed by what the manufacturer considers significant.
- ❑ Regularly at the interval defined by the configuration property `nciMaxSendTime`.

Default Service Type

The default service type is unacknowledged.

Effective HVAC Operating Mode — Output

```
network output sd_string("@p|4") bind_info(ackd)
SNVT_hvac_mode nvoHvacOpMode;
```

This output network variable provides the actual HVAC operating mode. The value of this network variable is the same as the value of the Desired HVAC Operating Mode (`nviHvacOpMode`) except when `HVAC_AUTO` is the input and a different mode can be selected by a locally wired input.

Valid Range

| | VALVE_NORMAL | VALVE_COOLING | VALVE_HEATING |
|------------------|----------------------|----------------------|----------------------|
| HVAC_AUTO | nviControlSignal | nviControlSignal | nviControlSignal |
| HVAC_HEAT | nviControlSignal | Closed | nviControlSignal |
| HVAC_MRNG_WRMUP | nviControlSignal | Closed | Manufacturer defined |
| HVAC_COOL | nviControlSignal | nviControlSignal | Closed |
| HVAC_NIGHT_PURGE | nciNightPurgePos | Closed | nciNightPurgePos |
| HVAC_PRE_COOL | Not Used | Not Used | Not Used |
| HVAC_OFF | Closed | Closed | Closed |
| HVAC_TEST | Manufacturer defined | Manufacturer defined | Manufacturer defined |
| HVAC_MAX_HEAT | Manufacturer defined | Closed | Fully Open |
| HVAC_MAX_COOL | Manufacturer defined | Fully open | Closed |
| HVAC_FAN_ONLY | Closed | Closed | Closed |
| HVAC_FREE_COOL | nciFreeCoolPos | nciFreeCoolPos | — |
| HVAC_ICE | Not Used | Not Used | Not Used |
| HVAC_ECONOMY | Not Used | Not Used | Not Used |
| HVAC_NUL | nviControlSignal | nviControlSignal | nviControlSignal |

Default Value

Default value is HVAC_AUTO. This value will be adopted at power-up.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Effective Valve Operating Mode — Output

```
network output sd_string("@p|5") bind_info(ackd)
SNVT_valve_mode nvoValveOpMode;
```

This output network variable provides the actual valve operating mode. For normal operation, the nciValveOpMode configuration property defines the status and the behavior of the valve.

Valid Range

| | | |
|---|------------------|---|
| 0 | VALVE_NORMAL | Valve works as normal control valve |
| 1 | VALVE_COOLING | Valve works as cooling valve only |
| 2 | VALVE_HEATING | Valve works as heating valve only |
| 3 | VALVE_EMERGENCY | Valve works in emergency operation |
| 4 | VALVE_STROKE_ADP | Valve is auto-adapting its stroke and end positions |
| 5 | VALVE_STROKE_SYN | Valve is re-synchronizing its position |
| 6 | VALVE_ERROR | Valve is in error mode |
| 7 | VALVE_OVERRIDDEN | Valve is overridden |

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Optional Network Variables

Override- Valve Stop — Input

```
network input sd_string("@p|6") SNVT_switch  
nviOvrDStop;
```

This input network variable provides a manual override function to stop the valve; typically from a supervisory device. The value “OVERRIDE STOP” stops the actions of the valve.

Valid Range

| value (raw) | state | Interpretation |
|-------------|-----------|--|
| any | 0 | NORMAL (0; 0) |
| 0 | 1 | NORMAL (0; 1) |
| >0 | 1 | OVERRIDE STOP (200; 1) |
| any | -1 (0xFF) | INVALID (0xFF; 0) no change to valve state |

Default Value

Default value is INVALID (0xFF; 0) in the state field. The value will be adopted at power-up.

Configuration Considerations

None specified.

Override Valve Capacity — Input

```
network input sd_string("@p|7") SNVT_lev_percent  
nviOvrCapacity;
```

This input network variable provides an override request to the valve capacity; typically from a supervisory device. When a valid value is received—and if the Override- Valve Stop (from nviOvrCapacity) and Override Valve Position (from nviOvrPosition) are inactive—then the Valve Capacity (and its NV: nvoValveCapacity) will be overridden and the valve will be controlled to the given override capacity.

An invalid value on this Override Valve Capacity input (nviOvrCapacity), and a NORMAL status of the Override- Valve Stop (nviOvrStop) will set the valve back into the normal mode. The manual override status of the valve positioner is indicated in the Effective Valve Operating Mode output network variable: nvoValveOpMode.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data that must be interpreted as “no override requested.”

Anything outside this range is an Invalid Value. Invalid Values should be range-limited so that a value of 0 is used for any input value below 0; and 100% is used for any value above 100%.

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

None specified.

Override Valve Position — Input

```
network input sd_string("@p|8") SNVT_lev_percent  
nviOvdPosition;
```

This input network variable provides for both an override request and a position value relative to the maximum stroke; typically from a supervisory device. When a valid value is received and the Override- Valve Stop is not active, the Valve Control Signal setpoint (nviControlSignal) will be overridden and the valve will be controlled to the given override-position value.

An invalid value on this Override Valve Capacity input (nviOvrCapacity), and a NORMAL status of the Override- Valve Stop (nviOvrStop) will set the valve back into the normal mode. The manual override status of the valve positioner is indicated in the Effective Valve Operating Mode output network variable: nvoValveOpMode.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data that must be interpreted as “no override requested.”

Anything outside this range is an Invalid Value. Invalid Values should be range-limited so that a value of 0 is used for any input value below 0; and 100% is used for any value above 100%.

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

None specified.

Emergency Mode Request — Input (Mandatory for 01 /21)

```
network input sd_string("@p|9") SNVT_hvac_emerg  
nviEmergencyMode;
```

This input network variable is used when the positioner possesses a real emergency operation (for example: a spring-return drive). The emergency

operation is controlled by this network variable. If this network variable is not implemented, the valve positioner has no emergency operation.

When the value is EMERG_SHUTDOWN the nvoEmergCount will be incremented.

The emergency status of the valve positioner is indicated in the Emergency Mode State output network variable: nvoEmergencyMode.

Valid Range

- 0 EMERG_NORMAL Normal actuator-position control
- 4 EMERG_SHUTDOWN Manufacturer-defined actuator action

Anything outside this range is an Invalid Value (interpreted as EMERG_NUL). Invalid Values should be ignored, except where the manufacturer optionally specifies a special purpose (e.g., EMERG_FIRE).

Default Value

Default value is EMERG_SHUTDOWN.

Configuration Considerations

The network variable is subject to a receive heartbeat: nciMaxReceiveTime.

Read-Value Valve Position — Input

```
network input sd_string("@p|10") SNVT_lev_percent
nviValvePosition;
```

This input network variable is used to connect an external position sensor for precise position control as shown in the following diagram:

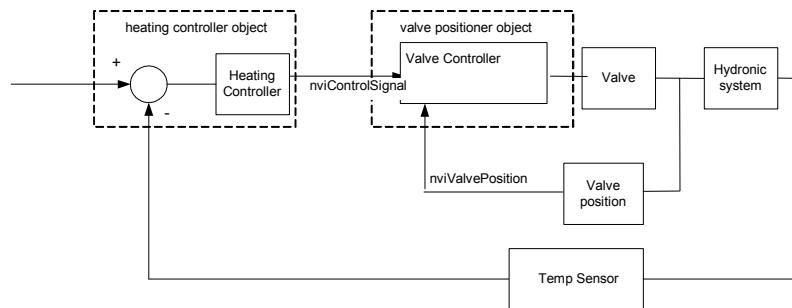


Figure 9 Read-Value Valve Position

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data that must be interpreted as “no valve position signal.”

Anything outside this range is an Invalid Value. Invalid Values must be interpreted as “no valve position signal.”

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

None specified.

Valve Capacity — Output

```
network output sd_string("@p|11") bind_info(ackd)
SNVT_lev_percent nvoValveCapacity;
```

This output network variable provides the actual valve capacity as a percentage of the flow.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- ❑ When the value has changed by what the manufacturer considers significant.
- ❑ Regularly at the interval defined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Valve Position — Output

```
network output sd_string("@p|12") bind_info(unackd)
SNVT_lev_percent nvoValvePosition;
```

This output network variable provides the calculated position relative to the maximum stroke length.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- ❑ When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Stroke Length — Output

```
network output sd_string("@p|2") bind_info(unackd)
SNVT_length_mil nvoStrokeLength;
```

This output network variable provides the calculated stroke as length in millimeters.

Valid Range

The valid range of SNVT_length_mil: 0 .. 6553.5 mm (0.1 mm).

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- ❑ When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Actual Valve Position — Output

```
network output sd_string("@p|14") bind_info(unackd)
SNVT_lev_percent nvoActValvePos;
```

This output network variable provides the actual position relative to the maximum stroke length.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Valve Flow — Output

```
network output sd_string("@p|15") bind_info(unackd)
SNVT_lev_percent nvoValveFlow;
```

This output network variable provides the calculated flow relative to the maximum flow of the valve.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

Default value is 0x7FFF (invalid value). The value will be adopted at power-up.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Drive Status — Output

```
network output sd_string("@p|16") bind_info(unackd)
SNVT_dev_status nvoDriveStatus;
```

This output network variable provides status/diagnostic information of the valve drive. The priority of the status states is manufacturer defined.

Valid Range

The valid range of SNVT_dev_status.valve_ctrl, excluding “reserved” fields.

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.

Default Service Type

The default service type is unacknowledged.

Valve Fault — Output

```
network output sd_string("@p|17") bind_info(unackd)
SNVT_dev_fault nvoValveFault;
```

This output network variable provides fault information about the valve. The priority of the faults is manufacturer defined.

Valid Range

The valid range of SNVT_dev_fault.valve_ctrl, excluding “reserved” fields.

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.

Default Service Type

The default service type is unacknowledged.

Maintenance — Output

```
network output sd_string("@p|18") bind_info(unackd)
SNVT_dev_maint nvoMaintenance;
```

This output network variable provides maintenance information of the valve. The priority of the maintenance states is manufacturer defined.

Valid Range

The valid range of SNVT_dev_maint.valve_ctrl, excluding “reserved” fields.

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.

Default Service Type

The default service type is unacknowledged.

Runtime — Output

```
network output sd_string("@p|19") bind_info(unackd)
SNVT_elapsed_tm nvoRuntime;
```

This output network variable provides the total cumulative running time of the valve actuator. It only can be cleared by manufacturer.

Valid Range

0 to 65534 days
0 to 23 hours
0 to 59 minutes
0 to 59 seconds
0 to 999 milliseconds.

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Cumulative Stroke Distance — Output

```
network output sd_string("@p|20") bind_info(unackd)
SNVT_length nvoStrokeCumul;
```

This output network variable provides the cumulative distance of all strokes of the valve as length in meters.

Valid Range

The valid range of SNVT_length: 0 .. 6553.5 m (0.1 m).

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Position-Error Count — Output

```
network output sd_string("@p|21") bind_info(unackd)
SNVT_count nvoPosErrCount;
```

This output network variable provides the count of positioning errors.

Valid Range

0 .. 65535 counts (1 count).

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Power-Failure Count — Output

```
network output sd_string("@p|22") bind_info(unackd)
SNVT_count nvoPwrFailCount;
```

This output network variable provides the count of power failures and voltage dips. After every power fail, or voltage dip, this count will be incremented.

Valid Range

0 .. 65535 counts (1 count).

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Emergency Count — Output

```
network output sd_string("@p|23") bind_info(unackd)
SNVT_count nvoEmergCount;
```

This output network variable provides the count of emergency actions (EMERG_SHUTDOWN), as represented with the Emergency Mode State network variable: nvoEmergencyMode.

Valid Range

0 .. 65535 counts (1 count).

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.

Default Service Type

The default service type is unacknowledged.

Emergency Mode State — Output (Mandatory for 01 /21)

```
network output sd_string("@p|24") bind_info(unackd)
SNVT_hvac_emerg nvoEmergencyMode;
```

This output network variable is only used in combination with the Emergency Mode Request input network variable: nviEmergencyMode. It reflects the actual emergency mode.

Valid Range

| | | |
|------|----------------|--------------------------------------|
| 0 | EMERG_NORMAL | Normal actuator-position control |
| 4 | EMERG_SHUTDOWN | Manufacturer-defined actuator action |
| 0xFF | EMERG_NUL | Value while in shutdown process |

Default Value

None specified.

Configuration Considerations

This value will be updated no faster than specified by the Send Throttle (nciMinSendTime) configuration property, if used.

When Transmitted

The output variable is transmitted:

- When the value has changed.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is unacknowledged.

Configuration Properties

Send Heartbeat (Mandatory for 00 / 01 / 20 / 21)

```
config network input sd_string("&2, i.j.k, 0\x80, 49")
SNVT_time_sec nciMaxSendTime;
```

This input configuration property sets the maximum period of time that can expire before the functional block will automatically update the following network variables:

nv3 – nvoControlSignFb (Mandatory)
nv4 – nvoHvacOpMode (Mandatory)
nv5 – nvoValveOpMode (Mandatory)
nv11 – nvoValveCapacity (Mandatory)
nv24 – nvoEmergencyMode (Mandatory)

Notice that this CP is Mandatory for nv11, which is a Optional NV. If nv11 is implemented, then the CP must also be implemented since it is marked as Mandatory.

Notice that this CP is also Mandatory for nv24, which is an Optional NV for profile-specific variants 00 and 20. If nv24 is implemented, then the CP must also be implemented since it is marked as Mandatory.

A Mandatory CP associated with a Mandatory NV means that the CP is Mandatory for implementing this functional block (as in Table 2).

Whether the CP is associated with any NVs that are not explicitly stated as requiring the CP, can be defined by the manufacturer.

i . j . k are the indices of the NVs in relation to their declaration order within the device, when implemented.

Valid Range

The valid range is 0.0 to 3600.0 seconds.

Values outside this range are invalid and will disable the automatic update mechanism. A value of zero (0) will be used for the internal timer in cases where configured values are above 3600.0 seconds. If a value of 0.0 is used it will disable the automatic update mechanism.

Default Value

The default value is 0.0 (no automatic update).

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTmaxSendTime (49)

Receive Heartbeat (Mandatory for 00 / 01 / 20 / 21)

```
config network input sd_string("&2, i.j.k, 0\x80, 48")
SNVT_time_sec nciMaxRcvTime;
```

This input configuration property sets the maximum period of time that can expire before the functional block will use the default values for the following network variables:

nv1 – nviControlSignal (Mandatory)

nv2 – nviHvacOpMode (Mandatory)

nv9 – nviEmergencyMode (Mandatory)

Notice that this CP is Mandatory for nv9, which is an Optional NV for profile-specific variants 00 and 20. If nv9 is implemented, then the CP must also be implemented since it is marked as Mandatory.

A Mandatory CP associated with a Mandatory NV means that the CP is Mandatory for implementing this functional block (as in Table 2).

Whether the CP is associated with any NVs that are not explicitly stated as requiring the CP, can be defined by the manufacturer.

i.j.k are the indices of the NVs in relation to their declaration order within the device, when implemented.

Valid Range

The valid range is 0.0 to 3600.0 seconds.

Values outside this range are invalid and will disable the automatic update mechanism. A value of zero (0) will be used for the internal timer in cases where configured values are above 3600.0 seconds. If a value of 0.0 is used it will disable the automatic update mechanism.

Default Value

The default value is 0.0 (no resulting to defaults).

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTmaxRcvTime (48)

Control Signal (Mandatory for 00 / 01 / 20 / 21)

```
config network input sd_string("&1,p,0\x80,245")
SCPTcontrolSignal nciControlSignal;
```

This configuration property provides the definition of the control signal parameters for sequencing, as shown in the following figure:

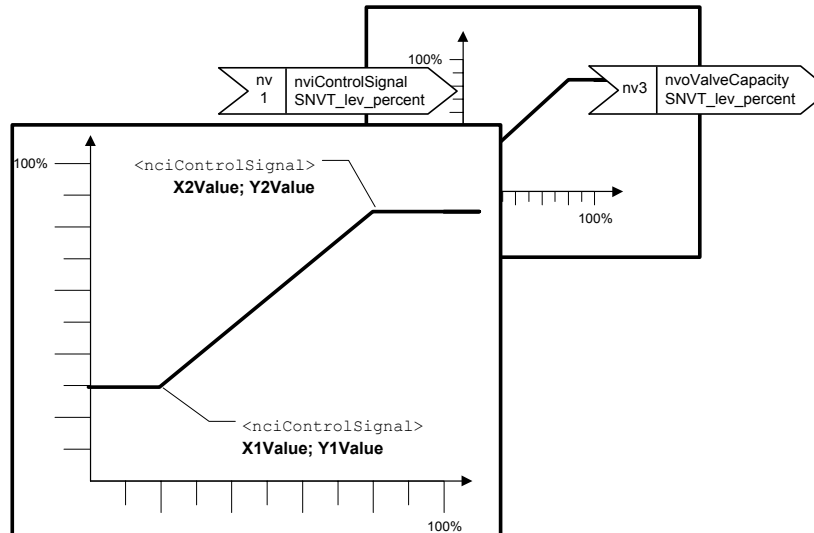


Figure 10 Control Signal Parameters for Sequencing

Valid Range

The valid range of the supported control-signal conditioning for sequencing is given in the following structure:

```
typedef struct {
    SNVT_lev_percent    X1Value
    SNVT_lev_percent    Y1Value
    SNVT_lev_percent    X2Value
    SNVT_lev_percent    Y2Value
} SCPTcontrolSignal;
```

$0\% \leq \text{nciControlSignal.X1Value} < \text{nciControlSignal.X2Value}$

nciControlSignal.X1Value < nciControlSignal.X2Value < 100%

For Y1Value and Y2Value the valid range is:

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The default values are:

X1Value = 0%

Y1Value = 0%

X2Value = 100%

Y2Value = 100%

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTcontrolSignal (245)

Default Output (Mandatory for 00 / 01 / 20 / 21)

```
config network input sd_string("&1, p, 0\x80, 7")
SNVT_lev_percent nciDefPosition;
```

This configuration property defines the valve position in case of time-out of the input network variables (nviControlSignal and nviHvacOpMode). It obtains its base type from the profile's Valve-Control Signal Mirror principal network variable: nvoControlSignFb.

Valid Range

0 .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The default value is 0.0%.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTdefOutput (7)

Send Throttle (Mandatory for 00 / 01 / 20 / 21)

```
config network input sd_string("&2, i.j.k, 0\x80, 52")
SNVT_time_sec nciMinSendTime;
```

This input configuration property sets the minimum period of time that must expire before the functional block will allow updates of the following network variables to propagate across the network:

- nv3 – nvoControlSignFb (Mandatory)
- nv4 – nvoHvacOpMode (Mandatory)
- nv5 – nvoValveOpMode (Mandatory)
- nv11 – nvoValveCapacity (Optional)
- nv12 – nvoValvePosition (Optional)
- nv13 – nvoStrokeLength (Optional)
- nv14 – nvoActValvePos (Optional)
- nv15 – nvoValveFlow (Optional)
- nv16 – nvoDriveStatus (Optional)
- nv17 – nvoValveFault (Optional)
- nv18 – nvoMaintenance (Optional)
- nv19 – nvoRuntime (Optional)
- nv20 – nvoStrokeCumul (Optional)
- nv21 – nvoPosErrCount (Optional)
- nv22 – nvoPwrFailCount (Optional)
- nv23 – nvoEmergencyCount (Optional)
- nv24 – nvoEmergencyMode (Mandatory)

Notice that this CP is mandatory for nv24, which is mandatory in profile-specific variants 01 and 21.

A Mandatory CP associated with a Mandatory NV means that the CP is Mandatory for implementing this functional block (as in Table 2).

Whether the CP is associated with any NVs that are not explicitly stated as requiring the CP, can be defined by the manufacturer.

i . j . k are the indices of the NVs in relation to their declaration order within the device, when implemented.

Valid Range

The valid range is 0.0 to 3600.0 seconds.

Values outside this range are invalid and will disable the automatic update mechanism. A value of zero (0) will be used for the internal timer in cases where configured values are above 3600.0 seconds. If a value of 0.0 is used it will disable the automatic update mechanism.

Default Value

The default value is 0.0 (no update throttling).

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTminSendTime (52)

Location Label (Optional)

```
config network input sd_string("&1, p, 0\x80, 17")
SNVT_str_asc nciLocation;
```

This configuration property can be used to provide the location of the functional block (or device), where *p* is the functional-block index. The above code declaration is for providing the location of the functional block.

If it is preferred, the location of the device can be represented with the following code declaration **only if no Node Object functional block exists on the device**; otherwise, the Location Label from the Node Object should be used to represent the location of the device:

```
config network input sd_string("&0, , 0\x80, 17")
SNVT_str_asc nciLocation;
```

Valid Range

Any NULL-terminated ASCII string up to 31 bytes of total length (including NULL). The string must be truncated if the length does not allow the 31st character to be the NULL (0x00).

Default Value

The default value is an ASCII string containing 31 NULLs (0x00).

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTlocation (17)

Minimum Setpoint (Optional)

```
config network input sd_string("&1, p, 0\xA4, 53")
SNVT_lev_percent nciMinPosition;
```

This configuration property can be used to provide the minimum control position in percent of maximum stroke.

Valid Range

0% .. 100%, but < nciMaxPosition

Default Value

The default value is 0%, but can be changed by the manufacture.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTminSetpoint (53)

Maximum Setpoint (Optional)

```
config network input sd_string("&1, p, 0\xA4, 50")
SNVT_lev_percent nciMaxPosition;
```

This configuration property can be used to provide the sets the maximum control position in percent of maximum stroke.

Valid Range

0%..100%, but > nciMinPosition

Default Value

The default value is 100%, but can be changed by the manufacture.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTmaxSetpoint (50)

Minimum Stroke (Optional)

```
config network input sd_string("&1, P, 0xA4, 252")
SNVT_length_mil nciMinStroke;
```

This configuration property can be used to provide minimum stroke position.

Valid Range

0.0mm 6533,4mm, but < nciMaxStroke

Default Value

The default value is specified by the Actuator or manufacturer.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTminStroke (252)

Maximum Stroke (Optional)

```
config network input sd_string("&1, P, 0\xA4, 253")
SNVT_length_mil nciMaxStroke;
```

This configuration property can be used to provide the the maximum stroke position.

Valid Range

0.0 mm 6533,4mm, but > nciMinStroke

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTmaxStroke (253)

Valve Operating Mode (Optional)

```
config network input sd_string("&1, P, 0\x80, 249")
SNVT_valve_mode nciValveOpMode;
```

This configuration property can be used to provide the normal working mode of the valve.

Valid Range

| | | |
|---|---------------|-------------------------------------|
| 0 | VALVE_NORMAL | Valve works as normal control valve |
| 1 | VALVE_COOLING | Valve works as cooling valve only |
| 2 | VALVE_HEATING | Valve works as heating valve only |

Default Value

The default value is 0 - VALVE_NORMAL - Valve works as normal control valve.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTvalveOpMode (249)

Night-Purge Position (Optional)

```
config network input sd_string("&1,p,0\x80,246")
SNVT_lev_percent nciNightPurgePos;
```

This configuration property can be used to provide the valve position for the HVAC mode "Night Purge". If supervisory system sends the command "Night Purge" the valve will be set to this position.

Valid Range

0 % .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The default value is 0%.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTnightPurgePos (246)

Free-Cooling Position (Optional)

```
config network input sd_string("&1,p,0\x80,247")
SNVT_lev_percent nciFreeCoolPos;
```

This configuration property can be used to provide the valve position for the HVAC mode "Free Cooling". If supervisory system sends the command "Free Cooling" the valve will be set to this position.

Valid Range

0 % .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The default value is 0.0%.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTfreeCoolPos (247)

Emergency Position (Optional)

```
config network input sd_string("&1, P, 0\x80, 250")
SNVT_lev_percent nciEmergencyPos;
```

This configuration property can be used to provide the valve position for the emergency operation. This state will be indicated in the <nvoValveOpMode> with the status VALVE_EMERGENCY. Invalid data in this configuration property disables the emergency function.

Valid Range

0 % .. 100.00% (0.005% or 50 ppm). The value 0x7FFF represents invalid data.

Default Value

The default value is 0.0%.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTemergencyPosition (250)

Drive Time (Optional)

```
config network input sd_string("&1,P,0\xA4,45")
SNVT_time_sec nciDriveTime;
```

This configuration property can be used to provide the transition time for a full stroke (100%).

Valid Range

Depends on actuator type (e.g. 5s .. 600s)

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTdriveTime (45)

Valve Stroke (Optional)

```
config network input sd_string("&1,P,0\xA4,280")
SNVT_length_mil nciValveStroke;
```

This configuration property can be used to provide the stroke to fully open the valve. For further technical information refer to the manufacturer documentation.

Valid Range

0.0mm 6533.4mm

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTValveStroke (280)

Nominal Valve Size (Optional)

```
config network input sd_string("&1, p, 0\x80, 281")
SNVT_length_mil nciValveNomSize;
```

This configuration property can be used to provide the nominal size of the valve body. For further technical information refer to the manufacturer documentation.

Valid Range

0.0mm 6533.4mm

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTvalveNominalSize (281)

Valve Flow (Optional)

```
config network input sd_string("&1, p, 0\x80, 282")
SNVT_flow_p nciValveKvs;
```

This configuration property can be used to provide the flow through an open valve at 1 bar differential pressure. For further technical information refer to the manufacturer documentation.

Valid Range

0..655.34 m3/h

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTvalveKvs (282)

Valve Type (Optional)

```
config network input sd_string("&1, P, 0\x80, 283")
SNVT_dev_c_mode nciValveType;
```

This configuration property can be used to provide the valve type (2 Way etc.). For further technical information refer to the manufacturer documentation.

Valid Range

The valid range of the supported valve characteristics are given in the following table:

Type

| Value | Identifier | Notes |
|-------|---------------------|--------------------------------|
| 27 | DCM_2WAY_VALVE | Valve is a 2-way valve |
| 28 | DCM_MIXING_VALVE | Valve is a mixing way valve |
| 29 | DCM_DIVERTING_VALVE | Valve is a diverting way valve |

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTvalveType (283)

Manufacture Date (Optional)

```
config network input sd_string("&1,p,0\x80,148")
SNVT_time_stamp nciValveDateCode;
```

This configuration property can be used to provide the date code of when the valve was manufactured. For further technical information, refer to the manufacturer's documentation.

Valid Range

Range of SNVT_time_stamp. (hour, minute, & second are optional, or zero)

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTmanfDate (148)

Installation Date (Optional)

```
config network input sd_string("&1,p,0\x80,146")
SNVT_time_stamp nciInstallDate;
```

This configuration property can be used to provide the date code of when the valve was installed. For further technical information, refer to the manufacturer's documentation.

Valid Range

Range of SNVT_time_stamp. (hour, minute, & second are optional, or zero)

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTinstallDate (146)

Actuator Type (Optional)

```
config network input sd_string("&1, P, 0\xA4, 41")
SNVT_str_asc nciValveDescr;
```

This configuration property can be used to provide a manufacturer defined type string. For further technical information refer to the manufacturer documentation.

Valid Range

Any NULL terminated ASCII string of 31 bytes total length.

Default Value

The default value is an ASCII string containing all zeros ("\0") or a manufacturer defined string.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTactuatorType (41)

Actuator Characteristic (Optional)

```
config network input sd_string("&1,p,0\xA4,284")
SNVT_dev_c_mode nciActuatorChar;
```

This configuration property can be used to provide the characteristic of the actuator (linear, equal percent, etc.). For further technical information refer to the manufacturer documentation.

Valid Range

The valid range of the supported characteristics are given in the following table:

| Value | Identifier | Notes |
|-------|---------------------|---|
| 20 | DCM_QUICK_OPEN | Actuator uses "Quick-Open" flow characteristic |
| 21 | DCM_LINEAR | Actuator uses "Linear" flow characteristic |
| 22 | DCM_EQUAL_PERCENT | Actuator uses "Equal Percent" flow characteristic |
| 23 | DCM_QUADRATIC | Actuator uses "Quadratic" flow characteristic |
| 24 | DCM_FREE_DEFINED | Actuator uses free defined flow characteristic |
| 30 | DCM_INVFNC_QCK_OPN | Actuator uses "Inverse function of Quick-Open" flow characteristic |
| 31 | DCM_INVFNC_EQL_PERC | Actuator uses "Inverse function of Equal Percent" flow characteristic |
| 32 | DCM_INVFNC_QUAD | Actuator uses "Inverse function of Quadratic" flow characteristic |

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTactuatorCharacteristic (284)

Actuator Characteristic Table X (Optional)

```
config network input sd_string("&1,p,0\x80,28")
SNVT_trans_table nciActTransTblX;
```

This configuration property will be used in conjunction with the translation-table Y configuration property to create a translation table that dictates how to scale the mechanical position with respect to the capacity.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table Y value must be specified for each Translation-Table X value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTtrnsTblX (28)

Actuator Characteristic Table Y (Optional)

```
config network input sd_string("&1,p,0\x80,29")
SNVT_trans_table nciActTransTblY;
```

This configuration property will be used in conjunction with the translation-table X configuration property to create a translation table that dictates how to scale the mechanical position with respect to the capacity.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table X Value must be specified for each Translation-Table Y value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPT trnsTblY (29)

Valve-Plug Characteristic (Mandatory for 20 / 21)

```
config network input sd_string("&1, P, 0\xA4, 248")
SNVT_dev_c_mode nciValvePlugChar;
```

This configuration property can be used to provide the characteristic of the plug (linear equal percent etc.). For further technical information refer to the manufacturer documentation.

This CP is **Mandatory** for

- 20 — Calculated Actuator Characteristic
 - 21 — Calculated Actuator Characteristic with Emergency Mode function
- and **Optional** for
- 00 — Programmed Actuator Characteristic
 - 01 — Programmed Actuator Characteristic with Emergency Mode function

Valid Range

The valid range of the supported plug characteristics are given in the following table:

| Value | Identifier | Notes |
|-------|-------------------|---|
| 20 | DCM_QUICK_OPEN | Valve has "Quick-Open" flow characteristic |
| 21 | DCM_LINEAR | Valve has "Linear" flow characteristic |
| 22 | DCM_EQUAL_PERCENT | Valve has "Equal Percent" flow characteristic |
| 23 | DCM_QUADRATIC | Valve has "Quadratic" flow characteristic |
| 24 | DCM_FREE_DEFINED | Valve has free defined flow |

| | |
|--|----------------|
| | characteristic |
|--|----------------|

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has modification restrictions of constant and device specific (0xA4), since improper usage may cause a nonfunctional device.

SCPT Reference

SCPTvalveFlowCharacteristic (248)

Valve-Plug Characteristic Table X (Optional)

```
config network input sd_string("&1, p, 0\x80, 285")
SNVT_trans_table nciValvTransTblX;
```

This configuration property will be used in conjunction with the translation-table Y configuration property to create a translation table that dictates how to scale the flow with respect to the mechanical stroke.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table Y Value must be specified for each Translation-Table X value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTtrnsTblX2 (285)

Valve-Plug Characteristic Table Y (Optional)

```
config network input sd_string("&1, P, 0\x80, 286")
SNVT_trans_table nciValvTransTblY;
```

This configuration property will be used in conjunction with the translation-table X configuration property to create a translation table that dictates how to scale the flow with respect to the mechanical stroke.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table X Value must be specified for each Translation Table Y value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTtrnsTblY2 (286)

Combination-Flow Characteristic (Mandatory for 20 / 21)

```
config network input sd_string("&1, P, 0\x80, 287")
SNVT_dev_c_mode nciCombFlowChar;
```

This configuration property can be used to provide the desired system control flow characteristic (combination of the valve and the actuator characteristics). This characteristic and valve plug flow characteristic will be used by the firmware to calculate the actuator characteristic.

This CP is **Mandatory** for

- 20 — Calculated Actuator Characteristic
- 21 — Calculated Actuator Characteristic with Emergency Mode function

and **Optional** for

- 00 — Programmed Actuator Characteristic
- 01 — Programmed Actuator Characteristic with Emergency Mode function

Valid Range

| Value | Identifier | Notes |
|-------|---------------------|---|
| 20 | DCM_QUICK_OPEN | System control requires "Quick-Open" flow characteristic |
| 21 | DCM_LINEAR | System control requires "Linear" flow characteristic |
| 22 | DCM_EQUAL_PERCENT | System control requires "Equal Percent" flow characteristic |
| 23 | DCM_QUADRATIC | System control requires "Quadratic" flow characteristic |
| 24 | DCM_FREE_DEFINED | System control requires free defined flow characteristic |
| 30 | DCM_INVFNC_QCK_OPN | System control requires "Inverse function of Quick-Open" flow characteristic |
| 31 | DCM_INVFNC_EQL_PERC | System control requires "Inverse function of Equal Percent" flow characteristic |
| 32 | DCM_INVFNC_QUAD | System control requires "Inverse function of Quadratic" flow characteristic |

Default Value

The default value is 22 DCM_EQUAL_PERCENT.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTcombFlowCharacteristic (287)

Combination-Flow Characteristic Table X (Optional)

```
config network input sd_string("&1,p,0\x80,288")
SNVT_trans_table nciCombTransTblX;
```

This configuration property will be used in conjunction with the translation-table Y configuration property to create a translation table that dictates how to scale the flow with respect to the valve capacity.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table Y Value must be specified for each Translation-Table X value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTtrnsTblX3 (288)

Combination-Flow Characteristic Table Y (Optional)

```
config network input sd_string("&1,p,0\x80,289")
SNVT_trans_table nciCombTransTblY;
```

This configuration property will be used in conjunction with the translation-table X configuration property to create a translation table that dictates how to scale the flow with respect to the valve capacity. Both are in percent.

Valid Range

The valid range for this configuration property is 0 to 100%. A Translation-Table X Value must be specified for each Translation-Table Y value.

Default Value

The default value is manufacturer defined.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTtrnsTbly3 (289)

Anti-Sticking-Protection Interval (Optional)

```
config network input sd_string("&1, p, 0\x80, 251")
SNVT_time_hour nciAntiStickTime;
```

This configuration property can be used to provide the maximum time that the valve may remain stationary. When the time is expired, the valve is forced to move. This periodical cycling of the valve prevents sticking.

Valid Range

0.0 to 6,553.4 hours (0.1 hour)

Setting <nciAntiStickTime> = 0.0 disables the protect function.

Default Value

The default value is 24.0 hours.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTblockProtectionTime (251)

Runtime Alarm (Optional)

```
config network input sd_string("&1, p, 0\x80, 290")
SNVT_elepsed_tm nciRunTimeAlarm;
```

This configuration property can be used to provide the alarm threshold for the run time counter output network variable nvoRuntime. When the threshold level is exceeded, an alarm is sent via the node object.

Valid Range

0 to 65534 days

0 to 23 hours
0 to 59 minutes
0 to 59 seconds
0 to 999 milliseconds

Default Value

The default value is manufacturer defined.
Typically minutes, seconds and milliseconds fields are set to 0.

Configuration Requirements/Restrictions

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference

SCPTrunTimeAlarm (290)

Object Major Version (Optional)

```
config network input sd_string("&1,p,0\x84,167")
unsigned short nciObjMajVer;
```

This configuration property can be used to provide the major version number of the functional block when implemented on a device.

Valid Range

Any integer number from 0 to 255. Only 1-byte of information is accepted.

Default Value

The default value is one (1).

Configuration Requirements/Restrictions

This CP is a Constant (const_flg).

The Constant flag means that all devices with the same Standard Program Identifier (SPID) will have the same value, while the Device-Specific flag attribute means that devices with an identical SPID may have different values for this configuration property.

The presence of these configuration properties within the functional block defines the major version and minor version of the functional block. The major version number must be incremented when the network interface for the functional block changes, while the minor version number must be incremented when the network interface remains the same, but the functional block has a different behavior.

SCPT Reference

SCPTobjMajVer (167)

Object Minor Version (Optional)

```
config network input sd_string("&1,P,0\xA4,168")
unsigned short nciObjMinVer;
```

This configuration property can be used to provide the minor version number of the functional block when implemented on a device.

Valid Range

Any integer number from 0 to 255. Only 1-byte of information is accepted.

Default Value

The default value is zero (0).

Configuration Requirements/Restrictions

This CP has modification restrictions of Constant (`const_flg`) and Device-Specific (`device_specific_flg`): \xA4. It is not to be modified except that it *is* allowable to modify the value in a download of new code to the device.

The Constant flag means that all devices with the same Standard Program Identifier (SPID) will have the same value, while the Device-Specific flag attribute means that devices with an identical SPID may have different values for this configuration property.

The presence of these configuration properties within the functional block defines the major version and minor version of the functional block. The major version number must be incremented when the network interface for the functional block changes, while the minor version number must be incremented when the network interface remains the same, but the functional block has a different behavior.

SCPT Reference

SCPTobjMinVer (168)

Key for Unresolved References

i . j . k are the indices of the CP-associated NVs in relation to their declaration order within the device, when implemented in the device.

p is this functional block's index relative to the Device Self-Documentation String (DSDS) declaration, when implemented in the device.

Data Transfer

None specified.

Power-up State

There is no immediate network action on Power-up State.

Boundary and Error Conditions

None specified.

Additional Considerations

None specified.

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