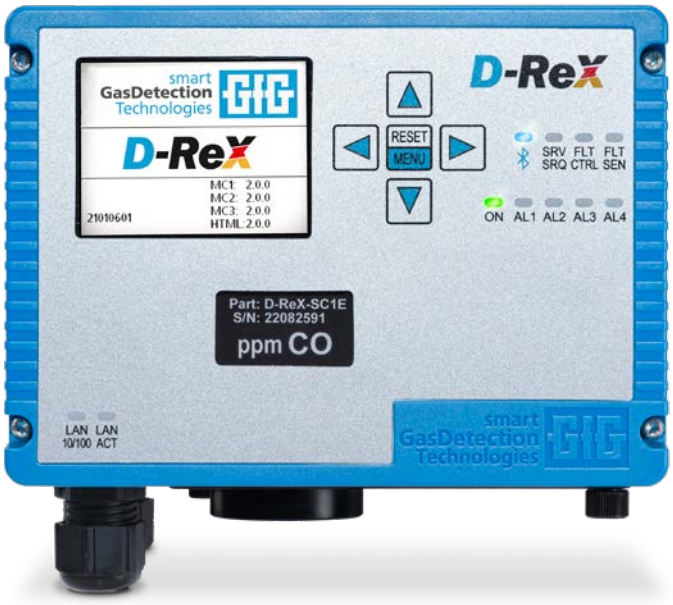
Annex to the Operation Manual

Application Instructions LON-Interface D-ReX_01

Version 1



Translation of the original operation manual
245-002.33_AOM_DReX-LonWorks

Version	Datum	Ersteller	Änderung
0.1	25 Oct, 2022	C.Lanzen	Document created, incomplete
0.2	26 Oct, 2022	C.Lanzen	Description of OpenLoopActuator, further comments
0.3	15 Nov, 2022	C.Lanzen	Added annex and changes to LON interface
0.4	18 Nov, 2022	C.Lanzen	Extended description
0.5	6 Dec, 2022	C.Lanzen	Changes regarding discussed topics
0.6	30 Jan, 2022	C.Lanzen	Rework for release
0.7	10 Mar, 2023	C.Lanzen	Added new names of gases
1.0	16 Jan, 2024	F.Böttger	Release by GfG

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1. Introduction

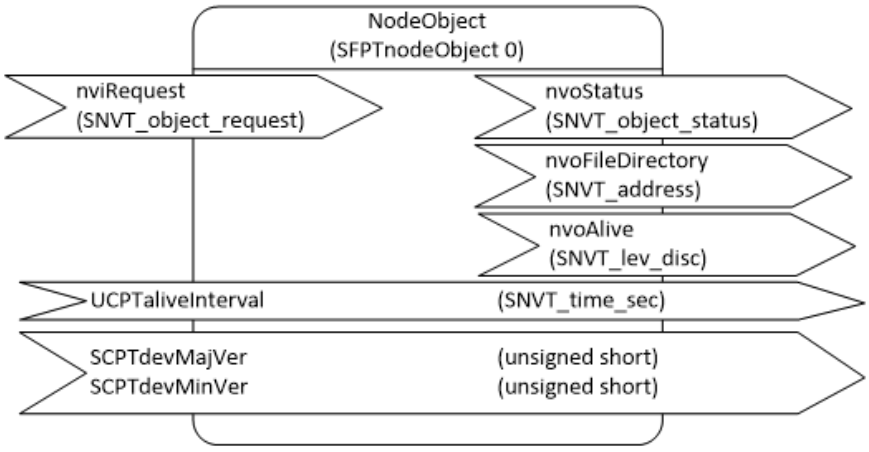
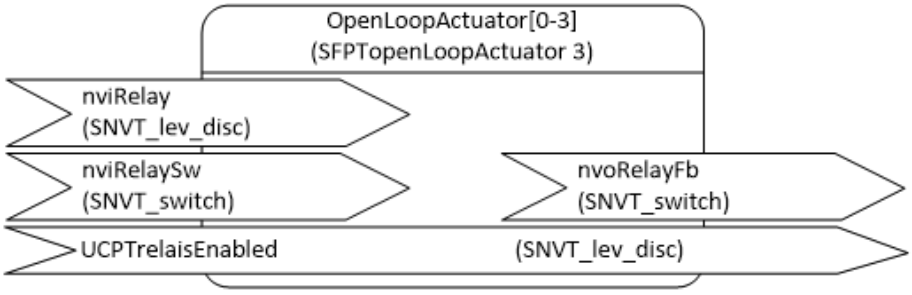
This document describes the application behavior of the D-ReX LON Works Module.

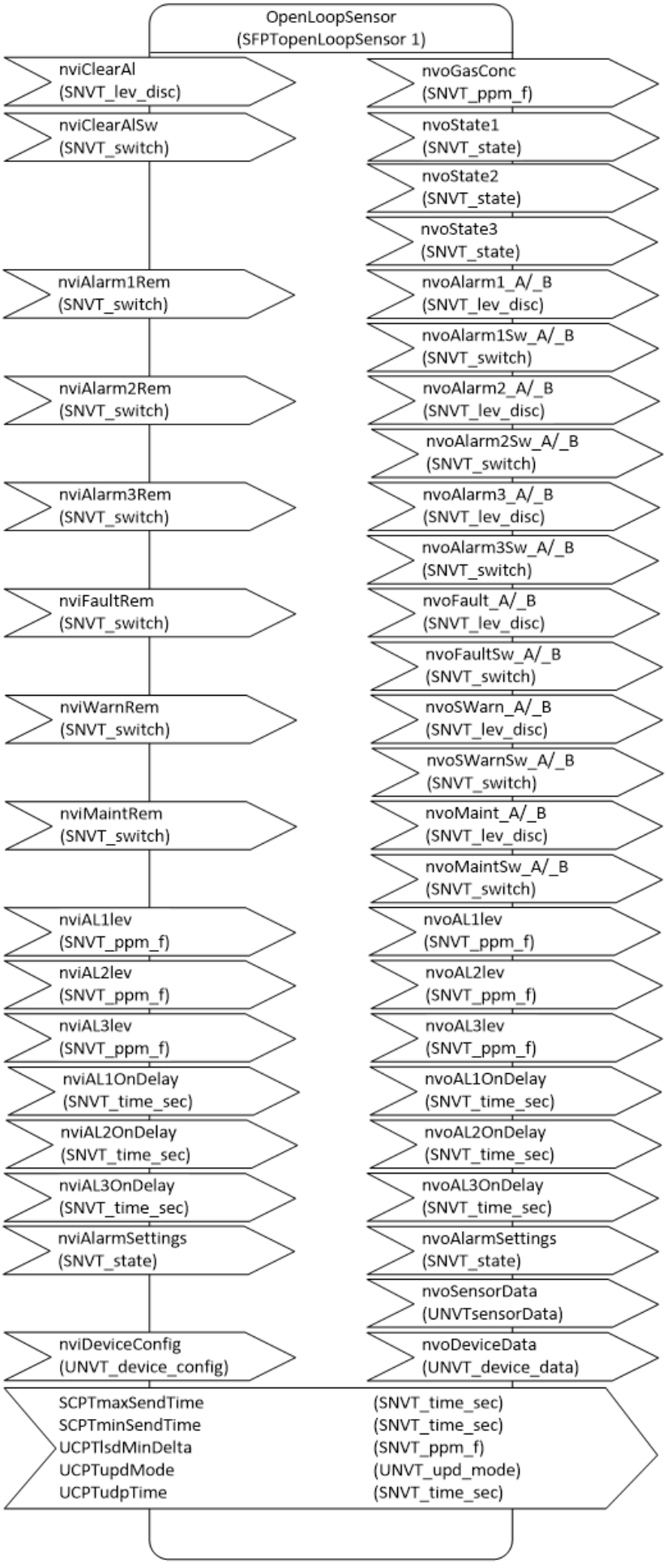
2. Software files

Software files	D-ReX_01.APB	D-ReX_01.APB
	D-ReX_01.NDL	
	D-ReX_01.XIF	Interface files
	D-ReX_01.XFB	
Resource files	9FA0014600_GFG.typ	Manufacturer-specific declaration of LON data type current version: 1.1
	9FA0014600_GFG.enu	
	9FA0014600_GFG.fmt	
	9FA0014600_GFG.fpt	

3. Functions

3.1 Overview of all functional objects

Object	Number	Overview
NodeObject	1	
OpenLoopActuator	4	

Object	Number	Overview
OpenLoopSensor	1	

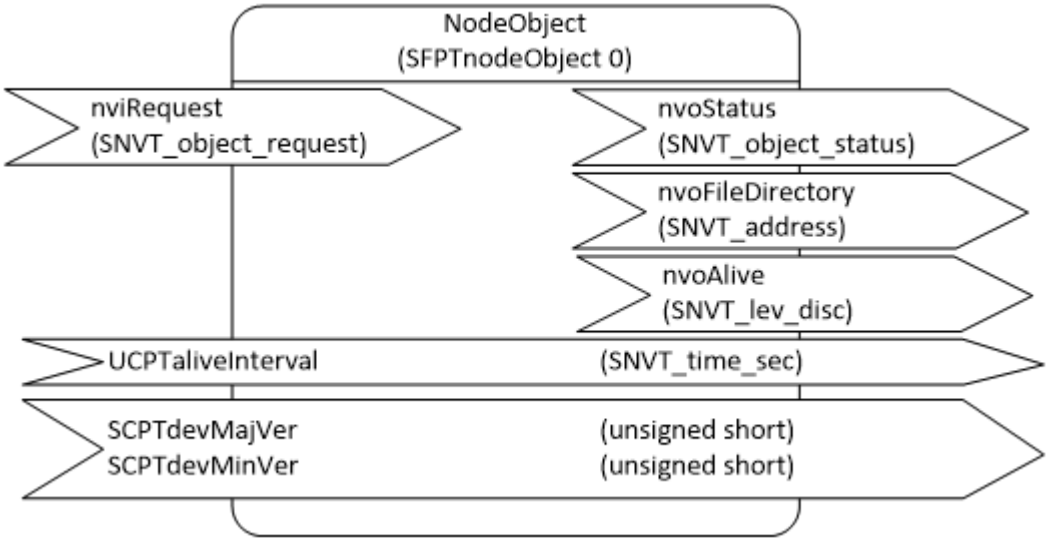
3.2 Description of all functional objects

3.2.1 NodeObject

3.2.1.1 Description

NodeObject is used to manage all of the application's LonMark objects as well as providing an interface for management commands of the LNS tools.

3.2.1.2 Network interface



3.2.1.3 Network variables

Input variables

nviRequest — Interface for LNS tool management commands and requests; for answers, these are sent via *nvoStatus*

Type: SNVT_object_request

Structure:

unsigned long	object_id;
object_request_t	object_request;

Value range:

Structural element *.object_id:*

0	NodeObject	
1	OpenLoopSensor	
2-5	OpenLoopActuator[0-3]	

Structural element *.object_request:*

0	RQ_NORMAL	
2	RQ_UPDATE_STATUS	Provides the current status of the individual functional block
5	RQ_REPORT_MASK	Provides the supported status flags of the functional block
17	RQ_RESET	A request for the Node object triggers a software reset

Default settings: {0, RQ_NORMAL} (0, 0)

Outlet variables

nvoStatus Interface for LNS tool management commands; answers to requests via *nviRequest*

Type: SNVT_object_status

```
unsigned long   object_id;
unsigned        invalid_id:1;
unsigned        invalid_request:1;
unsigned        disabled:1;
unsigned        out_of_limits:1;
unsigned        open_cirquit:1;
unsigned        out_of_service:1;
unsigned        mechanical_fault:1;
unsigned        feedback_failure:1;
unsigned        over_range:1;
unsigned        under_range:1;
unsigned        electrical_fault:1;
unsigned        unable_to_measure:1;
unsigned        comm_failure:1;
unsigned        fail_self_test:1;
unsigned        self_test_in_progress:1;
unsigned        locked_out:1;
unsigned        manual_control:1;
unsigned        in_alarm:1;
unsigned        in_override:1;
unsigned        report_mask:1;
unsigned        programming_mode:1;
unsigned        programming_fail:1;
unsigned        alarm_notify_disabled:1;
unsigned        reset_complete:1;
unsigned        reserved2:8;
```

Value range: Structural element *.object_id:*

0 NodeObject
1 OpenLoopSensor
2-5 OpenLoopActuator[0-3]

Structural element *.invalid_id:*

0 the request's *nviRequest.object_id* is valid
1 the request's *nviRequest.object_id* is unvalid

Structural element *.invalid_request:*

0 the *nviRequest.object_request* is supported
1 the *nviRequest.object_request* is not supported

Structural element *.report_mask:*

0 *nvoStatus* contains status of the functional block from *.object_id* ((if bits above are not 1)
1 *nvoStatus* contains ReportMask of the functional block from *object_id.*

Default settings: All structural elements 0

Transmission: After requests to *nviRequest*

nvoFileDirectory Interface for parameter access of the LNS tools

Type: SNVT_address

Value range: SNVT_address

nvoAlive Output for external failure monitoring of the node

Type: SNVT_lev_disc

Value range:

0 ST_OFF on voltage recovery and after initializing, if *UCPTaliveInterval* = 0
1 ST_LOW after initializing, if *UCPTaliveInterval* > 0

Default settings: ST_OFF (0)

Transmission: After reset and cyclically according to *UCPTaliveInterval*

3.2.1.4 Parameter

UCPTaliveInterval	Transmission interval for *nvoAlive*
Type:	SNVT_time_sec
Value range:	0,0 - no cyclic transmission
	0,1 … 6553,5 - Transmission interval in seconds
Default settings:	0,0 (0) - no cyclic transmission
SCPTdevMajVer	Main version of the LON application
Type:	unsigned short, constant
Value range:	0 … 255
Default settings:	1
SCPTdevMinVer	Sub version of the LON application
Type:	unsigned short, constant and device-specific
Value range:	0 … 255
Default settings:	0

3.2.1.5 Functions

NodeObject provides the management interfaces required by the LNS tools as well as several further functions:

Failure monitoring
It also provides a network variable, *nvoAlive*, which can be used to monitor the presence or availability of the node. If a cyclic transmission interval of the nvoAlive is set on the *UCPTaliveInterval* parameter, the regular receipt of telegrams can be monitored on another device within the network to determine failures of the device.

Information on current version
The current version of the LON application can be concluded from the device itself, using the *SCPTdevMajVer* and *SCPTdevMinVer* parameters.

3.2.1.6 Behavior on reset

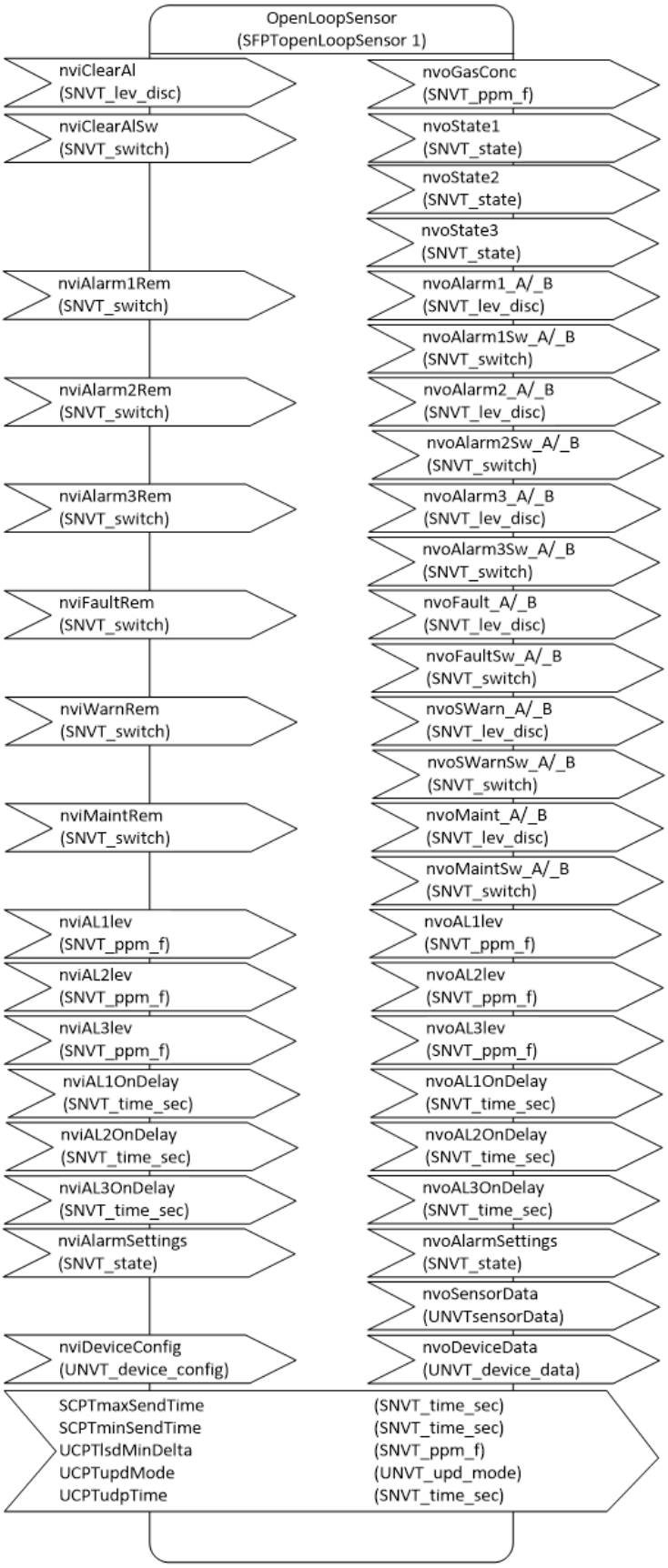
Depending on the *UCPTaliveInterval value, nvoAlive* is set to either ST_OFF oder ST_LOW and sent. If necessary, the time tracker for cyclic transmission is started as well.

3.2.2 OpenLoopSensor

3.2.2.1 Description

OpenLoopSensor is used for capturing all sensor data and settings of measuring point 1 and the GMA. It also allows you to change settings can and activate sensor data simulation.

3.2.2.2 Network interface



3.2.2.3 Network variables

Input variables

nviClearAl This inlet is used to acknowledge the alarm of measuring point 1.

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	no acknowledgement
	1	ST_LOW	acknowledge alarms
Default settings:	0	ST_OFF	no acknowledgement

nviClearAlSw This inlet is used to acknowledge the alarm of measuring point 1.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	no acknowledgement
	(x 1)	x/2% (x>0)	acknowledge alarms
Default settings:	(0 0)	0,0%	no acknowledgement

nviAlarm1Rem This inlet can be used to simulate Alarm 1, if it is activated on the GMA.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation for Alarm 1 deactivated
	(x 1)	x/2% (x>0)	Alarm 1 active (simulated)
Default settings:	(0 0)	0,0%	Simulation for Alarm 1 deactivated

nviAlarm2Rem This inlet can be used to simulate Alarm 2, if it is activated on the GMA.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation for Alarm 2 deactivated
	(x 1)	x/2% (x>0)	Alarm 2 active (simulated)
Default settings:	(0 0)	0,0%	Simulation for Alarm 2 deactivated

nviAlarm3Rem This inlet can be used to simulate Alarm 3, if it is activated on the GMA.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation for Alarm 3 deactivated
	(x 1)	x/2% (x>0)	Alarm 3 active (simulated)
Default settings:	(0 0)	0,0%	Simulation for Alarm 3 deactivated

nviFaultRem This inlet can be used to simulate a "fault" on measuring point 1.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation of "fault" MST1 deactivated
	(x 1)	x/2% (x>0)	"Fault" MST1 active (simulated)
Default settings:	(0 0)	0,0%	Simulation of "fault" MST1 deactivated

nviWarnRem This inlet can be used to simulate a "fault" on measuring point 1.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation "maintenance request" MST1 deactivated
	(x 1)	x/2% (x>0)	"Maintenance request" MST1 active (sim.)
Default settings:	(0 0)	0,0%	Simulation "maintenance request" MST1 deactivated

nviMaintRem This inlet can be used to simulate "maintenance" on measuring point 1.

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Simulation "Maintenance" MST1 deactivated
	(x 1)	x/2% (x>0)	"Maintenance" MST1 active (simulated)
Default settings:	(0 0)	0,0%	Simulation "Maintenance" MST1 deactivated

nviAl1Lev Setting the alarm threshold for Alarm 1. The value must be entered in the unit specified in *nvoSensorData.gas_unit*.

Type:	SNVT_ppm_f
Value range:	0 - 3.4028234663852886E+038
Default settings:	0

nviAl2Lev Setting the alarm threshold for Alarm 2. The value must be entered in the unit specified in *nvoSensorData.gas_unit*.

Type: SNVT_ppm_f
Value range: 0 - 3.4028234663852886E+038
Default settings: 0

nviAl3Lev Setting the alarm threshold for Alarm 3. The value must be entered in the unit specified in *nvoSensorData.gas_unit*.

Type: SNVT_ppm_f
Value range: 0 - 3.4028234663852886E+038
Default settings: 0

nviAl1OnDelay Setting the activation delay for Alarm 1.

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s

nviAl2OnDelay *Setting the activation delay for Alarm 2.*

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s

nviAl3OnDelay Setting the activation delay for Alarm 3.

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s

nviAlarmSettings *Inhibit and Latch settings of Alarms 1 to 3.*

Type: SNVT_state, meaning of individual elements explained below:

.bit0 - *.bit1*	Inhibit of Alarm 1
.bit2 - *.bit3*	Latching function of Alarm 1
.bit4 - *.bit5*	Inhibit of Alarm 2
.bit6 - *.bit7*	Latching function of Alarm 2
.bit8 - *.bit9*	Inhibit of Alarm 3
.bit10 - *.bit11*	Latching function of Alarm 3

Elements *bit12* to *bit15* are not currently in use.

Value range: The following applies to the values of the bit pairings used:

0	(0b00)	no changes	
1	(0b01)	deactivate	(*.bitX* is set)
2	(0b10)	aktivate	(*.bitX-1* is set)
4	(0b11)	no changes	(both bits are set)

Default settings: All Bits on 0 (no changes)

nviDeviceConfig Schnittstelle zur Änderung der Zugangsdaten

Type: UNVT_device_config
Structure:

```
pass_t          pw_config_old;
unsigned char   pw_id_old[4];
unsigned char   pw_pin_old[4];
pass_t          pw_config_new;
unsigned char   pw_id_new[4];
unsigned char   pw_pin_new[4];
```

Value range: Structural elemente *.pw_config_**:

0	PASSWORD_OFF	no password necessary
1	PASSWORD_ON	Use password structural element

structural elements *.pw_id_** und *.pw_pin_**:
4 Basic ASCII characters each (0-127)
Default settings: All structural elements 0

Outlet variables

nvoState1 GMA status outlet.

Type: SNVT_state; meaning of individual elements explained below:

.bit0	Startup*
.bit1	Fault*
.bit2	Maintenance*
.bit3	Maintenance request*
.bit4	configuration mode*
.bit5 - .bit7	not used
.bit8	Error in communication with GMA
.bit9	Password error
.bit10	Error concerning relay control
.bit11	min. 1 relay can be addressed via LON
.bit12	logic status Relais1*
.bit13	logic status Relais2*
.bit14	logic status Relais3*
.bit15	logic status Relais4*

* values identified by GMA

Value range: The following applies to used *.bitX*:
0 – not active
1 – active

Default settings: All elements are 0 values until they are first read out.

Transmission: Upon changing a .bitX and cyclically according to *SCPTmaxSendTime*

nvoState2 Output of measuring point 1's Status 1.

Type: SNVT_state; meaning of individual elements explained below:

.bit0	Active (MST1)
.bit1	Inhibited (MST1)
.bit2	Simulation (MST1)
.bit3	Measured value valid (MST1)
.bit4	Fault (MST1)
.bit5	Maintenance (MST1)
.bit6	Maintenance request (MST1)
.bit7	PreAlarm (MST1)
.bit8	Alarm1 (GMA)
.bit9	Alarm2 (GMA)
.bit10	Alarm3 (GMA)
.bit11	Alarm4 (GMA)
.bit12 - .bit14	not in use
.bit15	Ambiguity (GMA)

Value range: The following applies to used elements:
0 – not active
1 – active

Default settings: All elements are 0 values until they are first read out.

Transmission: On adjustments and cyclically according to *SCPTmaxSendTime*

nvoState3 Output of measuring point 1's Status2. The values determined entirely via the GMA are read out cyclically.

Type: SNVT_ state; meaning of individual elements explained below:

.bit0 - .bit2	Over-/Underrange (MST1)
.bit3	Fault Pyrolizer (MST1)
.bit4	Fault Gas Flow (MST1)
.bit5	Fault Line Integrity (MST1)
.bit6 - .bit11	not currently in use
.bit12 - .bit15	status indication (MST1)

Value range: Für *.bit0 - .bit2* and *.bit12 - .bit15*:
see Modbus specifications
The following applies to *.bit3 - .bit5*:
0 – not active
1 – active

Default settings: All Bits are 0 values until they are first read out.

Transmission: On adjustments and cyclically according to *SCPTmaxSendTime*

nvoGasConc
Output of measuring point 1's measured value.
The value is given in the unit specified in *nvoSensorData.gas_unit*.

Type:	SNVT_ppm_f
Value range:	0 - 3.4028234663852886E+038
Default settings:	0
Transmission:	On adjustments of at least *UCPTlsdMinDelta* and cyclically according to *SCPTmaxSendTime*, with a minimum interval of *SCPTminSendTime*

nvoAlarm1_A
nvoAlarm1_B
Output for Alarm1. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	Alarm1 not active
	1	ST_LOW	Alarm1 active
Default settings:	0	ST_OFF	Alarm1 not active
Transmission:	Depending on the *UCPTupdMode.alarm1_** settings (* A or B)		

nvoAlarm1Sw_A
nvoAlarm1Sw_B
Alarm1 output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Alarm1 not active
	(200 1)	100,0%	Alarm1 active
Default settings:	(0 0)	0,0%	Alarm1 not active
Transmission:	Depending on the *UCPTupdMode.alarm1_** settings (* A or B)		

nvoAlarm2_A
nvoAlarm2_B
Alarm2 output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	Alarm2 not active
	1	ST_LOW	Alarm2 active
Default settings:	0	ST_OFF	Alarm2 not active
Transmission:	Depending on the *UCPTupdMode.alarm2_** settings (* A or B)		

nvoAlarm2Sw_A
nvoAlarm2Sw_B
Alarm2 output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Alarm2 not active
	(200 1)	100,0%	Alarm2 active
Default settings:	(0 0)	0,0%	Alarm2 not active
Transmission:	Depending on the *UCPTupdMode.alarm2_** settings (* A or B)		

nvoAlarm3_A
nvoAlarm3_B
Alarm3 output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	Alarm3 not active
	1	ST_LOW	Alarm3 active
Default settings:	0	ST_OFF	Alarm3 not active
Transmission:	Depending on the *UCPTupdMode.alarm3_** settings (* A or B)		

nvoAlarm3Sw_A
nvoAlarm3Sw_B
Alarm3 output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	Alarm3 not active
	(200 1)	100,0%	Alarm3 active
Default settings:	(0 0)	0,0%	Alarm3 not active
Transmission:	Depending on the *UCPTupdMode.alarm3_** settings (* A or B)		

nvoFault_A
nvoFault_B

Fault status output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	no fault
	1	ST_LOW	fault
Default settings:	0	ST_OFF	no fault
Transmission:	Depending on the *UCPTupdMode.fault_** settings (* A or B)		

nvoFaultSw_A
nvoFaultSw_B

Ausgabe für Störungs-Zustand. Der Wert wird für 2 getrennte Zonen zur weiteren Auswertung zur Verfügung gestellt (A und B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	no fault
	(200 1)	100,0%	fault
Default settings:	(*0 0*)	0,0%	no fault
Transmission:	Depending on the *UCPTupdMode.fault_** settings (* A or B)		

nvoSWarn_A
nvoSWarn_B

Maintenance request status output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	no maintenance request
	1	ST_LOW	maintenance request
Default settings:	0	ST_OFF	no maintenance request
Transmission:	Depending on the *UCPTupdMode.warn_** settings (* A or B)		

nvoSWarnSw_A
nvoSWarnSw_B

Maintenance request status output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	no maintenance request
	(200 1)	100,0%	maintenance request
Default settings:	(0 0)	0,0%	no maintenance request
Transmission:	Depending on the UCPTupdMode.warn_* settings (* A or B)		

nvoMaint_A
nvoMaint_B

Maintenance status output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	no maintenance
	1	ST_LOW	maintenance active
Default settings:	0	ST_OFF	no maintenance
Transmission:	Depending on the *UCPTupdMode.warn_** settings (* A or B)		

nvoMaintSw_A
nvoMaintSw_B

Maintenance status output. The value is provided for 2 separate zones for further evaluation (A and B).

Type:	SNVT_switch		
Value range:	(0 0)	0,0%	no maintenance
	(200 1)	100,0%	maintenance
Default settings:	(0 0)	0,0%	no maintenance
Transmission:	Depending on the *UCPTupdMode.warn_** settings (* A or B)		

nvoAl1Lev

Output of measuring point 1's alarm threshold for Alarm 1, as set on the GMA. The value is given in the unit specified in n*voSensorData.gas_unit*.

Type:	SNVT_ppm_f
Value range:	0 - 3.4028234663852886E+038
Default settings:	0
Transmission:	On adjustments

nvoAl2Lev Output of measuring point 1's alarm threshold for Alarm 2, as set on the GMA. The value is given in the unit specified in *nvoSensorData.gas_unit.*

Type: SNVT_ppm_f
Value range: 0 - 3.4028234663852886E+038
Default settings: 0
Transmission: On adjustments

nvoAl3Lev Output of measuring point 1's alarm threshold for Alarm 3, as set on the GMA. The value is given in the unit specified in *nvoSensorData.gas_unit*.

Type: SNVT_ppm_f
Value range: 0 - 3.4028234663852886E+038
Default settings: 0
Transmission: On adjustments

nvoAl1OnDelay Output of measuring point 1's activation delay for Alarm 1, as set on the GMA.

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s
Transmission: On adjustments

nvoAl2OnDelay Output of measuring point 1's activation delay for Alarm 2, as set on the GMA.

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s
Transmission: On adjustments

nvoAl3OnDelay Activation delay of Alarm 3 from measuring point 1.

Type: SNVT_time_sec
Value range: 0,0 – 900,0 s
Default settings: 0,0 s
Transmission: On adjustments

nvoAlarmSettings Inhibit and Latch values of Alarms 1 to 3 as well as the alarm unlock status of all measuring point 1 alarms. .

Type: SNVT_state; meaning of individual elements explained below:

.bit0 - .bit1	Inhibit of Alarm 1
.bit2 - .bit3	Latching function of Alarm 1
.bit4 - .bit5	Inhibit of Alarm 2
.bit6 - .bit7	Latching function of Alarm 2
.bit8 - .bit9	Inhibit of Alarm 3
.bit10 - .bit11	Latching function of Alarm 3
.bit12	Unlock status of Alarm 1
.bit13	Unlock status of Alarm 2
.bit14	Unlock status of Alarm 3
.bit15	not used

Value range: The following applies to used Bit pairings (*.bit0 - .bit11*):

1	(0b01)	inactive (*.bitX* is set)
2	(0b10)	active (*.bitX-1* is set)

The following applies to the alarm unlock status (*.bit12 - .bit14*):

0	inactive	Alarm not unlocked
1	active	Alarm unlocked

Default settings: All elements are 0 values until they are first read out.
Transmission: On adjustments

nvoDeviceData — The device data contains Text1 of both measuring point 1 and the GMA as well as the current password settings. The measuring point's Text1 is read out on resets and when returning from configuration mode. The displayed password information is used alongside ID "LON" for unlocking purposes when writing parameters.

Type: UNVT_device_data

Struktur:
unsigend char location[14];
pass_t pw_setting_active;
unsigned char password[4];

Value range:
Structural elemente .location und .password:
Basis-ASCII-Zeichen (0-127)
Structural element *.pw_setting_active*:
0 PASSWORD_OFF no password necessary
1 PASSWORD_ON password necessary

Default settings:
.location: {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}
.pw_setting_active: {1} (PASSWORD_ON)
.password: {48, 48, 48, 48} ("0000")

Transmission: On adjustments and cyclically according to *SCPTmaxSendTime*

nvoSensorData — Measuring point 1 sensor data output.

Type: UNVTsensorData

Struktur:
gas_name_t gas_name;
gas_unit_t gas_unit;
unsigend char part_number[10];
unsigend char part_serial[10];
SNVT_date_cal first_calibration_date;
SNVT_date_cal recent_calibration_date;
mit SNVT_date_cal - Struktur:
unsigned long year;
unsigned short month;
unsigned short day;

Value range:
Structural elemente *.part_number* and *.part_serial*:
Basic ASCII characters (0-127)
Structural elements *.first_calibration_date* and *.recent_calibration_date*:
.year: 0 - 3000
.month: 1 - 12
.day: 1 – 31
Structural element .gas_name
see enumeration gas_name_t (Annex)
Structural element .gas_unit
see enumeration gas_unit_t (Annex)

Default settings:
Structural elemente *.part_number* and *.part_serial*:
Each {0, 0, 0, 0, 0, 0, 0, 0, 0, 0} until first readout.
Structural elements *.first_calibration_date* and *.recent_calibration_date*:
{0, 0, 0} no valid date until first readout.
Structural element .gas_name GN_NOTHING until first readout.
Structural element .gas_unit UN_NOTHING until first readout

Transmission: On adjustments and cyclically according to *SCPTmaxSendTime*

3.2.2.4 Parameter

SCPTmaxSendTime — Transmission interval for network variables *nvoGasConc*, *nvoState1*, *nvoState2, nvoState3, nvoSensorData* and *nvoDeviceData*. The transmission interval is considered separately for each of the mentioned network variable.

Type:	SNVT_time_sec	
Value range:	0,0	- no cyclic transmission
	0,1 … 6553,5	- Transmission interval in seconds
Default settings:	0,0 (0)	- no cyclic transmission

SCPTminSendTime — Minimum time interval for telegrams on *nvoGasConc*.

Type:	SNVT_time_sec	
Value range:	0,0	- no minimum interval
	0,1 … 6553,5	- minimum interval in seconds
Default settings:	0,0 (0)	- no minimum interval

UCPTlsdMinDelta — Minimum change for telegrams on *nvoGasConc*. The value must be entered in the unit specified in *nvoSensorData.gas_unit*.

Type:	SNVT_ppm_f
Value range:	0 - 3.4028234663852886E+038
Default settings:	0

UCPTupdMode — This parameter determines the transmission modes. They specify how alarms as well as die fault, maintenance and maintenance requirement statuses are transferred to the corresponding NVOs.

Type: UNVT_upd_mode

Struktur:

upd_mode_t	alarm1_A;
upd_mode_t	alarm1_B;
upd_mode_t	alarm2_A;
upd_mode_t	alarm2_B;
upd_mode_t	alarm3_A;
upd_mode_t	alarm3_B;
upd_mode_t	maint_A;
upd_mode_t	maint_B;
upd_mode_t	fault_A;
upd_mode_t	fault_B;
upd_mode_t	warn_A;
upd_mode_t	warn_B;

Value range: The following applies to all elements:

0	UM_ON_CHANGE	Transmission on adjustments
1	UM_WHEN_ON	Transmission on adjustments and cyclically if active, interval see *UCPTupdTime*
2	UM_HEARTBEAT	Transmission upon changes and cyclically, interval see *UCPTupdTime*

Default settings: The following applies to all elements:

UM_ON_CHANGE (0) — Transmission on adjustments

UCPTupdTime — Duration of the transmission cycle for transmission modes UM_WHEN_ON and UM_HEARTBEAT (see *UCPTupdMode*)

Type:	SNVT_time_sec	
Value range:	0,0	- no cyclic transmissionn
	0,1 … 6553,5	- transmission cycle in seconds
Default settings:	0,0 (0)	- no cyclic transmission

3.2.2.5 Functions

The *OpenLoopSensor* object is used to capture all device information of the GMA and measuring point 1 as well as their configuration and runtime data. The configuration of alarms can also be adjusted.

Logging measured values
The measured value taken on measuring point 1 is read out on *nvoGasConc*. The value is read out cyclically and therefore has to be evaluated according to the gas unit specified in *nvoSensorData*. A minimum time interval (*SCTPminSendTime*) between transmitted values, a transmission cycle (*SCPTmaxSendTime*) and a value for a minimum change (*UCPTlsdMinDelta*) can be specified for the measured value. Consider that the selected settings for these three parameters influence the LON network's bus load.

Logging alarms
The occurrence of an alarm which has been configured in measuring point 1 (Alarm 1 to 3) is detected and indicated by reading out status 1 of measuring point 1 every second. It is given out for 2 separate zones (A and B). The network variable outputs *nvoAlarm1_**, *nvoAlarm2_** and *nvoAlarm3_** of the SNVT_lev_disc type and the network variables *nvoAlarm1Sw_**, *nvoAlarm2Sw_** as well as *nvoAlarm3Sw_** of type SNVT_switch are available. The transmission of the values can be influenced by defining the transmission mode (*UCPTupdMode*) and the associated setting of a transmission cycle (*UCPTupdTime*). Consider that the selected settings for these two parameters influence the LON network's bus load.

Acknowledging alarms
There are two input network variables available to acknowledge measuring point 1's alarms: nviClearAl of the SNVT_lev_disc type and nviClearAlSw of the SNVT_switch type. On both inlets, an acknowledgement is only triggered on switching from "no acknowledgement" to "acknowledge alarms". The acknowledgement is sent to the GMA. The flashing LEDs inside the GMA are then reset and the displayed information changes.

Device data
The device data, which can be read out on nvoDeviceData, contains Text1 of both measuring point 1 and the GMA as well as the current password settings. The measuring point's Text1 is read out on resets and when returning from configuration mode on the GMA. The displayed password information is used alongside ID "LON" for unlocking purposes when writing parameters. The transmission cycle set in SCPTmaxSendTime is used to transmit nvoDeviceData in the LON network. Consider that the transmission cycle's configuration influences the LON network's bus load.

Sensor data of measuring point 1
Measuring point 1's sensor data is read out on *nvoSensorData*. It contains information on the names of the measured gases and the unit used for *nvoGasConc* as well as the sensor's component and serial number and the date of its first and latest sensor calibration. The sensor data is read out on measuring point 1 upon voltage recovery, software reset and after returning from configuration mode.The transmission cycle set in *SCPTmaxSendTime* is used for transmission in the LON network. Consider that the transmission cycle's configuration influences the LON network's bus load.

Alarm configuration
The settings (alarm threshold, activation delay, Inhibit and Latch) can be adjusted for all three alarms. The alarms are not implicitly activated though, but must be activated using the GMA's configuration tool. The activation status is read out by measuring point 1 and then indicated on *nvoAlarmSettings* (*.bit12* to *.bit14*). You will need the access data stored in the LON node to adjust the alarm configuration settings on the GMA. Since the parameters can also be adjusted using the GMA's configuration tool, there are also corresponding outlet network variables. All GMA parameters which have been read out are updated after writing the individual parameter, on voltage recovery or software resets as well as after you return from configuration mode. The alarm thresholds for the individual alarms can be adjusted on *nviAl1Lev*, *nviAl2Lev* and *nviAl3Lev* respectively. The alarm threshold currently set on measuring point 1 are indicated on *nvoAl1Lev*, *nvoAl2Lev* and *nvoAl3Lev*. You can use the inlet network variables *nviAl1OnDelay*, *nviAl2OnDelay* and *nviAl3OnDelay* to adjust the activation delay times. The activation delay times currently set on measuring point 1 are indicated on *nvoAl1OnDelay*, *nvoAl2OnDelay* and *nvoAl3OnDelay*. There may be disparities in the values which are read back, due to the different resolutions of the LON node and the GMA. The Inhibit and Latch values for Alarms 1 to 3 may also be adjusted here. Use the nviAlarmSettings inlet to do so. The current Inhibit and Latch settings are indicated on nvoAlarmSettings (*.bit0* bis *.bit11*).

Alarm simulation
Alarms 1 to 3 can be simulated using *nviAlarm1Rem*, *nviAlarm2Rem* and *nviAlarm3Rem*. Consider the set activation delay. Alarms which are not unlocked on the GMA cannot be simulated. Only active conditions may be simulated. Simulations can be deactivated explicitly or end automatically on a reset of the GMA. Structural element bit2 in nvoState2 indicates whether a fault, maintenance, a maintenance request or one of the alarms is being simulated.

Logging faults, maintenance and maintenance requests
"Fault", "maintenance request" and "maintenance" statuses are each determined from an OR-combination of the corresponding GMA status information and measuring point 1's status1. Both statuses are read out cyclically. The "Fault" status is given for 2 separate zones (A and B) each, both on the outlet network variable *nvoFault_** of the *SNVT_lev_disc type* and on *nvoFaultSw_** of the *SNVT_switch type*. The "Maintenance request" status is given for zones A and B too, both on the outlet network variable *nvoSWarn_** of the *SNVT_lev_disc type* and *nvoSWarnSw_** of the *SNVT_switch type*. The "Maintenance" status is given for both zones, both on the outlet network variable *nvoMaint_** of the *SNVT_lev_disc type* and on *nvoMaintSw_** of the *SNVT_switch type*. The transmission of values may be influenced by the *UCPTupdMode* and *UCPTupdTime parameters*. Consider that the selected settings for these two parameters influence the LON network's bus load.

Simulating faults, maintenance and maintenance requests
The "Fault", "Maintenance request" and "Maintenance" statuses can be simulated using *nviFaultRem*, *nviSWarnRem* and *nviMaintRem*. Only the currently active conditions may be simulated. Simulations can be deactivated explicitly or end automatically on a reset of the GMA. Structural element bit2 in nvoState2 indicates whether a fault, maintenance, a maintenance request or one of the alarms is being simulated.

Logging other GMA statuses
Other identified GMA statuses or information on the communication with the GMA are indicated on *nvoState1*. In addition to the fault, maintenance and maintenance request statuses, which are also available as individual NVs, the GMA startup, an active configuration mode and status information on the internal relays of the GMA can also be found there. It also indicates whether one or more of the internal relays of the GMA can be addressed via LON. Communication errors between the GMA and the LON-Gateway, faults on unlocking (writing of parameters) as well as faults when addressing relays are signaled too. The GMA statuses are read out cyclically. The transmission cycle set in *SCPTmaxSendTime* is used for transmission in the LON network. Consider that the transmission cycle's configuration influences the LON network's bus load.

Logging other measuring point statuses
Other identified measuring point 1 statuses are indicated on the outlet network variables *nvoState2* and *nvoState3*. nvoState2 contains general status and alarm notifications of measuring point 1, while nvoState3 contains more detailed information about faults and statuses. This data is read out cyclically. The transmission cycle set in *SCPTmaxSendTime* is used for transmission in the LON network. Consider that the transmission cycle's configuration influences the LON network's bus load.

Unlocking the writing parameter values
You will need the access information stored in the LON node to parameterize measuring point 1's alarms, simulate alarms and statuses as well as to address relays via *OpenLoopActuator* objects. The access information currently stored in the LON node (Flags and PIN) are indicated on *nvoDeviceData* for monitoring purposes. If the access information is changed in the GMA (using D-ReX-Config), the new information can be adjusted using *nviDeviceConfig* in the LON application. To enter the new data, you will also need the previous access information.

3.2.2.6 Behavior on reset

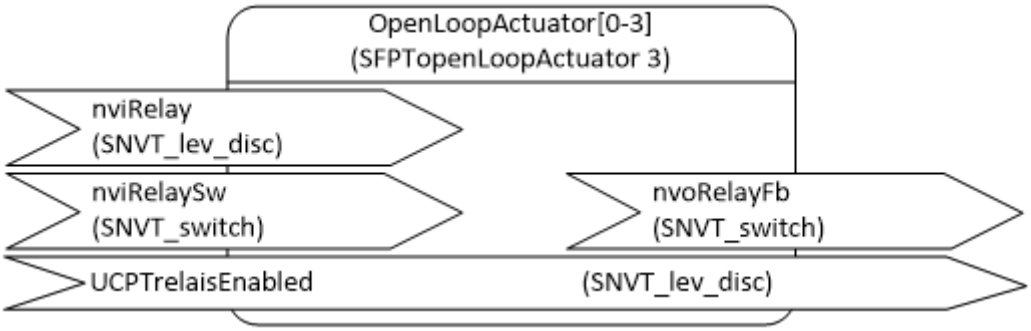
On reset, the output values are updated by reading the information from the GMA.

OpenLoopActuator

3.2.3.1 Description

The OpenLoopActuator objects are used to address the internal relays 1-4 of the GMA as well as to detect their status.

3.2.3.2 Network interface



3.2.3.3 Network variables

Input variables

nviRelay — Addressing the corresponding internal relays of the GMA.

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	relay logically off
	1	ST_LOW	relay logically on
Default settings:	0	ST_OFF	relay logically off

nviRelaySw — Addressing the corresponding internal relays of the GMA.

Type:	SNVT_switch	
Value range:	(x 0) 0,0%	relay logically off
	(0 1) 0,0%	relay logically off
	(x*2 1) x%	relay logically on, condition: x>0
Default settings:	0,0% (0 0)	relay logically off

Outlet variables

nvoRelayFb — Outlet of the assigned relay's status.

Type:	SNVT_switch	
Value range:	(0 0) 0,0%	relay logically off
	(200 1) 100,0%	relay logically on
Default settings:	0,0% (0 0)	relay logically off
Transmission:	After changes and resets	

3.2.3.4 Parameter

UCPTrelaisEnabled — This parameter determines whether the corresponding relay can be addressed via *nviRelay* and *nviRelaySw*.

Type:	SNVT_lev_disc		
Value range:	0	ST_OFF	addressing relay locked
	1	ST_LOW	addressing relay unlocked
Default settings:	0	ST_OFF	addressing relay locked

3.2.3.5 Functions

The OpenLoopActuator object is used to register the status of the first four internal relays of the GMA. If a GMA relay is unlocked it can be addressed via LON and thus the LON network. The relays are assigned to the functional blocks in the following way:

Functional block	Relays
OpenLoopActuator[0]	Relay1, GMA internal relay
OpenLoopActuator[1]	Relay2, GMA internal relay
OpenLoopActuator[2]	Relay3, GMA internal relay
OpenLoopActuator[3]	Relay4, GMA internal relay

Unlocking the addressing functionality
The unlocking process can / has to be performed on two different layers. 1: An assigned relay (see table) can only be addressed if the GMA configuration allows for it to be addressed via LON. 2: UCPTrelaisEnabled can additionally be used to lock it on the LON level. This value is only valid in LON and does not affect the GMA configuration's relay assignment. You will also need the access information stored in OpenLoopSensor to address the relay.

Addressing relays
You may address relays via nviRelay or nviRelaySw. They are treated equivalently and will be processed in the order they were received in. Any addressing of the assigned relays is only transmitted to the GMA if it is unlocked on UCPTrelaisEnabled. Inside the GMA, it is only processed if the GMA relay is unlocked and thus enabled to be addressed via LON. If this is not the case, any attempt of addressing it will result in a nvoState1 error notification of the OpenLoopSensor object. It is only processed when a telegram is received.

Relay status
The status of the assigned relay is indicated on nvoRelayFb. It is determined based on the GMA status, which is read out cyclically. The status will also be indicated if it is locked for addressing purposes.

3.2.3.6 Behavior on reset

Resets will trigger an update and a status report as a result of reading out the GMA status.

3.3 General description

This section contains information on additional general behavior regarding the communication with the GMA, which cannot be explicitly influenced or seen on the LON interface.

3.3.1 Initial testing of the GMA type

In case of returning voltages (voltage recovery), the system first checks whether it is a GMA type approved for cooperation.

3.3.2 Application information for presentation on the GMA

In case of voltage recovery or after returning from configuration mode, the Neuron ID as well as application and information on the hardware version are sent to the GMA for display.

3.3.3 Cyclic information query

After initializing, the status of the GMA and measuring point 1 are requested every second.

3.3.4 Information query after switching back from configuration mode

Additional information is read out after the GMA switches back from configuration mode. This includes not only the statuses of the GMA and measuring point 1 but also sensor data, texts and alarm parameters (alarm threshold, activation delay, Inhibit and Latch) of measuring point 1.

4 Annex

4.1 Enumeration gas_names_t

```
typedef enum gas_names_t {
        /*-128 */       GN_ETHYLLACTAT = -128,
        /*-127 */       GN_AMMONIUM_ION = -127,
        /*-126 */       GN_R11_TRICHLORFLUORMETHAN = -126,
        /*-125 */       GN_R245FA_PENTAFLUORPROPAN = -125,
        /*-124 */       GN_PROPIN = -124,
        /*-123 */       GN_CARBON_DISULFIDE = -123,
        /*-122 */       GN_BORTRICHLORID = -122,
        /*-121 */       GN_BORTRIFLUORID = -121,
        /*-120 */       GN_BROMMETHAN = -120,
        /*-119 */       GN_2_BUTHANOL = -119,
        /*-118 */       GN_LANDFILL_GAS_ = -118,
        /*-117 */       GN_R152A_DIFLUORETHAN = -117,
        /*-116 */       GN_1_4_DIOXAN = -116,
        /*-115 */       GN_KEROSIN = -115,
        /*-114 */       GN_METHYLAMIN = -114,
        /*-113 */       GN_SILICIUMTETRACHLORID = -113,
        /*-112 */       GN_NITROGEN_ = -112,
        /*-111 */       GN_R143A_TRIFLUORETHAN = -111,
        /*-110 */       GN_DIESEL = -110,
        /*-109 */       GN_R404A_REFRIGERANTS_MIX = -109,
        /*-108 */       GN_BROMGAS = -108,
        /*-107 */       GN_VOC = -107,
        /*-106 */       GN_PID_SENSOR = -106,
        /*-105 */       GN_R507_REFRIGERANTS_MIX = -105,
        /*-104 */       GN_ETHYLFORMIAT = -104,
        /*-103 */       GN_ARGON = -103,
        /*-102 */       GN_R113_TRICHLORFLUORETHAN = -102,
        /*-101 */       GN_HFO_1234YF_REFRIGERANT = -101,
        /*-100 */       GN_R407C_REFRIGERANTS_MIX = -100,
        /* -99 */       GN_R410A_REFRIGERANTS_MIX = -99,
        /* -98 */       GN_NITROGEN_TRIFLUORIDE = -98,
        /* -97 */       GN_PH = -97,
        /* -96 */       GN_REDOX = -96,
        /* -95 */       GN_TBM_TERT_BUTHYL_MERCAPTAN = -95,
        /* -94 */       GN_HYDROGEN_BROMIDE = -94,
        /* -93 */       GN_R438A_REFRIGERANTS_MIX = -93,
        /* -92 */       GN_R449A_REFRIGERANTS_MIX = -92,
        /* -91 */       GN_HFO_1234ZE_REFRIGERANT = -91,
        /* -90 */       GN_R448A_REFRIGERANTS_MIX = -90,
        /* -89 */       GN_C8_9_ISOPARAFFIN = -89,
        /* -88 */       GN_R454B_REFRIGERANTS_MIX = -88,
        /* -87 */       GN_R32_DIFLUOROMETHANE = -87,
        /* -86 */       GN_R513A_REFRIGERANTS_MIX = -86,
        /* -85 */       GN_R453A_REFRIGERANTS_MIX = -85,
        /* -84 */       GN_R508B_REFRIGERANTS_MIX = -84,
        /* -83 */       GN_R454C_REFRIGERANTS_MIX = -83,
        /* -82 */       GN_CHLOROTRIFLUORIDE = -82,
        /* -81 */       GN_HMDS_HEXAMETHYLDISILAZANE = -81,
        /* -80 */       GN_HYDROGEN_SELENIDE = -80,
        /* -79 */       GN_TEOS_TETRAETHOXYSILANE = -79,
        /* -78 */       GN_TMB_TRIMETHYL_BORATE = -78,
        /* -77 */       GN_GERMANIUM_TETRAFLUORIDE = -77,
        /* -76 */       GN_TUNGSTEN_HEXAFLUORIDE = -76,
        /* -75 */       GN_HEXAFLUOROBUTADIENE = -75,
        /* -74 */       GN_OCTAFLUORCYCLOPENTENE = -74,
        /* -73 */       GN_DCS_DICHLOROSILANE = -73,
        /* -32 */       GN_PW = -32,
        /* -31 */       GN_COMMON_SIGNAL = -31,
        /* -30 */       GN_Q_FLOW_RATE = -30,
        /* -29 */       GN_PRESSURE = -29,
```

```
/* -28 */       GN_MASS = -28,
/* -27 */       GN_WIND_DIR = -27,
/*  -3 */       GN_TEMPERATURE = -3,
/*  -2 */       GN_AIR_VELOCITY = -2,
/*  -1 */       GN_RELATIVE_HUMIDITY = -1,
/*   0 */       GN_NOTHING = 0,
/*   1 */       GN_ACETON = 1,
/*   2 */       GN_ACETONITRIL = 2,
/*   3 */       GN_ACETHYLEN = 3,
/*   4 */       GN_ACRYLNITRIL = 4,
/*   5 */       GN_AMINOPROPAN = 5,
/*   6 */       GN_AMIONIAK = 6,
/*   7 */       GN_AMYLALCOHOL = 7,
/*   8 */       GN_GASOLINE_60_95 = 8,
/*   9 */       GN_GASOLINE_80_10 = 9,
/*  10 */       GN_GASOLINE_100_140 = 10,
/*  11 */       GN_BENZOL = 11,
/*  12 */       GN_COMBUSTIBLE_GASES = 12,
/*  13 */       GN_BROMTRIFLOURMETHAN = 13,
/*  14 */       GN_1_3_BUTADIEN = 14,
/*  15 */       GN_N_BUTAN = 15,
/*  16 */       GN_I_BUTAN = 16,
/*  17 */       GN_BUTANOL = 17,
/*  18 */       GN_MEK = 18,
/*  19 */       GN_BUTYLACETAT_N = 19,
/*  20 */       GN_BUTYLACETAT_I = 20,
/*  21 */       GN_BUTYLALCOHOL = 21,
/*  22 */       GN_BUTYLEN = 22,
/*  23 */       GN_CHLOR = 23,
/*  24 */       GN_CHLORMETHAN = 24,
/*  25 */       GN_HYDROGEN_CHLORIDE = 25,
/*  26 */       GN_HYDROGEN_CYANIDE = 26,
/*  27 */       GN_CYCLOHEXAN = 27,
/*  28 */       GN_CYCLOPENTAN = 28,
/*  29 */       GN_CYCLOPROPAN = 29,
/*  30 */       GN_R12_DICHLORIDFLUORMETHAN = 30,
/*  31 */       GN_DICHLORETHAN = 31,
/*  32 */       GN_R21_DICHLORFLUORMETHAN = 32,
/*  33 */       GN_DICHLORMETHAN = 33,
/*  34 */       GN_DICHLORPROPAN = 34,
/*  35 */       GN_DIETHYLAMIN = 35,
/*  36 */       GN_DIMETHYLETHER = 36,
/*  37 */       GN_EPICHLORHYDRIN = 37,
/*  38 */       GN_NATURAL_GAS = 38,
/*  39 */       GN_ETHAN = 39,
/*  40 */       GN_ETHANOL = 40,
/*  41 */       GN_ETHYLACETAT = 41,
/*  42 */       GN_ETHYLALCOHOL = 42,
/*  43 */       GN_ETHYLEN = 43,
/*  44 */       GN_ETHYLENOXID = 44,
/*  45 */       GN_FAM_GASOLINE_65_95 = 45,
/*  46 */       GN_AVIATION_GASOLINE_40_180 = 46,
/*  47 */       GN_FORMALDEHYD = 47,
/*  48 */       GN_R22_CHLORDOFLUORMETHAN = 48,
/*  49 */       GN_HELIUM = 49,
/*  50 */       GN_HEPTAN = 50,
/*  51 */       GN_HEXAN = 51,
/*  52 */       GN_I_HEXAN = 52,
/*  53 */       GN_HEXANON = 53,
/*  54 */       GN_ISOBUTHYLACETAT = 54,
/*  55 */       GN_CARBON_DIOXIDE = 55,
/*  56 */       GN_CARBON_MONOXIDE = 56,
/*  57 */       GN_COKE_OVEN_GAS = 57,
/*  58 */       GN_AIR = 58,
/*  59 */       GN_METHAN = 59,
/*  60 */       GN_METHANOL = 60,
/*  61 */       GN_METHYLACETAT = 61,
/*  62 */       GN_METHYLALCOHOL = 62,
/*  63 */       GN_BUTYLMETHYLKETON = 63,
/*  64 */       GN_METHYLCHLORID = 64,
```

```
        /*  65 */       GN_METHYLENCHLORID = 65,
        /*  66 */       GN_MIBK = 66,
        /*  67 */       GN_ETHYLMETHYLKETON = 67,
        /*  68 */       GN_METHYLGLYKOL = 68,
        /*  69 */       GN_METHYLMETHACRYLAT = 69,
        /*  70 */       GN_METHYLPROPANOL = 70,
        /*  71 */       GN_BROMCHLORIDFLUORMETHAN = 71,
        /*  72 */       GN_N_NONAN = 72,
        /*  73 */       GN_OCTAN_I = 73,
        /*  74 */       GN_OKTAN = 74,
        /*  75 */       GN_PENTAN_I = 75,
        /*  76 */       GN_PENTAN = 76,
        /*  77 */       GN_PENTANON = 77,
        /*  78 */       GN_PENTEN = 78,
        /*  79 */       GN_PENTYLACETAT = 79,
        /*  80 */       GN_PERCHLORETHYLEN = 80,
        /*  81 */       GN_PROPAN = 81,
        /*  82 */       GN_PROPANOL = 82,
        /*  83 */       GN_PROPYLACETAT_I = 83,
        /*  84 */       GN_PROPYLACETAT_N = 84,
        /*  85 */       GN_PROPYLALCOHOL_N = 85,
        /*  86 */       GN_PROPYLALCOHOL_I = 86,
        /*  87 */       GN_PROPEN = 87,
        /*  88 */       GN_PROPYLENDICHLORID = 88,
        /*  89 */       GN_OXYGEN = 89,
        /*  90 */       GN_SULPHUR_DIOXIDE = 90,
        /*  91 */       GN_SULPHUR_HEXAFLUORIDE = 91,
        /*  92 */       GN_HYDROGEN_SULPHIDE = 92,
        /*  93 */       GN_TOWN_GAS = 93,
        /*  94 */       GN_NITROGEN_DIOXIDE = 94,
        /*  95 */       GN_NITROGEN_MONOXIDE = 95,
        /*  96 */       GN_STYROL = 96,
        /*  97 */       GN_TETRACHLORETHAN = 97,
        /*  98 */       GN_TULUOL = 98,
        /*  99 */       GN_TRICHLORETHAN = 99,
        /* 100 */       GN_TRICHLORETHYLEN = 100,
        /* 101 */       GN_R23_TRIFLUORMETHAN = 101,
        /* 102 */       GN_VINYLACETAT = 102,
        /* 103 */       GN_VINYLCHLORID = 103,
        /* 104 */       GN_HYDROGEN = 104,
        /* 105 */       GN_WATER_GAS = 105,
        /* 106 */       GN_XYLOL = 106,
        /* 107 */       GN_OZON = 107,
        /* 108 */       GN_PHOSGEN = 108,
        /* 109 */       GN_PHOSPHIN = 109,
        /* 110 */       GN_SILAN = 110,
        /* 111 */       GN_ARSIN = 111,
        /* 112 */       GN_CHLORDIOXID = 112,
        /* 113 */       GN_DIBORAN = 113,
        /* 114 */       GN_R123_DICHLORTRIFLUORETHAN = 114,
        /* 115 */       GN_DIETHYLETHER = 115,
        /* 116 */       GN_NITROUS_OXIDE = 116,
        /* 117 */       GN_ETHANE_ACID = 117,
        /* 118 */       GN_FLUOR = 118,
        /* 119 */       GN_HYDROGEN_FLUORIDE = 119,
        /* 120 */       GN_GERMANIUM_HYDROGEN = 120,
        /* 121 */       GN_HYDRAZIN = 121,
        /* 122 */       GN_PHENOL = 122,
        /* 123 */       GN_PROPYLENOXID = 123,
        /* 124 */       GN_R134A_TETRAFLOURETHAN = 124,
        /* 125 */       GN_THT = 125,
        /* 126 */       GN_TOX_ALERT = 126,
        /* 127 */       GN_R365_PENTAFLOURBUTAN = 127
} gas_names_t;
```

4.2 Enumeration units_t

```
typedef enum unit_t {
        /*   0 */       UN_NOTHING = 0,
        /*   1 */       UN_PARTS_PER_MILLION = 1,
        /*   2 */       UN_PERCENT_BY_VOLUME = 2,
        /*   3 */       UN_PERCENT_LOWER_EXPL_LIMIT = 3,
        /*   4 */       UN_PARTS_PER_BILLION = 4,
        /*   5 */       UN_MICRO_GRAM = 5,
        /*   6 */       UN_MILLI_GRAM = 6,
        /*   7 */       UN_PERCENT = 7,
        /*   8 */       UN_PROMILL = 8,
        /*   9 */       UN_METER_PER_SECOND = 9,
        /*  10 */       UN_DEGREE_CELSIUS = 10,
        /*  11 */       UN_MILLI_VOLT = 11,
        /*  12 */       UN_VOLT = 12,
        /*  13 */       UN_MILLI_AMPERE = 13,
        /*  14 */       UN_AMPERE = 14,
        /*  15 */       UN_OHM = 15,
        /*  16 */       UN_DIGIT = 16,
        /*  23 */       UN_GRAD = 23,
        /*  24 */       UN_DEGREE_FAHRENHEIT = 24,
        /*  25 */       UN_GRAM = 25,
        /*  26 */       UN_KILO_GRAM = 26,
        /*  27 */       UN_PASCAL = 27,
        /*  28 */       UN_KILO_PASCALA = 28,
        /*  29 */       UN_BAR = 29,
        /*  30 */       UN_PSI = 30,
        /*  31 */       UN_SECOND = 31,
        /*  32 */       UN_MINUTE = 32,
        /*  33 */       UN_KILO_BYTE = 33,
        /*  34 */       UN_MEGA_BYTE = 34,
        /*  35 */       UN_GIGA_BYTE = 35,
        /*  36 */       UN_MILLI_GRAM_PER_LITRE = 36,
        /*  37 */       UN_STANDARD_LITER_PER_MINUTE = 37,
        /*  38 */       UN_MICRO_AMPERE = 38,
        /*  39 */       UN_WATT = 39,
        /*  40 */       UN_GRAM_PER_CUBIC_METRE = 40,
        /*  -1 */       UN_NUL = -1
 } unit_t;
```