



LONMARK[®]

Functional Profile:

Damper Actuators

- general purpose**
- fire and smoke**
- airflow control**

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Overview

This document describes the profile of a HVAC damper actuator object. The HVAC damper actuator object makes use of the Node Object. Three sub types of HVAC actuators can be handled by this object:

- general purpose actuators
- fire and smoke actuators
- airflow control actuators

In addition more than one actuator can be controlled by a single HVAC damper actuator object.

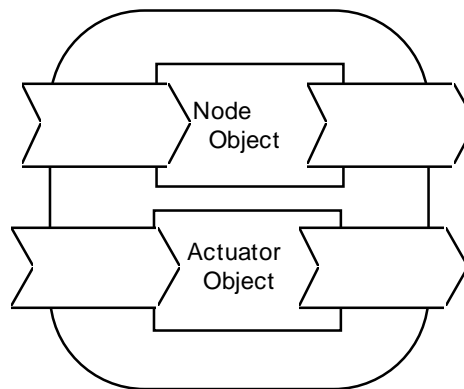


Figure 1.1 Functional Profile

Example Usage

The Damper actuator object interacts with one ore more of the following nodes:

- Thermostat
- HVAC Controller
- Multistate switches / Positioner
- Building Management System (BMS)
- Commissioning / Installation node
- Monitoring node (PC, Displays, ..)

Use of the Node Object

The Node Object is fully described in the LONMARK Application Layer interoperability Guidelines.

Mandatory Network Variables

SNVT_obj_request

```
network input SNVT_obj_request nviRequest;
```

Valid Range

RQ_NORMAL, RQ_UPDATE_STATUS, RQ_REPORT_MASK are supported as described in the LONMARK Application Layer interoperability Guidelines.

SNVT_obj_status

```
network output SNVT_obj_status nvoStatus;
```

This output network variable reports the status of any object on the node.

The semantic meaning of `nvoStatus` in relation to a damper actuator is described below.

Valid Range

The valid range is any value within the defined limits of `SNVT_obj_status`. The following states are supported:

invalid_id:	the object addressed in <code>nviRequest</code> does not exist.
invalid_request:	the requested code is not supported by the addressed object.
disabled:	the addressed object is currently disabled. Any updated input NV's are not executed by the actuator and no output will be updated.
out_of_service:	actuator not functional, or physically not present
mechanical_fault:	expected end stop lost or unexpected end stop occurred
over_range:	expected end stop lost
under_range:	unexpected end stop
electrical_fault:	the power supply voltage is out of its nominal range
self_test_in_progress:	adaptation (angle of rotation) or sync in progress
manual_control:	the gear release or the manual winding is currently activated.
in_alarm:	the addressed object is currently in alarm condition, the actuator doesn't work properly.
in_warning/in_servicecall:	the selected actuator has detected a service call condition but is still functional (proposed new state).
in_override:	indicates that <code>nviManOvr</code> is not "normal"

Optional Network Variables

File Request

network input SNVT_file_req nviFileReq;

File Request is used to access the configuration parameters

File Status

network output SNVT_file_status nvoFileStat;

File Status is used to access the configuration parameters

Configuration Properties

Max Send Time

network input config SNVT_time_sec nciMaxSendT;

Indicates the maximum period of time that expires before the node object automatically updates all it's nvo's (e.g. nvoStatus).

Valid Range

see SNVT_time_sec

Default Value

0 (no automatic update)

SCPT Reference

SCPTmaxSendTime(49)

Min Send Time

network input config SNVT_time_sec nciMinSendT;

Indicates the minimum period of time that expires before the node object automatically updates all it's nvo's (e.g. nvoStatus).

Valid Range

see SNVT_time_sec

Default Value

30 s

SCPT Reference

SCPTminSendTime(52)

Max Receive Time

```
network input config SNVT_time_sec nciRcvTime;
```

Indicates the max receive time for the network input variables (nviActuatState or nviRelStpt) before changing to default values.

Valid Range

see SNVT_time_sec

Default Value

0 (time-out not enabled)

SCPT Reference

SCPTmaxRcvTime(54)

Damper Actuator Object Details

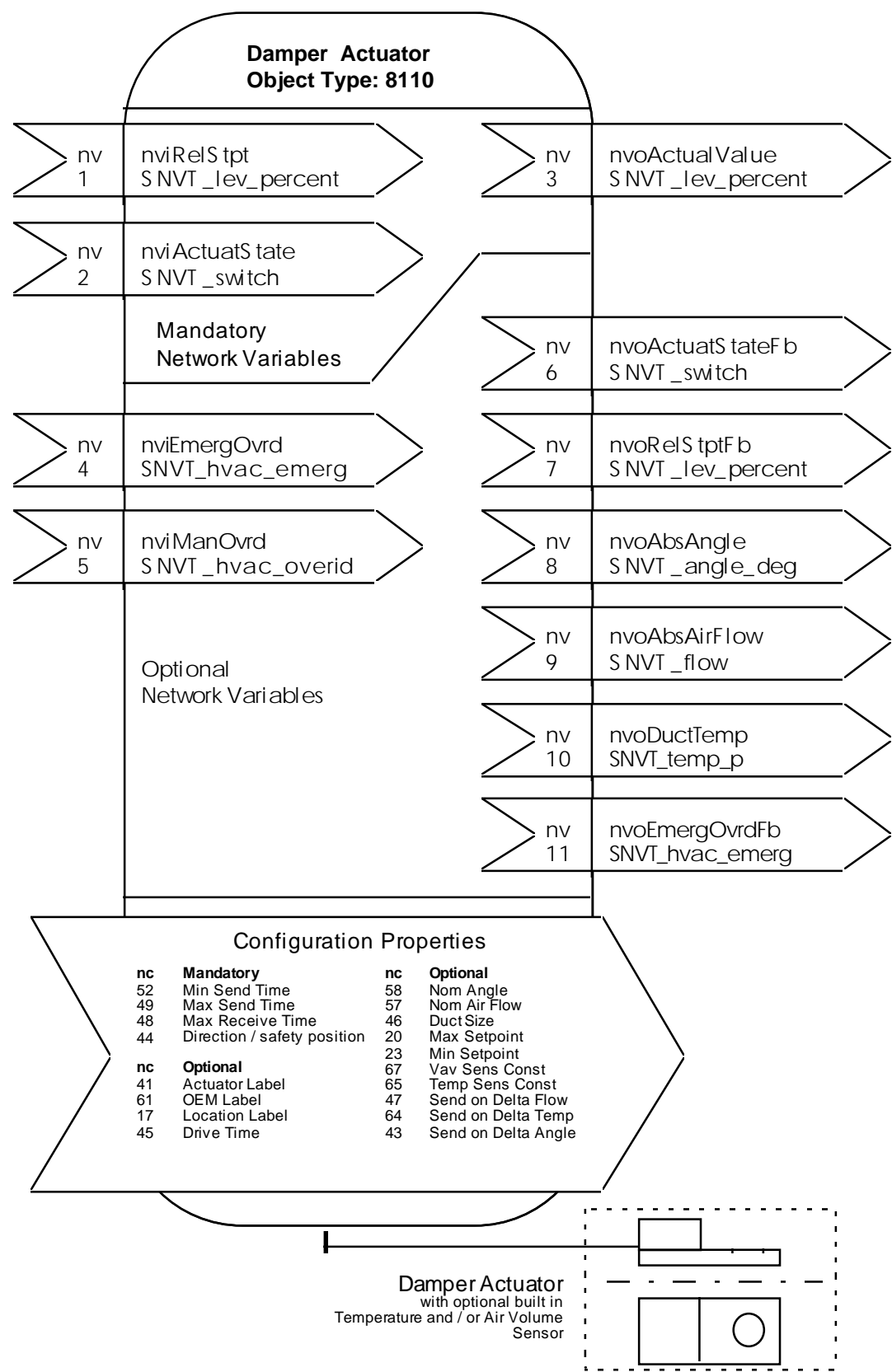


Figure 1.1 Damper Actuator Object Details

Mandatory Network Variables

Actuator Setpoint Input

network input SNVT_lev_percent nviRelStpt;

This input network variable controls the relative actuator setpoint. It would normally be used for comfort control and therefore be connected to a HVAC controller / Thermostat.

0% equals min setting and 100% equals max setting. Depending on the type of actuator either the damper angle or the air volume is controlled.

Application

general purpose	fire / smoke	airflow controller
damper angle	damper angle	air volume

Valid Range

The valid Range is 0-100%

Default Value

Default Value is 0%

Remark

The valid actuator setpoint is given by the latest update on either nviActuatState or nviRelStpt.

Actuator State Input

network input SNVT_switch nviActuatState;

This input network variable controls the actuator state. It is used for comfort control where the actuator is connected to a switch that forces the actuator to a pre defined set of positions or air volumes. The following table shows the relation between the value field of SNVT_switch and the associated function.

state	val %	general purpose	fire / smoke	air flow controller
0	x	close (1)	safety position (1)	close (1)
1	0-19.5	close (1)	safety position (1)	close (1)
1	20-39.5	min position	min position	min air volume
1	40-59.5	inter. position	inter. position	inter. position
1	60-79.5	max position	max position	max air volume
1	80-100	open (1)	operating position (1)	open (1)

1) for definition see configuration property "direction / safety position" (nc 7)

Valid Range

The valid Range is 0 to 100%.

Default Value

Default Value is 20 (min)

Remark

The valid actuator setpoint is given by the latest update on either `nviActuatState` or `nviRelStpt`.

Actual Position Output

network output SNVT_lev_percent nvoActualValue;

This output reflects the current position of the actuator and can be used as part of a control loop and for monitoring purposes.

Valid Range

0% - 100%

When Transmitted

The variable is transmitted immediately when it's value has changed by a predetermined amount. Depending on the actuator type this is defined by either `nciSendOnDeltaAngle` or `nciSendOnDeltaFlow`.

Update Rate

Defined by `nciMinSendTime` and `nciMaxSendTime`

Default Service Type

The default service type is unacknowledged

Optional Network Variables

Emergency Override Input

network input SNVT_hvac_emerg nviEmergOvrdr;

This input is used in fire and smoke applications to open and close an actuator with maximum speed. This input has highest priority, therefore if activated all other inputs and the input heartbeat timer (`nciRcvTime`) are disabled.

	Actuator Action
NORMAL	<code>nviActuatState</code> , <code>nviRelSetpt</code> , <code>nviManOvrdr</code> are valid
PRESSURIZE	not valid
DEPRESSURIZE	not valid
PURGE	operating position (1)
FIRE	safety position (1)

1) for definition see configuration property "direction / safety position" (nc 7)

Valid Range

see table

Default

Default value is NORMAL.

In the case of communication loss or power fail a safety damper automatically runs to it's predefined safety position.

Manual Override Input

network input SNVT_hvac_overid nviManOvrdr;

This input is used to command the actuator into a manual mode (mainly used during balancing).

Valid Range

state	no_manual; manual_flow; manual_flow_percent; open; close; minimum; maximum; manual_nul
ManPosition	0% to 100%
ManFlow	0 to 65535 liters per second

Default

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

Actuator Setpoint Feedback Output

network output SNVT_lev_percent nvoRelStptFb;

This output network variable mirrors the actual value of nviRelStpt. This can be used for multiple Sensor applications.

Valid Range

same as nviRelStpt

When Transmitted

The variable is transmitted immediately when a change is made to nviRelSetpt.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is unacknowledged

Actuator State Feedback Output

network output SNVT_switch nvoActuatStateFb;

This output network variable mirrors the actual value of `nviActuatState`. This can be used for multiple Sensor applications.

Valid Range

same as `nviActuatState`

When Transmitted

The variable is transmitted immediately when a change is made to `nviActuatState`.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is unacknowledged

Emergency Override Feedback Output

network output SNVT_hvac_emerg nvoEmergOvrdfb;

This output network variable mirrors the value of `nviEmergOvrdfb`. This can be used to read back the high priority `nviEmergOvrdfb` input.

Valid Range

same as `nviEmergOvrdfb`

When Transmitted

The variable is transmitted immediately when a change is made to `nviEmergOvrdfb`.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is unacknowledged

Damper Angle Output

network output SNVT_angle_deg nvoAbsAngle;

This output network variable reflects the current position of the actuators shaft / damper blade and can be used for monitoring and service purposes.

Valid Range

The valid range is limited to the mechanical working range of the associated actuator (-5..95 or -5..185). A value of 0x7FFF indicates “data not available” (e.g. during startup)

When Transmitted

The variable is transmitted immediately when it's value has changed by a predefined amount which is specified in nciSendOnDeltaAngle.

Update Rate

Defined by nciMinSendTime and nciMaxSendTime

Default Service Type

The default service type is unacknowledged

Air Flow Output

network output SNVT_flow nvoAbsAirFlow;

This output network variable reflects the current air flow through the associated VAV box and can be used as part of a control loop and for monitoring purposes.

Valid Range

The valid range is 0 ... 65'535 (l/s). A value of 0x7FFF indicates that no VAV sensor is present.

When Transmitted

The variable is transmitted immediately when it's value has changed by a predefined amount which is specified in nciSendOnDeltaFlow.

Update Rate

Defined by nciMinSendTime and nciMaxSendTime

Default Service Type

The default service type is unacknowledged

Inside Duct Temperature Output

network output SNVT_temp_p nvoDuctTemp;

This output network variable reflects the current temperature inside the duct and can be used for monitoring purposes.

Valid Range

The valid range is -50 .. 150 degree C. A value of 0x7FFF indicates that no duct temperature sensor is present.

When Transmitted

The variable is transmitted immediately when it's value has changed by a predefined amount which is specified in nciSendOnDeltaTemp.

Update Rate

Defined by nciMinSendTime and nciMaxSendTime

Default Service Type

The default service type is unacknowledged

Configuration Properties

Min Send Time

network input config SNVT_time_sec nciMinSendTime;

Indicates the minimum period between output network variable transitions.

Valid Range

see SNVT_time_sec

Default Value

tbd

SCPT Reference

SCPTminSendTime(52)

Max Send Time

network input config SNVT_time_sec nciMaxSendTime;

Indicates the maximum period of time that expires before the actuator object automatically updates all its output variables.

Valid Range

see SNVT_time_sec

Default Value

0 (no automatic update)

SCPT Reference

SCPTmaxSendTime(49)

Max Receive Time

```
network input config SNVT_time_sec nciRcvTime;
```

Indicates the max receive time for the network input variables (nviActuatState or nviRelStpt or nviManOvrdr) before changing to default value.

Valid Range

see SNVT_time_sec

Default Value

0 (time-out not enabled)

SCPT Reference

SCPTmaxRcvTime(48)

Direction / Safety position

```
network input config SNVT_state nciDirection;
```

nciDirection is used to set the actuators sense of rotation.

bit0=0 : actuator runs CW (top view) if e.g. nviRelSetpt is 100%

bit0=1 : actuator runs CCW (top view) if nviRelSetpt is 100%

bit1=0 : safety position = damper closed

bit1=1 : safety position = damper open

Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer.

Default Value

bit0=0, bit1=0

SCPT Reference

SCPTdirection(44)

Flow Send on Delta

```
network input config SNVT_flow nciSendOnDltFlow;
```

Indicates the minimum delta on the air flow to send a new value on nvoAbsFlow.

Valid Range

same as SNVT_flow

Default Value

10 l/s

SCPT Reference

SCPTminDeltaFlow(47)

Duct Temperature Send on Delta

```
network input config SNVT_temp_p nciSendOnDltTemp;
```

Indicates the minimum delta on the duct temperature to send a new value on nvoDuctTemp.

Valid Range

same as SNVT_temp_p

Default Value

1 degree C

SCPT Reference

SCPTminDeltaTemp(64)

Damper Angle Send on Delta

```
network input config SNVT_ang_deg nciSendOnDltAngl;
```

Indicates the minimum delta on the damper angle to send a new value on nvoDamperAngle.

Valid Range

same as SNVT_angle_deg

Default Value

5 degrees

SCPT Reference

SCPTminDeltaAngl(43)

Actuator Label

```
network output config SNVT_str_asc nciActuatType;
```

This configuration property can be used to identify the exact actuator type or label. This information is read only.

Default Value

Actuator Label

SCPT Reference

SCPTactuatorType(41)

OEM Label

```
network input config SNVT_str_asc nciOemType;
```

This configuration property can be programmed by the OEM and can be used to identify the unit name (e.g. VAV-Box type). Write access can be disabled by the manufacturer.

Default Value

OEM Label (16 lower bytes used only)

SCPT Reference

SCPToemType(61)

Location Label

```
network input config SNVT_str_asc nciLocation;
```

This configuration property can be used to provide physical location of the actuator object. Write access can be disabled by the manufacturer.

Valid Range

Location Label (16 lower bytes used only)

Default Value

None specified.

SCPT Reference

SCPT_location (17)

Drive Time

```
network input config SNVT_time_sec nciDriveTime;
```

This configuration property sets the transition time for a full stroke (100%).

Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer. `nciDriveTime` does not affect airflow control actuators.

Default Value

150 seconds

Valid Range

depending on actuator type (e.g. 50s .. 600s)

SCPT Reference

SCPTdriveTime(45)

NomAngle

```
network input config SNVT_Angle_deg nciNomAngle;
```

Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer. Write access may also cause an automatic self test to get the mechanical working range of the actuator.

Default Value

90

Valid Range

0-95

SCPT Reference

SCPTnomAngle(58)

NomAirFlow

```
network input config SNVT_flow nciNomAirFlow;
```

nciNomAirFlow is used to calculate the airflow and therefore is relevant only for airflow control actuators. Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer.

Default Value

Programmed by the box manufacturer or balancer

Valid Range

same as SNVT_flow

SCPT Reference

SCPTnomAirFlow(57)

Duct Size

```
network input config SNVT_area nciDuctSize;
```

nciDuctSize is used to calculate the Air Flow and therefore is relevant only for VAV actuators / controllers. Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer.

Default Value

0xFFFF (indicates that the box isn't set up correct)

Valid Range

same as SNVT_area

SCPT Reference

SCPTductArea(46)

Max Setpoint

```
network input config SNVT_lev_percent nciMaxSetpoint;
```

Depending on the actuator category this configuration property sets either the max angle of rotation or the maximum air flow (see either NomAngle or NomAirVolume).

Valid Range

0% .. 163% of the nominal value. nciMaxSetpt has to be equal or more than nciMinSetpt.

Default Value

100%

SCPT Reference

SCPT_max_rnge (20)

Min Setpoint

```
network input config SNVT_lev_percent nciMinSetpoint;
```

Depending on the actuator category this configuration property set's either the min angle of rotation or the minimum air flow (see either NomAngle or NomAirVolume)..

Valid Range

0% .. 163% of the nominal value nciMinSetpt has to be equal or less than nciMaxSetpt.

Default Value

0%

SCPT Reference

SCPT_min_rnge (23)

VAV Sensor Constant

```
network input config SNVT_multiplier nciVavSensConst;
```

nciVavSensConst is used to calculate the Air Flow and therefore relevant only for airflow control actuators. Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer.

Default Value

Programmed by the VAV Box manufacturer or balancer

SCPT Reference

SCPTsensConstVAV(67)

Temperature Sensor Constant

```
network input config SNVT_multiplier nciTempSensConst;
```

nciTempSensConst is used to calibrate the optional duct temperature sensor. Since improper usage may cause a nonfunctional device, write access can be disabled by the manufacturer.

Default Value

1

SCPT Reference

SCPTsensConstTemp(65)

Power-up State

All input variables are set to their default values.