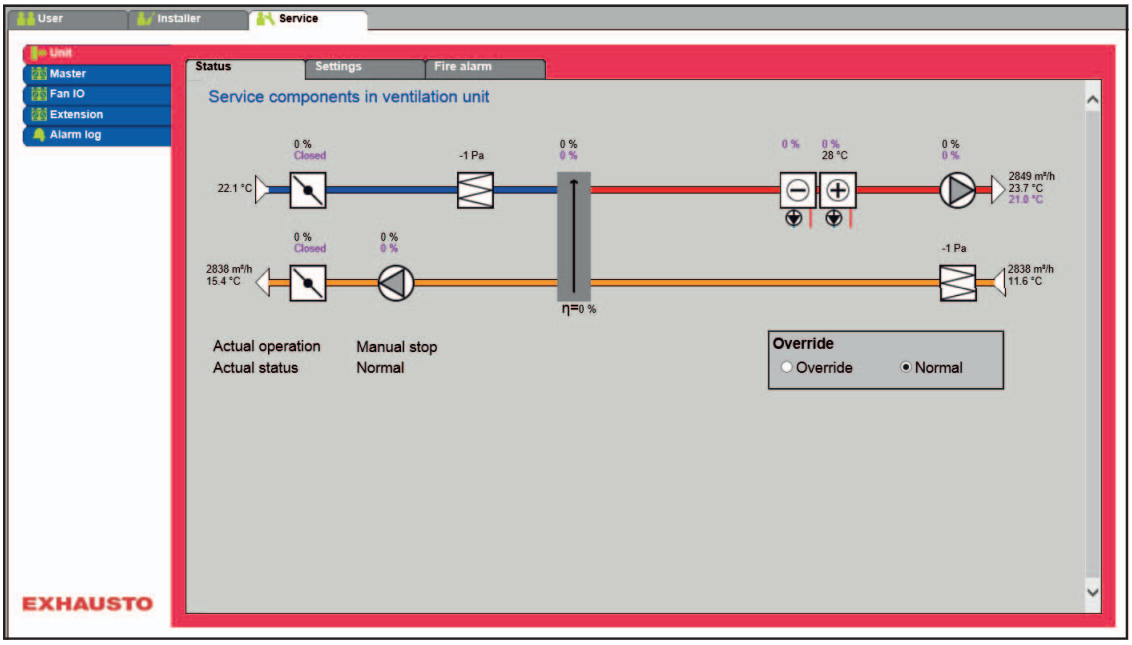
GB

LON Protocol

User Manual
EXcon SW vers. 3.xx



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EXHAUSTO

1. Product information

This protocol describes EXcon LON gateway, which is used to connect an EXHAUSTO A/S ventilation unit using the EXcon control system to a LonWorks network.

The LonWorks gateway converts signals on the EXcon Master's local RS485 Modbus to standard LonMark Association SNVTs, enabling the unit to be monitored and controlled from a LonWorks network.

A FTT-10A free topology transceiver with a transmission speed of 78 kbps is used.

Version control

y indicates a larger version and x indicates a smaller version.
The actual version can be found online by the installation tool's browser in NodeObject cpDevMinorVer and cpDevMajorVer. Larger version upgrades require a new XIF file.

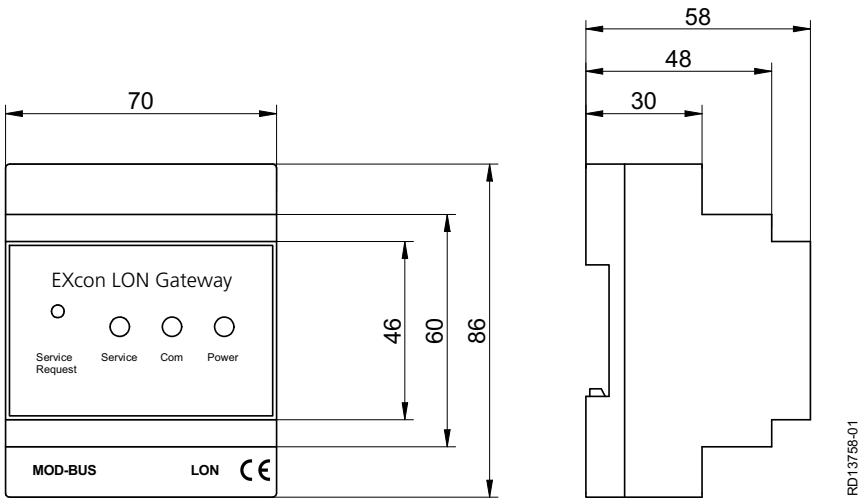
Further information about LON function profiles is available at: www.lonmark.org/products/fprofile.htm#hvac

2. Installation

Mechanical installation

LonWorks gateway must be fitted on a DIN rail in a cabinet with an enclosure class required by the installation. EXcon panels are prepared for EXcon LON Gateway.

Dimensions



Configuration of EXcon Master

LON Gateway requires EXcon Master software vers. 3.00 or above.
EXcon Master does not require any configuration for LON operation, since this is done automatically when the EXcon LON module is connected to EXcon Master.
Once the LON module is recognised, alarm no. 15 "LON gateway (EXconLon): No communication" is set, if the LON module is disconnected from EXcon Master.

Electrical installation

Connect the network cable for the LonWorks network to the LonWorks gateway's LON port via the 2-pole male connector.

Connect one of the LonWorks Gateway Modbus ports to EXcon Master RS485 connector B or C using a RJ12/6 connector.

The LON Gateway can be factory-fitted or supplied as an after sales service.

3. Technical data

Power supply	
The EXcon LON module is powered by Modbus using	24 VDC

Modbus connection	
Signal	RS485 (38.4 kbaud)
Protocol	Modbus RTU
Connector	RJ11/6 connector (double female fitted in module)
Max. cable length	100 m

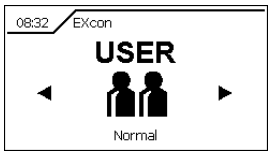
LonWorks connection	
Transceiver	FTT-10A
Speed	78 kbps
Connector	PTA STLZ950/2G-508H (the module is supplied with 2-pole male and female connectors)
Max. cable length	100 m

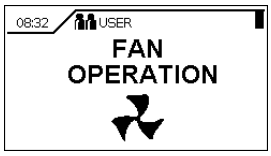
Requirements related to surroundings/environment	
Enclosure class	IP20
Air humidity	10-90 % RH
Temperature range	-40°C to +50°C

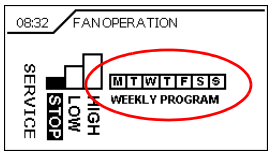
4. Operation

Setting

Full control of the unit using LON network requires that “FAN OPERATION” is set to "WEEKLY PROGRAM” on the manual terminal.







Settings on the manual terminal for executing start/stop on the LON.

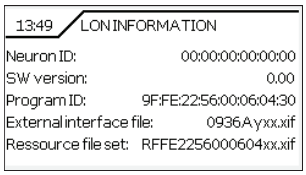
If the EXcon system is in the STOP setting, the fan operation settings from LON will not have any effect. STOP always has high priority in the EXcon system and can be set from various sources:

Priority 1:
- Manual terminal
- Online user interface
- Digital inputs on EXcon master

Priority 2:
- Modbus RTU (RS485)
- Modbus (TCP/IP)
- LON

Neuron ID

The actual LON module Neuron ID can be read on the manual terminal:
Installer > Communication >LON INFORMATION



The Neuron ID is first shown when the node is brought into use.

LonWorks software conformity

The LonWorks module is designed to connect to an EXcon ventilation system for an open LonWorks control network in accordance with international LonMark guidelines.

Standard program ID: 9F:FE:22:56:00:06:04:30

The following data files from EXHAUSTO A/S can be requested for use in connection with LonWorks installation tools and to document conformity.

- Latest external interface file 0936Ayxx.xif
- Latest resource file set RFFE2256000604xx.zip

Both files are available on the EXHAUSTO website (www).

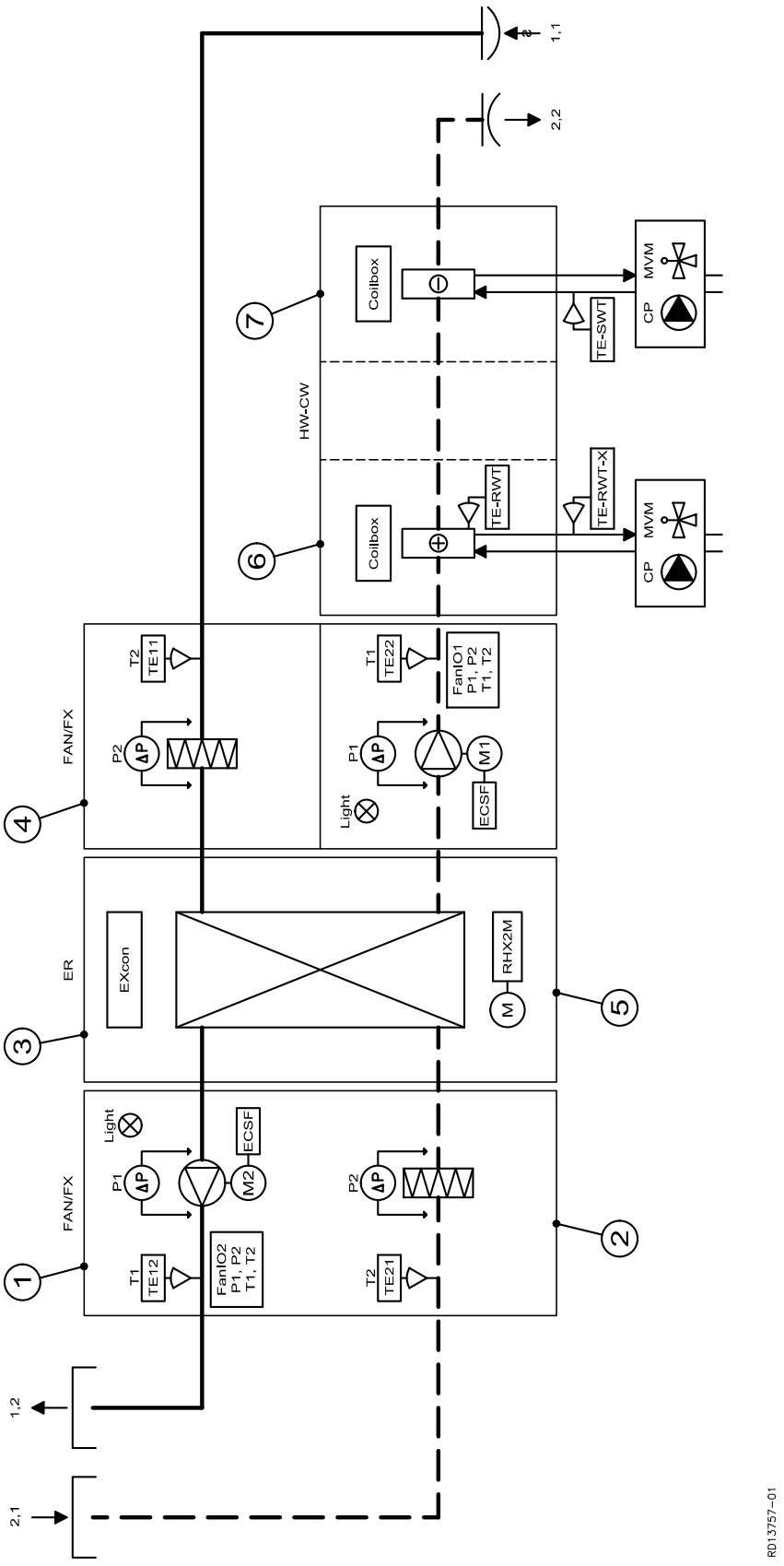
User interface

The user interface consists of three LEDs and a service button on the front of the module. The service button is used to identify the node on the control network and can be activated using a pencil or the tip of something (2 mm diameter).
The LEDs have the following colours and functions:

Name of LED	Colour	Function
Service	Yellow	• Flashes if the node is not configured. • Unlit if the node is configured on the network. • Lights when the service button is pressed in. • Lit constantly if the node does not have program (error condition).
Com	Green	• Flashes when Modbus is synchronising data. • Flashes quickly when the data is being updated from the control network to Modbus. • Constantly lit/unlit if there is a communication fault.
Power	Green	• Lights when the node is connected to power supply.
Power and com	Green	• Lights alternately during the initialisation of the node or connection to power supply. • Lights alternately when the installation tool sends a WINK signal to the node.

The location of the LEDs and the service button are shown on the drawing in the "Installation" section.

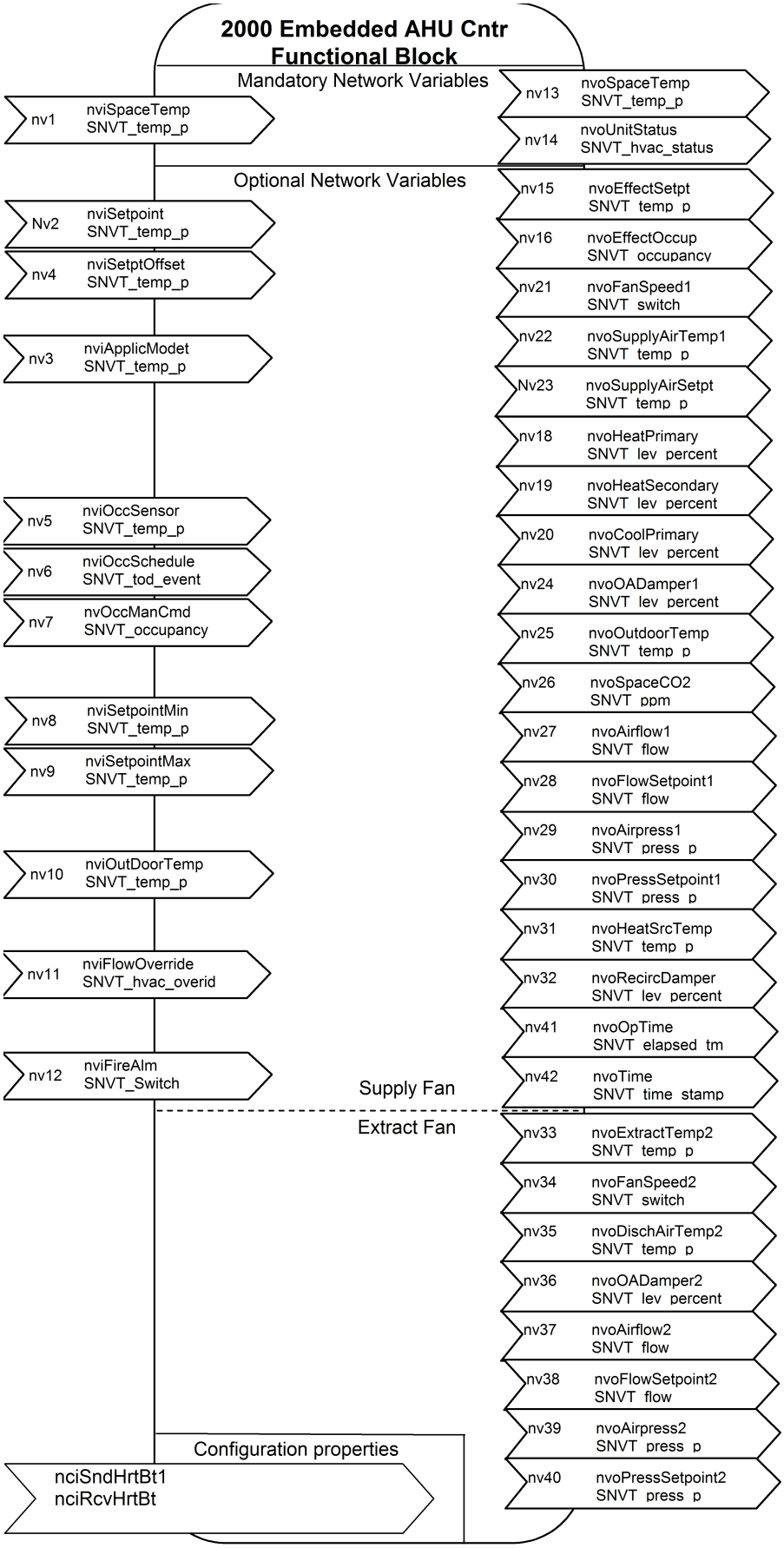
5. Overview diagram and data points



Pos. no.	Location	Data points
-	The unit in general	Temperature setpoint (NV2) Change between Low and High airflow (NV7)
1	Exhaust air	Temperature, measured (NV35) Airflow, measured (NV37) Airflow, setpoint (NV38) Fan, setpoint (NV34) Damper position (NV36)
2	Outdoor air	Temperature, measured (NV25) Damper position (NV24)
3	Recovery	Setpoint (NV18)
4	Extract air	Temperature, measured (NV33) Pressure in duct, measured (NV39) Pressure in duct, setpoint (NV40) CO2, measured (NV26)
5	Supply air	Temperature, measured (NV22) Temperature, setpoint (NV23) Airflow, measured (NV27) Airflow, setpoint (NV28) Fan, setpoint (NV21) Pressure in duct, measured (NV29) Pressure in duct, setpoint (NV30)
6	Heating coil	Heating, setpoint (NV19)
7	Cooling - evaporator	Setpoint (NV20)

6. LonMark Object

Function block



6.1 Network variables, Inputs (NVI), UFTP embedded AHU control

Table 1						
NV no. (M/O)*	**Name of variable**	**Recv HrtBt**	**SNVT-name**	**SNVT-index**	**Class**	**Description**
1 (M)	nviSpaceTemp	Yes	SNVT_temp_p	105	RAM	Room temperature
2 (O)	nviSetpoint	No	SNVT_temp_p	105	RAM	Temperature setpoint (absolute)
3 (O)	nviApplicMode	Yes	SNVT_hvac_mode	108	RAM	Mode of use
4 (O)	nviSetptOffset	Yes	SNVT_temp_p	105	RAM	Setpoint offset
5 (O)	nviOccSensor	Yes	SNVT_occupancy	109	RAM	Motion sensor
6 (O)	nviOccSchedule	Yes	SNVT_tod_event	128	RAM	Motion sensor planning
7 (O)	nviOccManCmd	No	SNVT_occupancy	109	RAM	Motion sensor override
8 (O)	nviSetpointMin	Yes	SNVT_temp_p	105	RAM	Setpoint for supply air, min. temperature
9 (O)	nviSetpointMax	Yes	SNVT_temp_p	105	RAM	Setpoint for supply air, max. temperature
10 (O)	nviOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor air temperature
11 (O)	nviFlowOverride	No	SNVT_hvac_overid	111	RAM	Airflow override
12 (O)	nviFireAlm	Yes	SNVT_switch	95	RAM	Fire alarm

* M = Mandatory Network Variables, O = Optional Network Variables

6.2 Supported nviApplicMode modes

Table 2			
Value	**nviApplicMode**	**nvoEffectOccup**	**Operation of fans**
0	HVAC_AUTO	See Table 3	See Table 3
6	HVAC_OFF	OC_UNOCCUPIED	Stop
13	HVAC_ECONOMY	OC_STANDBY	Low speed
0xFF	HVAC_NUL	Same as HVAC_AUTO	Same as HVAC_AUTO

Standard value is HVAC_AUTO

6.3 nviApplicMode 0 = HVAC_Auto

Table 3				
LON inputs			**LON output**	**AHU output**
nviOccManCmd	**nviOccSchedule[1]**	**nviOccSensor[2]**	**nvoEffectOccup**	**Operation of fan**
OC_OCCUPIED[3]	Don't Care	Don't Care	OC_OCCUPIED	High speed
OC_UNOCCUPIED[3]	Don't Care	Don't Care	OC_UNOCCUPIED	Stop
OC_BYPASS OC_NUL	OC_OCCUPIED[3]	Don't Care	OC_OCCUPIED	High speed
	OC_UNOCCUPIED[3]	Don't Care	OC_UNOCCUPIED	Stop
	OC_STANDBY[3]	OC_OCCUPIED	OC_OCCUPIED	High speed
		OC_UNOCCUPIED	OC_OCCUPIED[5] OC_STANDBY	High-speed operation on[5] Low speed
	OC_NUL[4]	OC_OCCUPIED	OC_OCCUPIED	High speed
		OC_UNOCCUPIED	OC_OCCUPIED[6] OC_STANDBY[7] OC_UNOCCUPIED	High speed[6] High-speed operation on[5] Low speed[7] Stop
OC_STANDBY	Don't Care	OC_OCCUPIED	OC_OCCUPIED	
		OC_UNOCCUPIED	OC_OCCUPIED[6] OC_STANDBY	High speed[6] High-speed operation on[5] Low speed

NOTES

1) nviOccSchedule refers to the field "current_state". The fields "next_state" and "time_to_next_state" are not active.

2) The motion sensor can be a local input or a motion sensor on a LON network input. If both are used, OC_OCCUPIED from one source overrides OC_UNOCCUPIED from the other source.
OC_NUL is the same as OC_UNOCCUPIED.

3) Deactivates "Device scheduler" in EXcon Master.

4) Standard value. Activates "Device scheduler" in EXcon Master.

5) nvoEffectOccup will be OC_OCCUPIED during active operation incorporated in EXcon Master, if it is activated by a motion sensor.
nvoEffectOccup = OC_OCCUPIED. If a motion sensor connected to a digital input has started the unit.

6) "High speed" controlled by "Device scheduler" in EXcon Master.

7) "High speed" controlled by "Device scheduler" in EXcon Master.

8) "Don't Care" = an arbitrary state

6.4 Supported nviFlowOverride modes

Table 4		
nviFlowOverride	**Description**	**Fan operation**
0	HVO_OFF	Normal control
2	HVO_FLOW_VALUE	Supply air setpoint in l/s
3	HVO_FLOW_PERCENT	Supply air fan speed in %
8	HVO_FLOW2_VALUE	Extract air setpoint in l/s
9	HVO_FLOW2_PERCENT	Extract air fan speed in %
0xFF	Same as HVO_OFF	Same as HVO_OFF

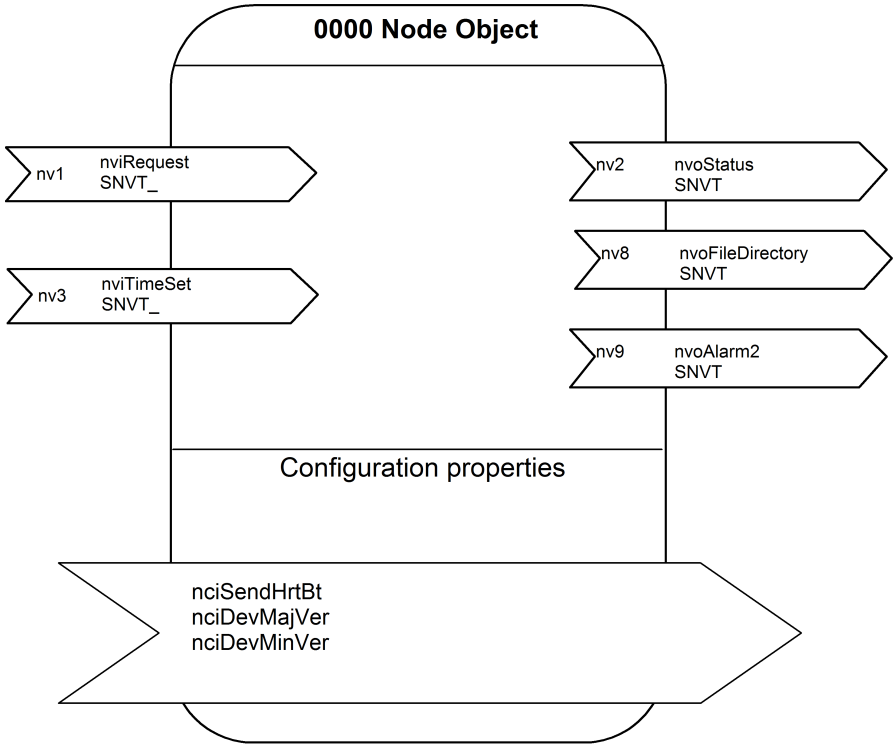
6.5 Variable outputs for network, UFTP embedded AHU control (output)

Table 5						
NV no. (M/O)*	**Name of variable**	**Snd HrtBt**	**SNVT-name**	**SNVT-index**	**Class**	**Description**
13 (M)	nvoSpaceTemp	Yes	SNVT_temp_p	105	RAM	Effective air temperature
14 (O)	nvoUnitStatus	Yes	SNVT_hvac_status	112	RAM	Device status
15 (O)	nvoEffectSetpt	Yes	SNVT_temp_p	105	RAM	Effective setpoint
16 (O)	nvoEffectOccup	No	SNVT_occupancy	109	RAM	Effective mode
18 (O)	nvoHeatPrimary	Yes	SNVT_lev_percent	81	RAM	Primary heating
19 (O)	nvoHeatSecondary	Yes	SNVT_lev_percent	81	RAM	Secondary heating
20 (O)	nvoCoolPrimary	Yes	SNVT_lev_percent	81	RAM	Primary cooling
21 (O)	nvoFanSpeed1	Yes	SNVT_switch	95	RAM	Fan 1 - speed
22 (O)	nvoSupplyAirTemp1	No	SNVT_temp_p	105	RAM	Supply air temperature
23 (O)	nvoSupplyAirSetpt	Yes	SNVT_temp_p	105	RAM	Setpoint for supply air temperature
24 (O)	nvoOADamper1	Yes	SNVT_lev_percent	81	RAM	Outdoor air damper 1
25 (O)	nvoOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor air temperature
26 (O)	nvoSpaceCO2	Yes	SNVT_ppm	29	RAM	CO2 level in the extract air
27 (O)	nvoAirflow1	Yes	SNVT_flow	15	RAM	Airflow 1
28 (O)	nvoFlowSetpoint1	Yes	SNVT_flow	15	RAM	Setpoint for airflow 1
29 (O)	nvoAirPress1	Yes	SNVT_press_p	113	RAM	Air pressure 1, output
30 (O)	nvoPressSetpoint1	Yes	SNVT_press_p	113	RAM	Setpoint for pressure 1
31 (O)	nvoHeatSrcTemp	Yes	SNVT_temp_p	105	RAM	Heating source, temperature output
32 (O)	nvoRecircDamper	Yes	SNVT_lev_percent	81	RAM	Air damper for recirculation
33 (O)	nvoExtractTemp2	Yes	SNVT_temp_p	105	RAM	Extract air temperature
34 (O)	nvoFanSpeed2	Yes	SNVT_switch	95	RAM	Fan 2 - speed
35 (O)	nvoDischAirTemp 2	No	SNVT_temp_p	105	RAM	Exhaust air 2 - temperature
36 (O)	nvoOADamper2	Yes	SNVT_lev_percent	81	RAM	Outdoor air damper 2
37 (O)	nvoAirflow2	Yes	SNVT_flow	15	RAM	Airflow 2
38 (O)	nvoFlowsetpoint2	Yes	SNVT_flow	15	RAM	Setpoint for airflow 2
39 (O)	nvoAirpress2	Yes	SNVT_press_p	113	RAM	Air pressure 2
40 (O)	nvoPressSetpoint2	Yes	SNVT_flow	15	RAM	Setpoint for pressure 2
41 (O)	nvoOpTime	No	SNVT_elapsed_tm	87	RAM	Shows device's total accumulated operating time
42 (O)	nvoTime	No	SNVT_time_stamp	84	RAM	Shows device's real-time internal clock

1) nvoUnitStatus gives a basic alarm status in the SNVT_hvac_status field "in_alarm".
0 = no alarm.
1 = A alarm (alarm has stopped AHU, execute service).
2 = B alarm (alarm, AHU operates with reduced performance, execute maintenance).
3 = A + B alarm.

2) Index "1" applies in general to supply air. Index "2" applies to extract air.

Node object for function block



6.6 Inputs for network variable, Node Object

Table 6

NV no. (M/O)*	Name of variable	SNVT-name	SNVT Index	Description
1 (M)	nviRequest	SNVT_obj_request	92	Request about a specific function block in the device
2 (M)	nvoStatus	SNVT_obj_status	93	Reports status of the requested function block in the device
3 (O)	nviTimeSet	SNVT_time_stamp	84	Synchronises the device's internal real time clock with an external clock
8 (O)	nvoFileDirectory	SNVT_address	114	Address for the file folder that contains the descriptors for configuration files
9 (O)	nvoAlarm2	SNVT_alarm_2	164	Transmits alarm data for every function block on a device, whenever an alarm is activated or deactivated and on request. Replaces **nvoAlarm**

1) nviTimeSet should not be updated more than once every hour, since the changes are saved internally in the EEPROM in the EXcon control.
Updating nviTimeSet more than once every hour will unnecessary wear the EEPROM and reduce the performance of the EXcon control system.

7. Network cables and connections

7.1 Cable type

Specifications for double terminated bus topology

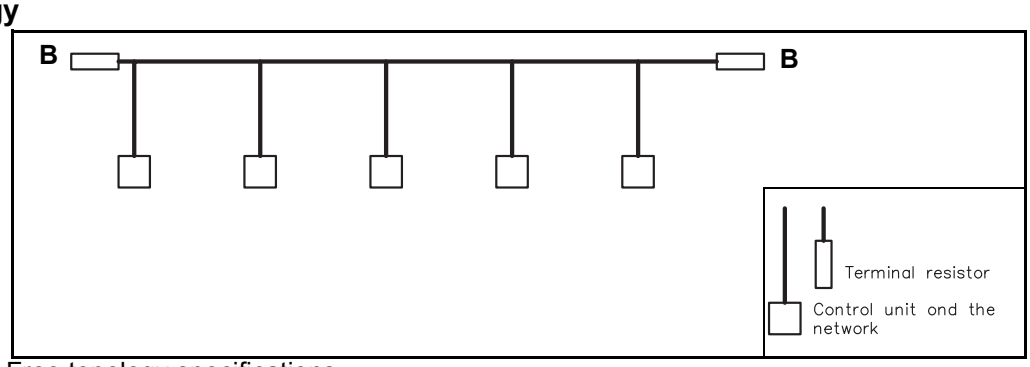
Maximum bus length	
Belden 85102	2700 m
Belden 8471	2700 m
Level IV, 22 AWG	1400 m
JY (St) Y 2 x 2 x 0.8	900 m
Category 5 Ethernet cable	900 m

7.2 Topology

A double terminated bus can have a "stump" of up to 3 m from the bus to each node.

To terminate **(B)** a Siemens LON bus termination connector type RXZ01.1 52.5 Ω or equivalent can be used.

7.2.1 Bus topology



Free topology specifications.

Greatest permitted node-to-node distance		Longest permitted total cable length
Belden 85102	500 m	500 m
Belden 8471	400 m	500 m
Level IV, 22 AWG	400 m	500 m
JY (St) Y 2 x 2 x 0.8	320 m	500 m
Category 5 Ethernet cable	250 m	450 m

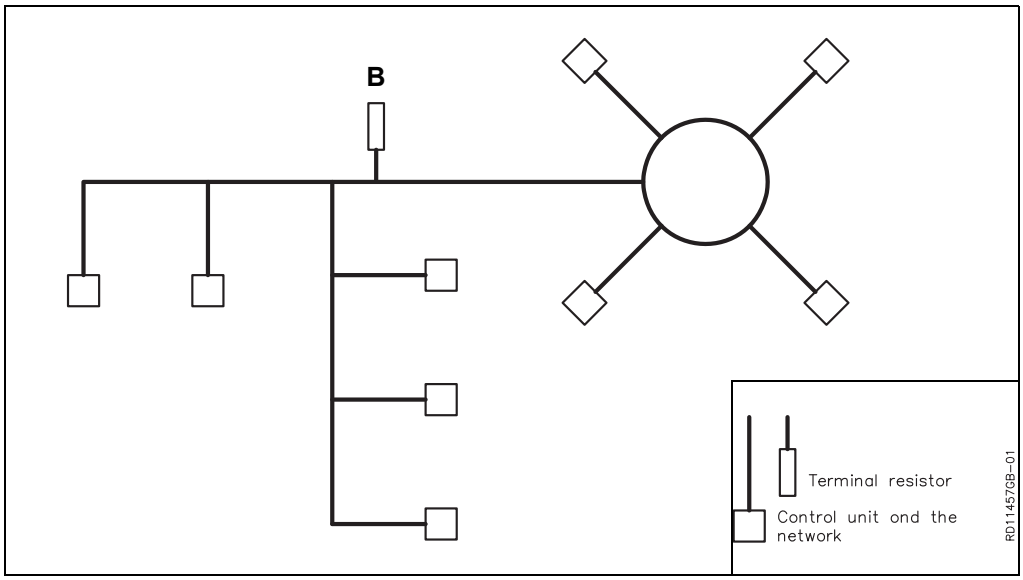
7.2.2 Free topology

In the case of free topology, the following conditions must be met.

1. The greatest distance between two arbitrary nodes or terminating devices may not exceed the maximum node-to-node distance.
   If there are several signal paths, e.g. with a ring topology, the distance that is greatest applies.
2. The overall cable length may not exceed the maximum total cable length.

To terminate **(B)** a Siemens LON bus termination connector type RXZ02.1 105 Ω or equivalent can be used.

Free topology (example)



Earth connection for STP cable (shielded network cable)

When STP cable is used, the cable must be terminated and the cable's shield connected to earth using a 470 kΩ, 1/4 W, 5% resistor.

This cable shield must be connected to earth at least once very segment and ideally with each node.
Connecting the cable shield to earth at each node will help to attenuate standing 50/60 Hz waves.

Scan code and go to addresses at
www.exhausto.com

EXHAUSTO