

# Sensor Plug-In

## Description / Documentation

**Belimo - Sensor Plug-In**

UK24LON / PT1000\_MP2

**Input**

Sensor Type

Disabled

Active ( 0V .. 32V )

Passive ( 850 ohm .. 1.6 kohm )

Passive ( 200 ohm .. 60 kohm )

Switch, n.o. ( 0 / 1 )

**Transformation**

Disabled

Enabled

Invert:

OFF

ON

nvoSensorValue:

Sensor definition: Transformation

Load From File Save to File Cancel

LONWORKS®

**Belimo - Sensor Plug-In**

UK24LON / PT1000\_MP2

**Input**

Unit: Ohm

921.6
960.9
1000
1039
1077.9
1097.4
1116.7
1155.4
1194
1232.4
1270
1308.9
1347
1385

Range: 850 .. 1600

Resolution: 1

**Output**

-20
-10
0
10
20
25
30
40
50
60
70
80
90
100

Sensor definition: Transformation

Load From File Save to File Cancel Apply OK

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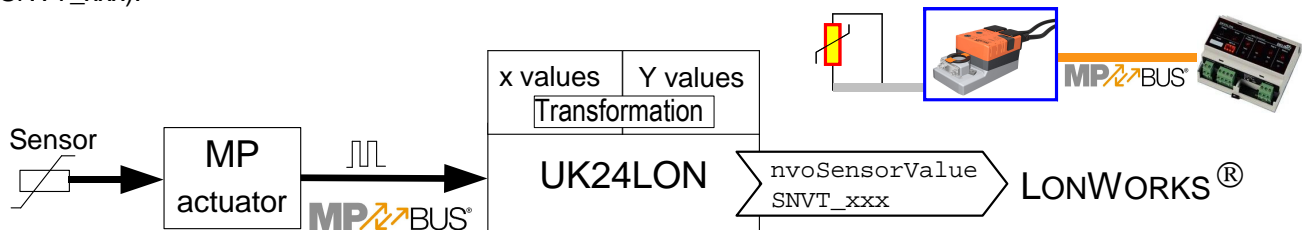
## 1 General

The Belimo *Sensor Plug-In* is a plug-in device with a LNS capability and it is executable with a LNS based binding tool (e.g. LonMaker, NL220, Alex). Its purpose is to make the parameterising of sensor functions much easier. Referring to the sensor connected to an MP/MFT(2) or Lon actuator, for example, it is possible either to enter a sensor table or to determine the required output variable (nvoSensorValue, SNVT\_XXX).

## 2 Application

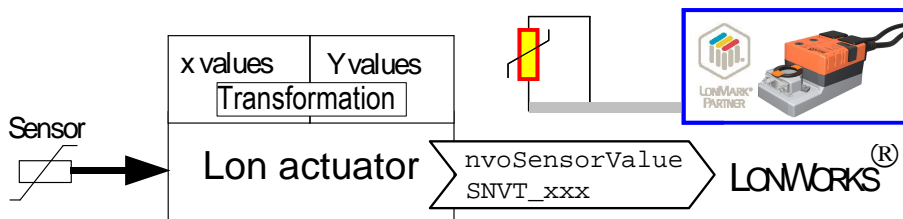
### 2.1 Application via Gateway UK24LON

For MP bus operation, one sensor can be connected to each MP/MFT(2) actuator - they can be active sensors with a DC 0-10 V output, ON/OFF switches or passive resistance sensors (e.g. Pt 1000). In the case of MP/MFT(2) actuators the analogue signal from the sensors is digitized and transferred by MP-Bus to a UK24LON Gateway unit from where it can be passed on to a LonWorks network as a network variable (SNVT\_XXX).



### 2.2 Application with a LON actuator (new generation)

A sensor can be connected to the LonWorks compatible actuator - they can be active sensors with a DC 0-10 V output, ON/OFF switches or passive resistance sensors (e.g. Pt 1000). The analogue signal from the sensor is digitized by the Lon actuator and is transferred to LonWorks as a Standard Network Variable (SNVT\_XXX).



### 3 Accessing the function objects via Plug-In

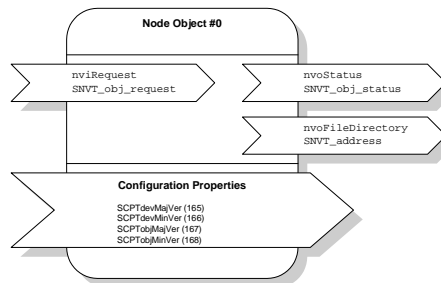
#### 3.1 Access at Gateway UK24LON

Node Object #0 is implemented once and Damper Actuator Object #8110 eight times in a UK24LON Gateway unit (once for each actuator that can be connected to the UK24LON unit). In addition, the Open Loop Sensor Object #1 is also implemented eight times. The sensor value can be transferred to LonWorks via each of these objects.

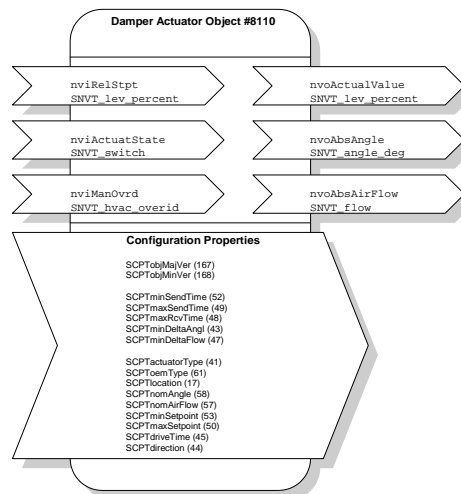
The **Sensor Plug-In** accesses Sensors 1...8 through the function object of the corresponding Open Loop Sensor Object #1.

The **Damper Actuator Plug-In** accesses through the function object of the corresponding Damper Actuator Object #8110 1...8.

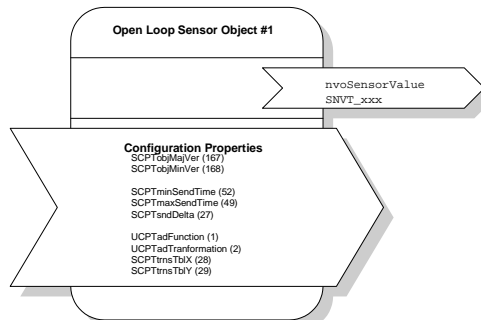
**Node Object #0**  
1x implemented



**Damper Actuator Object #8110**  
8x implemented

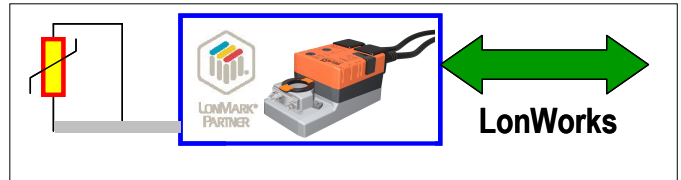


**Open Loop Sensor Object #1**  
8x implemented



### 3.2 Access at a LON-actuator (new generation)

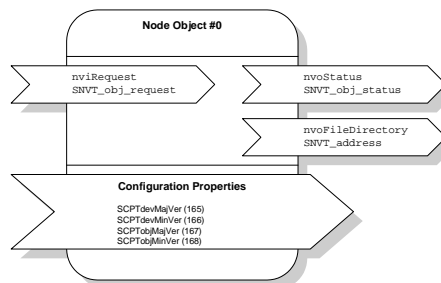
Node Object #0 and Damper Actuator Object #8110 are implemented in a Lon actuator. In addition, the Open Loop Sensor Object #1 is also implemented. The sensor value can be transferred to LonWorks via the Open Loop Sensor Object #1.



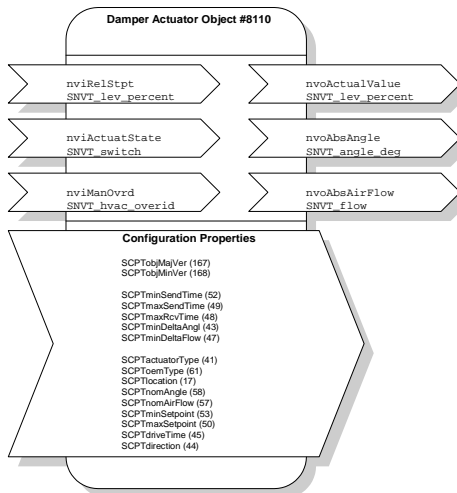
The **Sensor Plug-In** accesses the Sensor through the function object of the Open Loop Sensor Object #1.

The **Damper Actuator Plug-In** accesses through the function object of the Damper Actuator Object #8110.

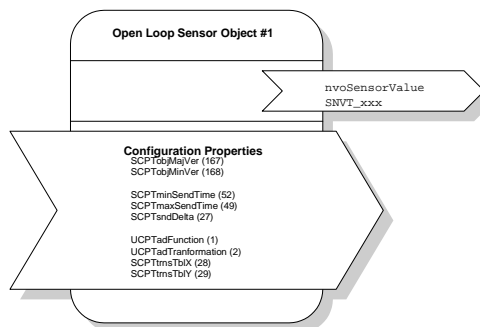
#### Node Object #0



#### Damper Actuator Object #8110



#### Open Loop Sensor Object #1



## 4 Installation

### 4.1 System requirements

- Minimum requirement LNS 3.x
- Remote capability (with LNS Turbo Edition)

### 4.2 Installation

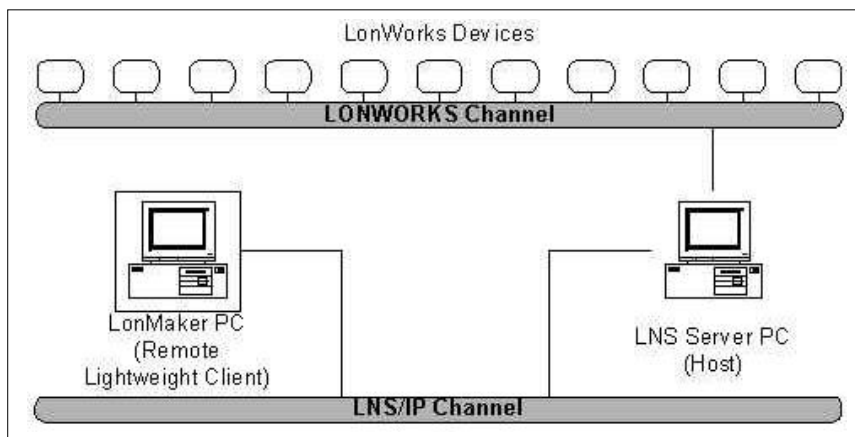
Belimo provides the *Sensor Plug-In* as setup file. The setup file contains all Belimo Plug-In (Actuator, Sensor, Controller), that is why only one setup procedure is required.

Download address: : [www.belimo.eu](http://www.belimo.eu) Bus- & System-Integration | LonWorks | Download Section

1. Download the Plug-In and save to a temporary directory
2. Start installation by double-clicking on the file **BelimoPlugIn - xxxx.exe**.
3. Follow the instructions in the Setup program

## 5 Remote capability

The Sensor Plug-in has a remote capability. That means a remotely controlled accesses on databases of LonWorks projects are possible.



Picture:  
Remote Lightweight  
Client.

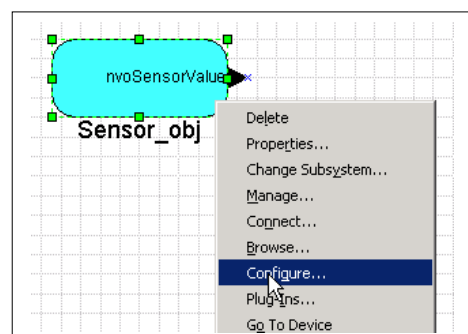
Example remotely  
controlled access via  
an IP connection on a  
LonWorks project

## 6 Starting the Plug-In

Procedure:

(Example with LonMaker binding tool)

1. Select the required sensor object
2. Open the context menu and select "Configure"

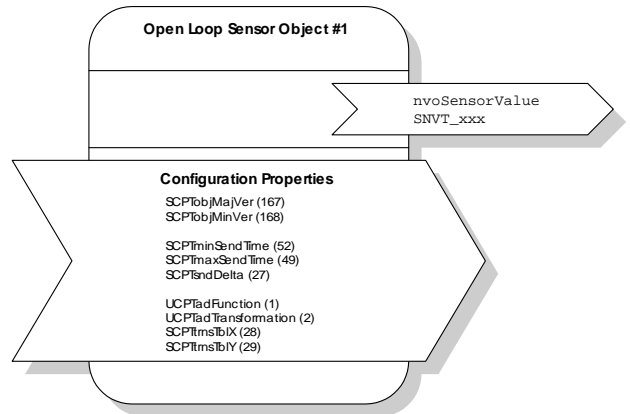


## 7 Definition of nvoSensorValue, SNVT\_xxx,

The output variable nvoSensorValue, SNVT\_xxx indicates the actual value being provided by the sensor. Depending on the type of sensor connected to the MP/MFT(2) actuator, the output variable from the UK24LON unit can be configured to suit the particular application involved.

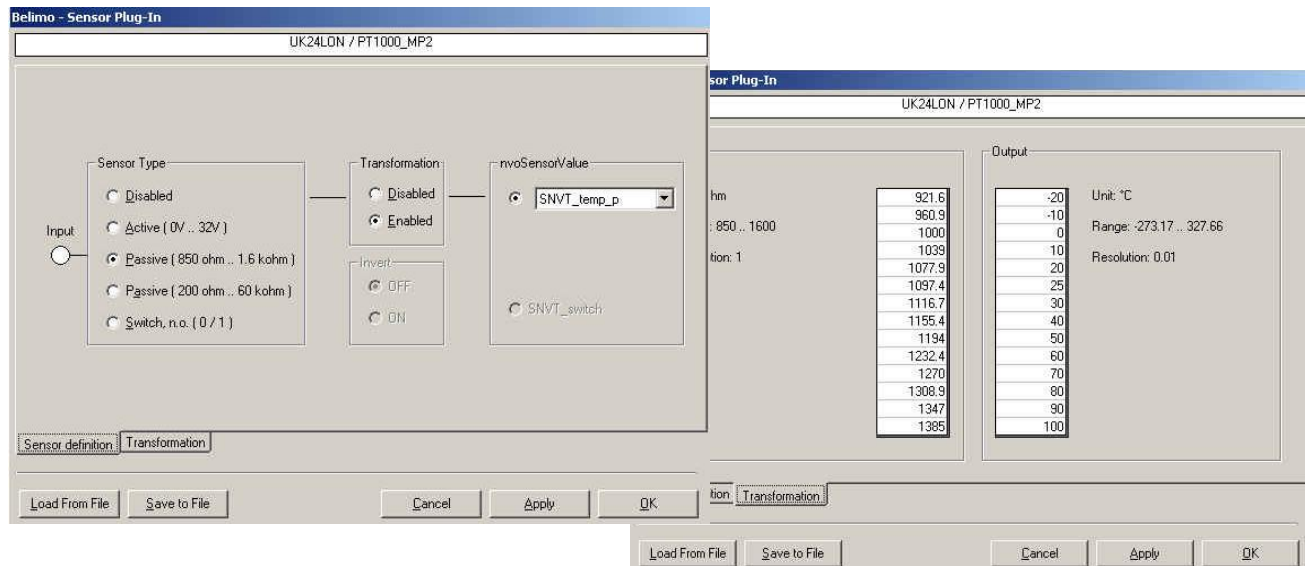
The output variable nvoSensorValue, SNVT\_xxx indicates the actual value being provided by the sensor. Depending on the type of SNVT needed in the LonWorks application the output variable can be configured accordingly. There are 15 different variables as shown in the table.

SNVT_temp_p	SNVT_lev_percent	SNVT_lux
SNVT_temp	SNVT_abs_humidity	SNVT_press_p
SNVT_switch	SNVT_enthalpy	SNVT_smo_obscur
SNVT_flow	SNVT_ppm	SNVT_power
SNVT_flow_p	SNVT_rpm	SNVT_elec_kwh



## 8 Function pages of the Sensor Plug-In

Basically, the *Sensor Plug-In* incorporates 2 Function Pages - the "Sensor definition" page and the "Transformation" page which allow specific parameters to be assigned very easily for all the sensors and LonWorks.



## 8.1 Elements of the *Sensor Plug-In*

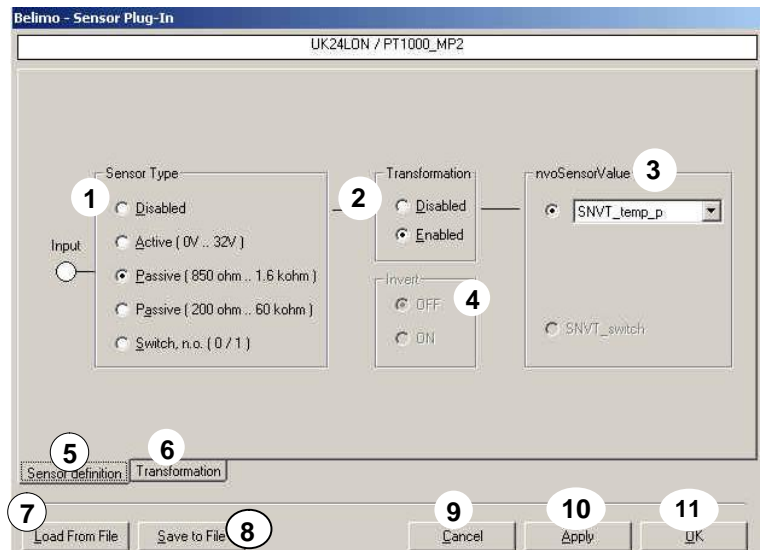
The main page "Sensor definition" appears as soon as the *Sensor Plug-In* has been started.

Legend:

### 1. Sensor type

Depending on the sensor connected to the MP/MFT(2) actuator the "Input" is defined here.

- When a sensor with a DC voltage output is connected, select "Active (0V...32V)" (see examples 7.4 and 7.5)
- When a passive sensor is connected - select either "Passive (850 Ω...1.6 kΩ)" or "Passive (200 Ω...60 kΩ)" according to the resistance range of the sensor (see example 7.1)



- When a switch with an AC/DC 24 V or 0 V output is connected, select "Switch, n.o. (0/1)".

### 2. Transformation

On/Off switching of the transformation table (see also 6). Allowing the table in which the input-to-output scaling can be defined to be switched on or off.

### 3. nvoSensorValue

Definition of the type of output variable that the sensor value transfers to LonWorks. 15 different types can be selected (see also 4 on Page 5).

### 4. Invert

If 'Switch' is selected at 1 (Sensor Type) and its function at 3 is transferred to LonWorks with the variable SNVT\_switch the logic relationship between input and output can be inverted.

### 5. Sensor definition

The button for selecting the "Sensor definition" Function Page.

### 6. Transformation

The button for selecting the Transformation Table (see also 2).

### 7. Load from file

Predefined sensor settings (see 8) are loaded from a file and copied into the selected sensor object. This is especially helpful when the same sensor with the identical transformation table is being used over and over again (see also 6.2.2).

### 8. Save to file

Settings made on the "Sensor definition" page and the "Transformation" page can be copied to a file from where, when necessary (see 7), they can be loaded and transferred to other sensor objects (see also 6.2.2 on Page 8).

### 9. Cancel

For exiting from the *Plug-In* without accepting any settings that have been made.

### 10. Apply

All *Plug-In* settings are stored in the sensor object without exiting from the *Plug-In*.

### 11. OK

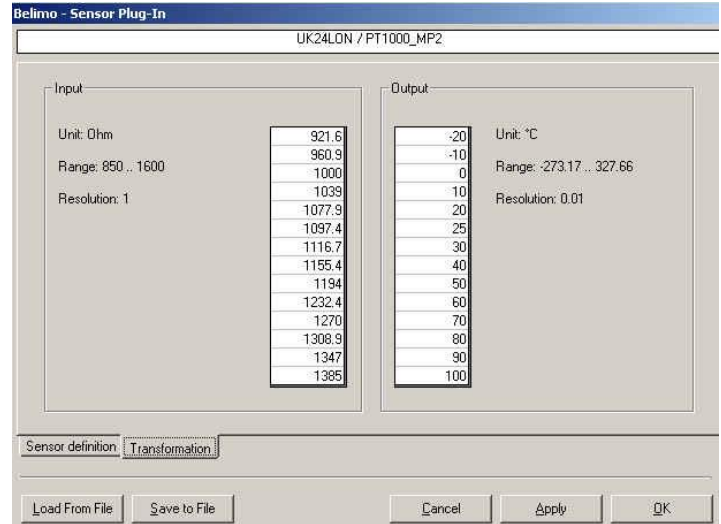
All *Plug-In* settings are stored in the sensor object and the *Plug-In* is exited.



## 8.2 Function page: "Transformation"

The transformation table makes it very easy to assign the sensor values (sensor characteristic) from the sensor connected to an MP/MFT(2) actuator to the required output values for the LonWorks network. In total, 14 pairs of X/Y values can be entered, whereby the X-values are entered in the "Input" field and the corresponding Y-values in the "Output" field.

The input units, input range and resolution in the "Input" field arise from the choice of "Sensor Type" on the "Sensor definition" page. The output units, output range and resolution in the "Output" field arise from the choice of SNVT in the "nvoSensorValue" field on the "Sensor definition" page.



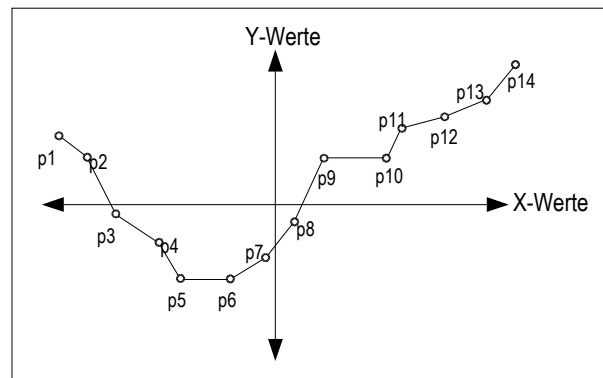
### 8.2.1 Instructions for filling in the transformation table

#### a) Strictly monotonic increasing X-values

The X-values that are entered in the transformation table must be strictly monotonic increasing ( $X_{n+1} > x_n$ ), i.e. the magnitude of the values entered successively into the X-Table must increase value by value.

The example illustrates this (table and diagram).

	Input X-value	Output Y-value		Input X-value	Output Y-value
p1	-30	10	p8	3	-2
p2	-25	7	p9	6	6
p3	-22	-1	p10	16	6
p4	-16	-5	p11	19	11
p5	-13	-10	p12	24	12
p6	-5	-10	p13	30	15
p7	-1	-6	p14	34	20



#### b) Linear interpolation (described with reference to the diagram above)

- Linear interpolation is performed between the points p1-p2, p2-p3, p3-p4, etc.
- After points p1 and p14 the characteristic is interpolated further from the gradient of the previous points, i.e. in the negative range of the X-curve further interpolation is performed from the gradient defined by points p1 and p2 and, in the positive range, the X-curve is interpolated further from the gradient defined by points p13 and p14.

#### c) The table need not be completely filled

In the case of linear sensor characteristics only 2 points need be defined in the transformation table, namely the top and bottom points of the characteristic. This is because the shape of the characteristic between the defined points is always linear.

### 8.2.2 Save to file / Load from file

Settings made on the "Sensor definition" and "Transformation" pages can be stored in a file for easy transfer to other sensor objects. This can be very helpful when the same sensor with a complex transformation table is being used over and over again.

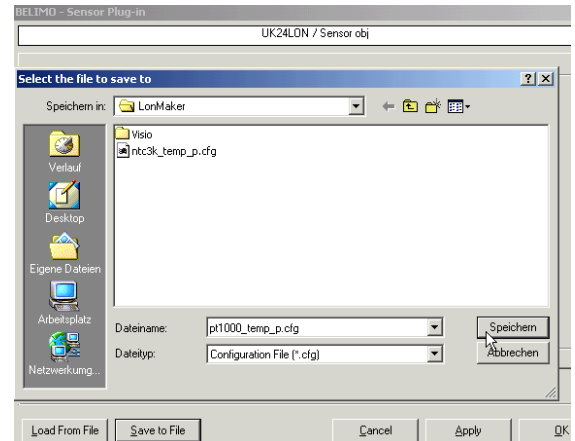
#### a) Save to file

Procedure for the *Plug-In* settings of a Pt 1000 sensor:

Definition of the initial state:

The *Plug-In* is started in the sensor object whose settings are to be copied to another sensor object

- Press the "Save to file" button
- Define the destination folder
- Select a filename (in the example: "Pt1000\_temp\_p.cfg")
- Press the "Store" button



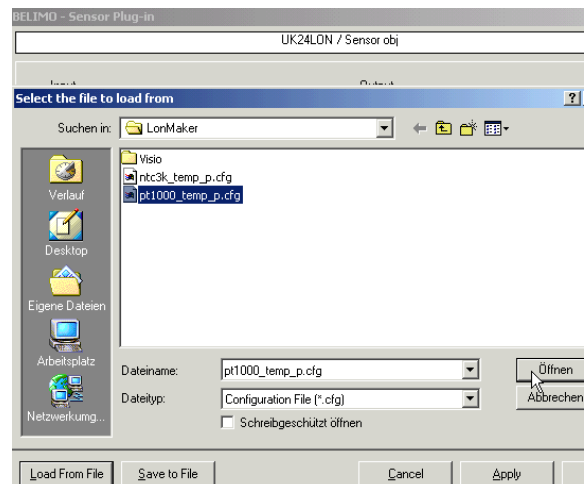
#### b) Load from file

Procedure for the file of a Pt 1000 sensor (pt1000\_temp\_p.cfg) as generated above.

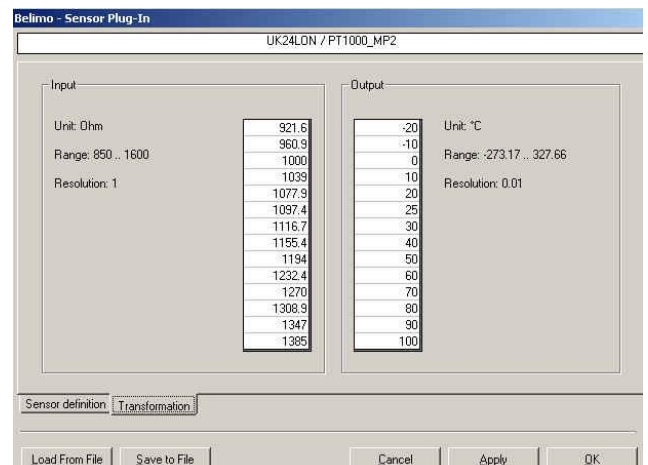
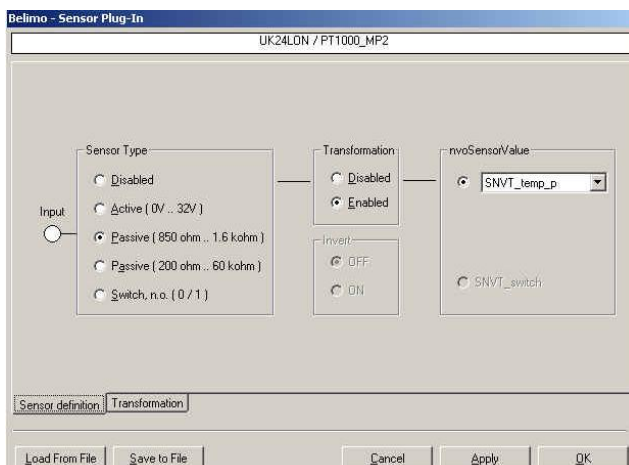
Definition of the initial state:

The *Plug-In* is started in the sensor object whose settings are to be copied from a file.

- Press the "Load from file" button
- Select the required file
- Press the "Start" button



The settings have now been transferred to the "Sensor definition" and "Transformation" pages of the *Plug-In*. Pressing the "OK" button causes them to be transferred to the sensor object.



## 9 Examples

### General:

The following examples are based on the solution related to UK24LON (in particular wiring diagrams). The selected examples of plug-in settings can be applied one to one to the Lon actuators of the new generation. (types ...ALON oder VAV ...LON)

### 9.1 Transferring a temperature value from a Pt 1000 to LonWorks

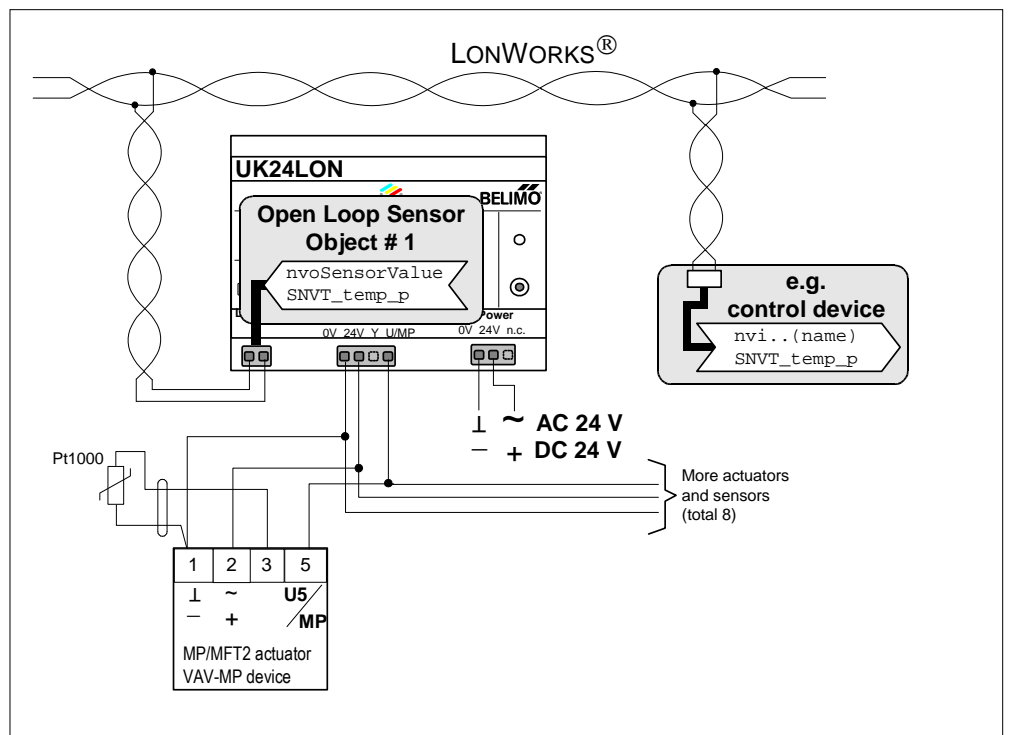
To convert the values of a Pt 1000 sensor to "SNVT\_temp\_p".  
 Range SNVT\_temp\_p = -273.17... +327.66°C (0.01°)

**Possible application:** To give the temperature characteristic of a Pt 1000 "LON capability".

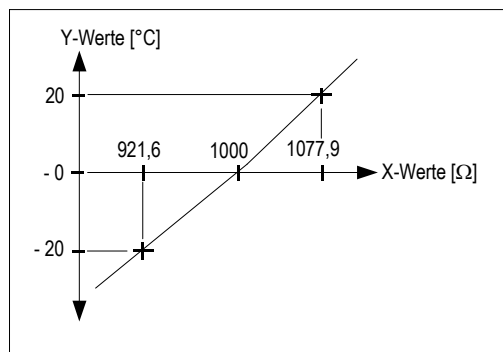
#### Pt 1000 value table

Y-value Temp [°C]	X-value R [Ω]
-50	803.1
-40	842.7
-30	882.2
-20	921.6
-10	960.9
0	1000.0
10	1039.0
20	1077.9
25	1097.4
30	1116.7
40	1155.4
50	1194.0
60	1232.4
70	1270.0
80	1308.9
90	1347.0
100	1385.0
110	1422.0
120	1460.6
130	1498.2
140	1535.8
150	1573.1

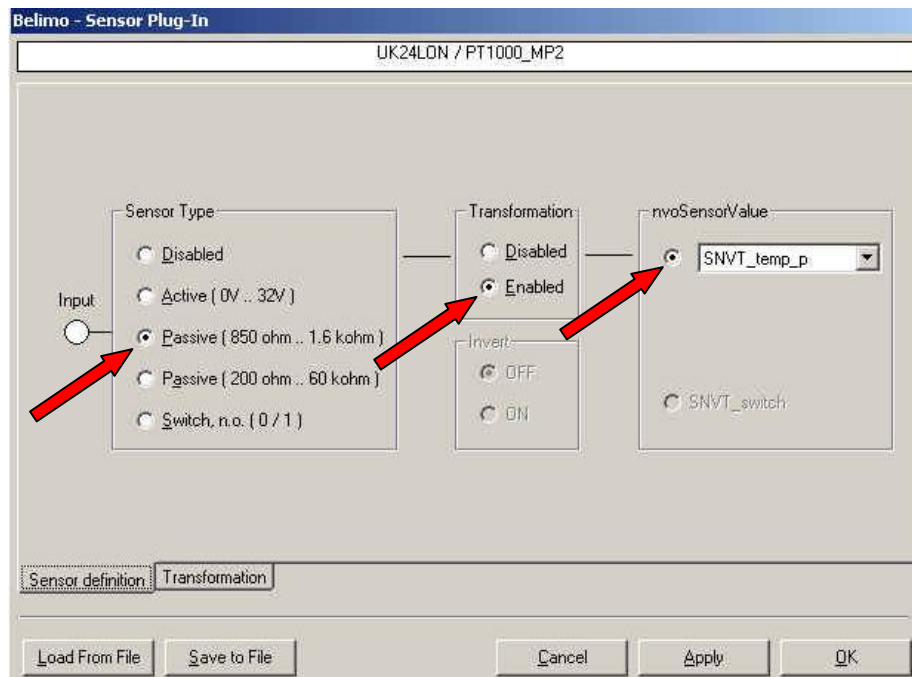
#### Wiring and function diagram:



#### Pt 1000 characteristic (diagrammatic)

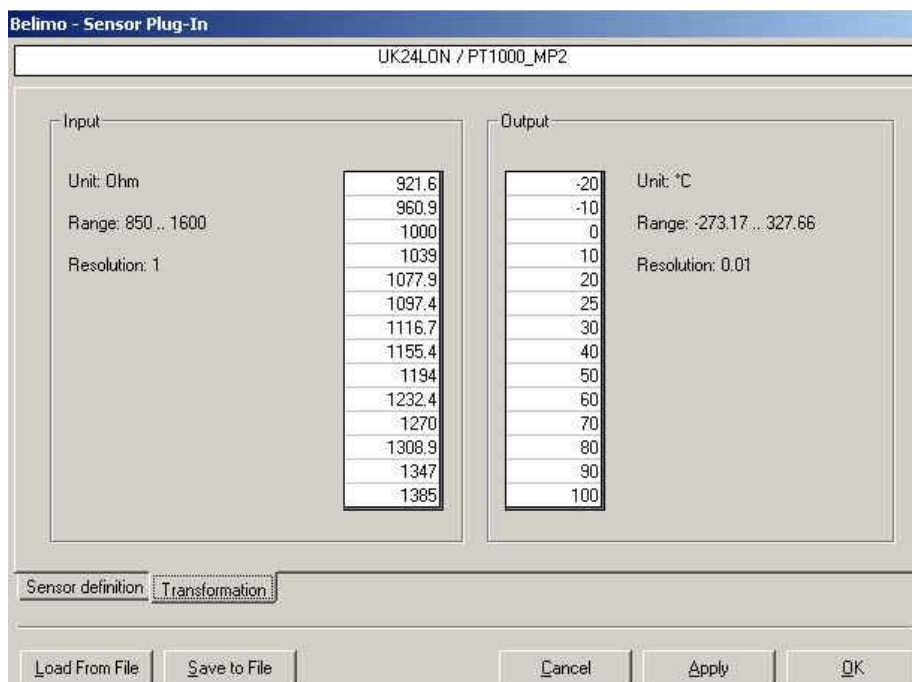


### 9.1.1 Settings on Function page: "Sensor definition"



### 9.1.2 Settings on Function page: "Transformation"

14 X-values and 14 Y-values can be defined in the table. The values with the grey background are taken from the table of values for the Pt 1000. Linear interpolation is employed outside the defined range, e.g. for determining the point (-30°C and 882.  $\Omega$ ) on the characteristic the gradient of the characteristic given by the points -20°C and 921.6  $\Omega$  is the governing factor. Similarly, for determining the point (110°C and 1422.0  $\Omega$ ) on the characteristic the gradient of the characteristic given by the points 100°C and 1385  $\Omega$  is the governing factor.



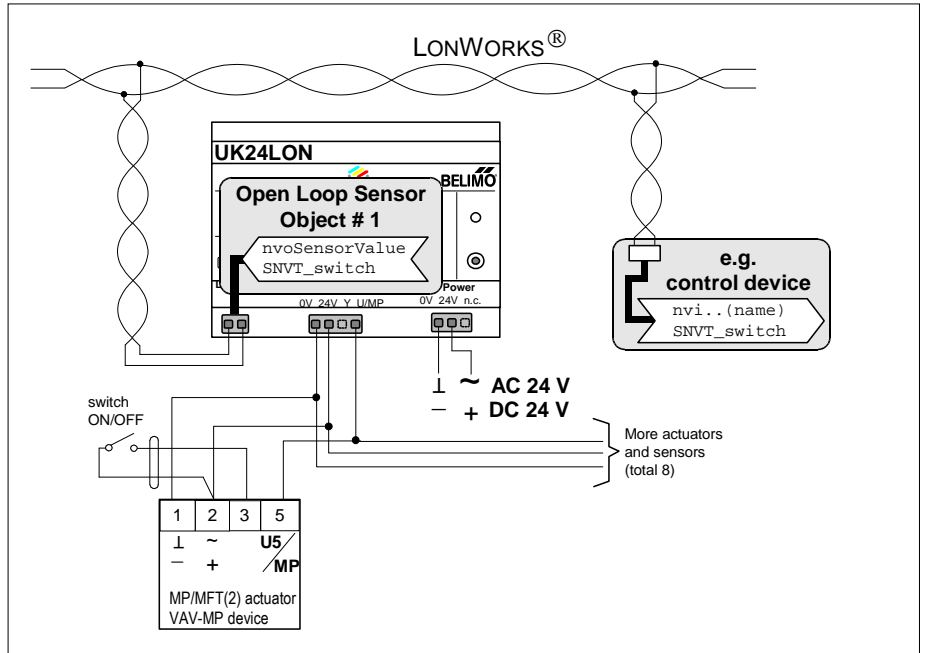
## 9.2 Connecting an ON/OFF switch

To convert the ON/OFF positions of a switch to "SNVT\_switch" (switching function not inverted)

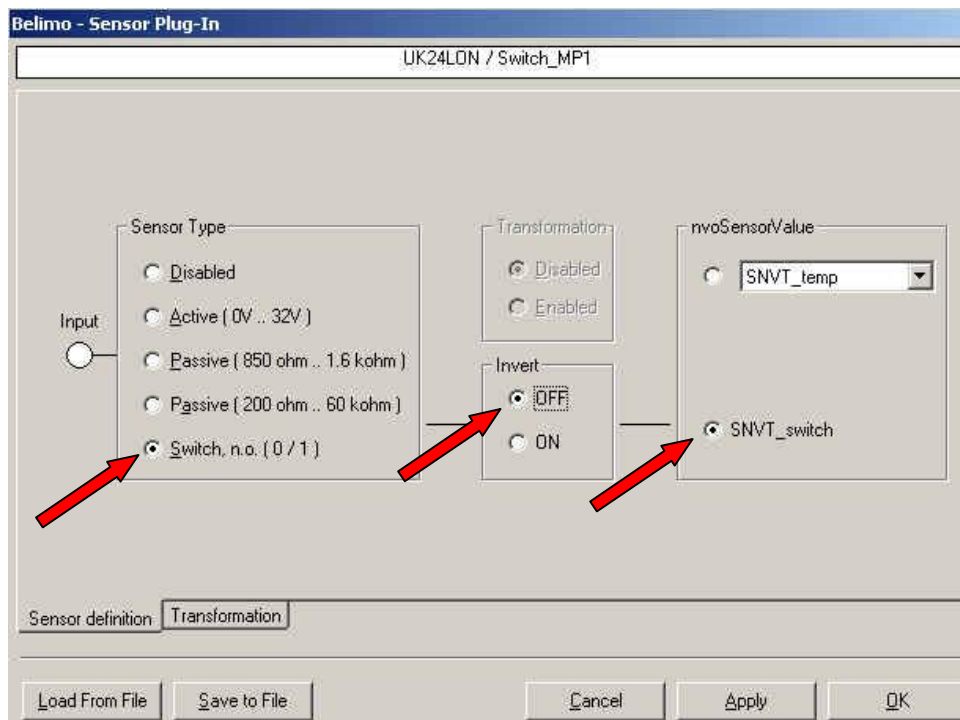
### Possible applications

- Differential-pressure switch
- Proximity switch
- Manual/Automatic switch

### Wiring and function diagram



### 9.2.1 Settings on Function page: "Sensor definition"



Note: The "Transformation" Function Page does not have to be filled in.

### 9.3 Converting switch positions to 2 temperature setpoints

To convert the ON/OFF positions of a switch to 2 temperature values which are then transferred to LonWorks as "SNVT\_temp".

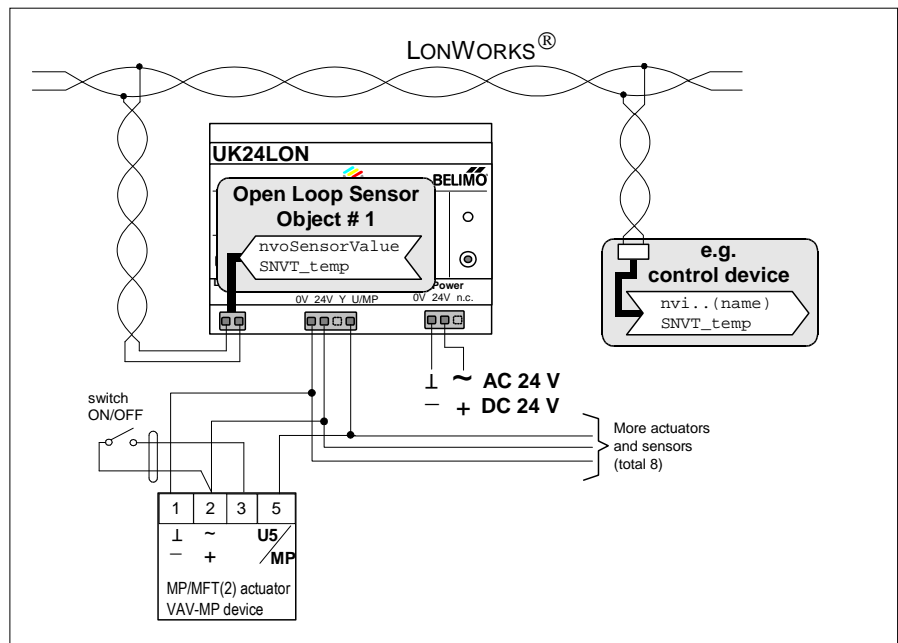
Range SNVT\_temp = -274 ...6,279.5 °C (0.1°C)

- Definition:
- When the switch is in the OFF position (0) a value of 17°C is transferred to LonWorks
  - When the switch is in the ON position (1) a value of 23°C is transferred to LonWorks

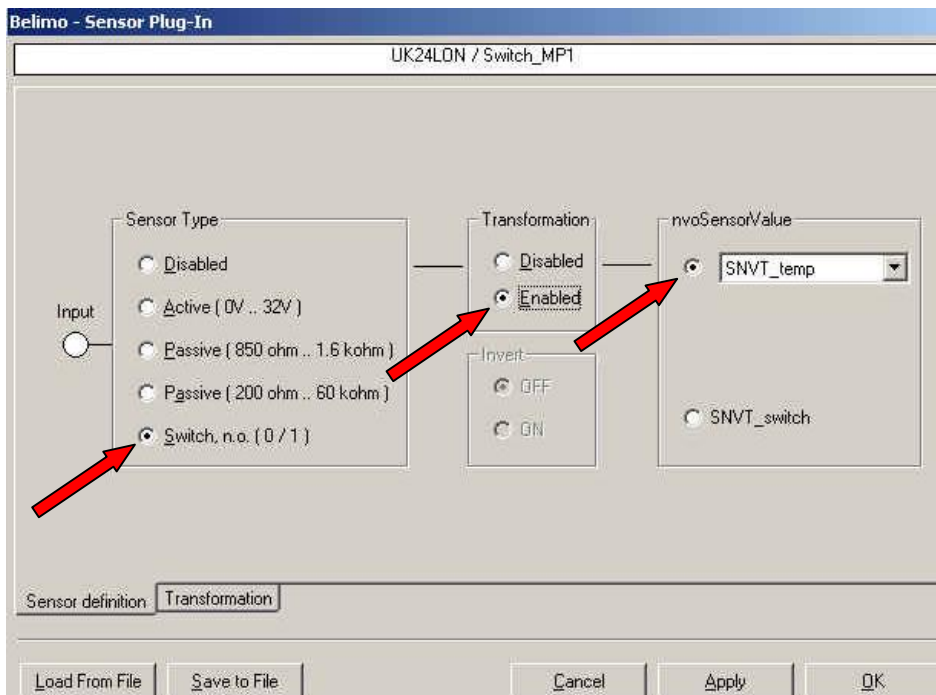
#### Possible application

- Issuing a standby or comfort set point with a switch.

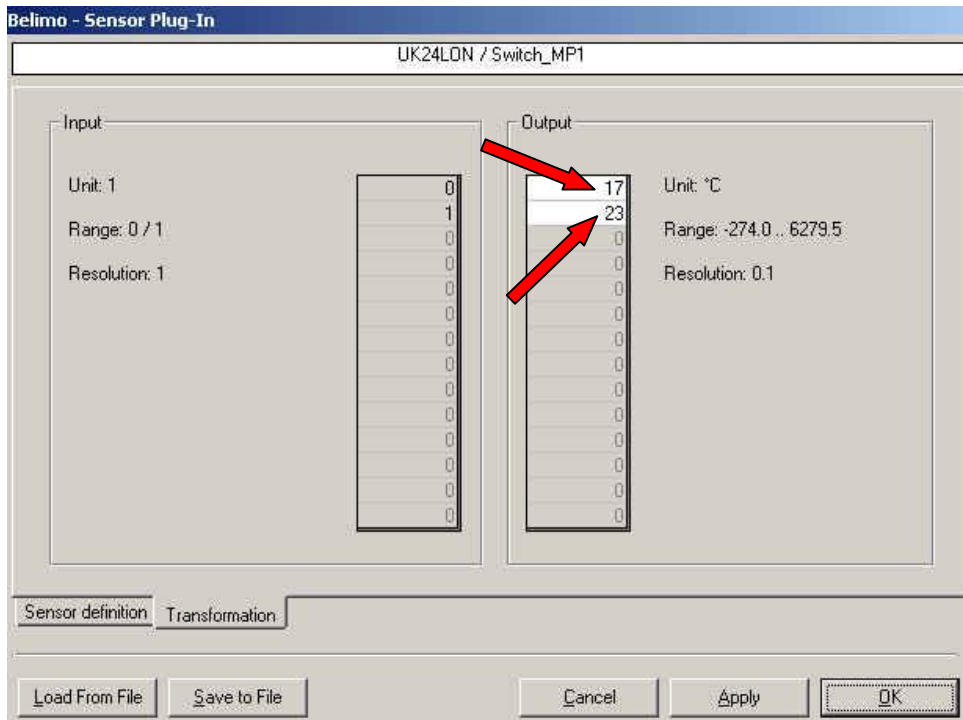
#### Wiring and function diagram



#### 9.3.1 Settings on Function page: "Sensor definition"



### 9.3.2 Settings on Function page: "Transformation"



### 9.4 Converting a modulating DC 0...10 V signal to a 0...100% value

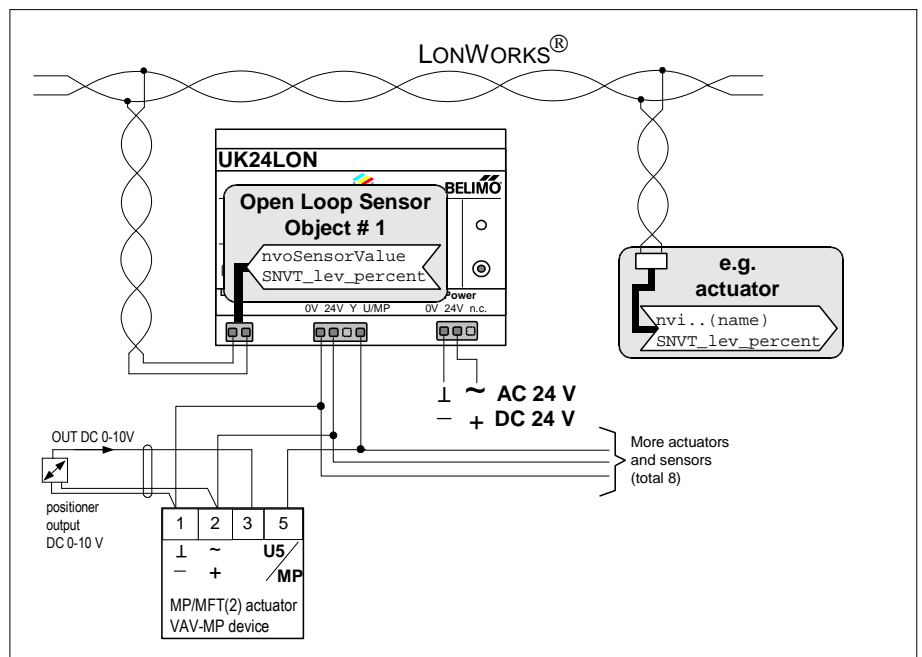
To convert the modulating DC 0...10 V voltage signal of a position transmitter to a 0...100% value and transfer it to LonWorks as "SNVT\_lev\_percent".

Range SNVT\_lev\_percent = 163.84% .. 163.83% (0.005%)

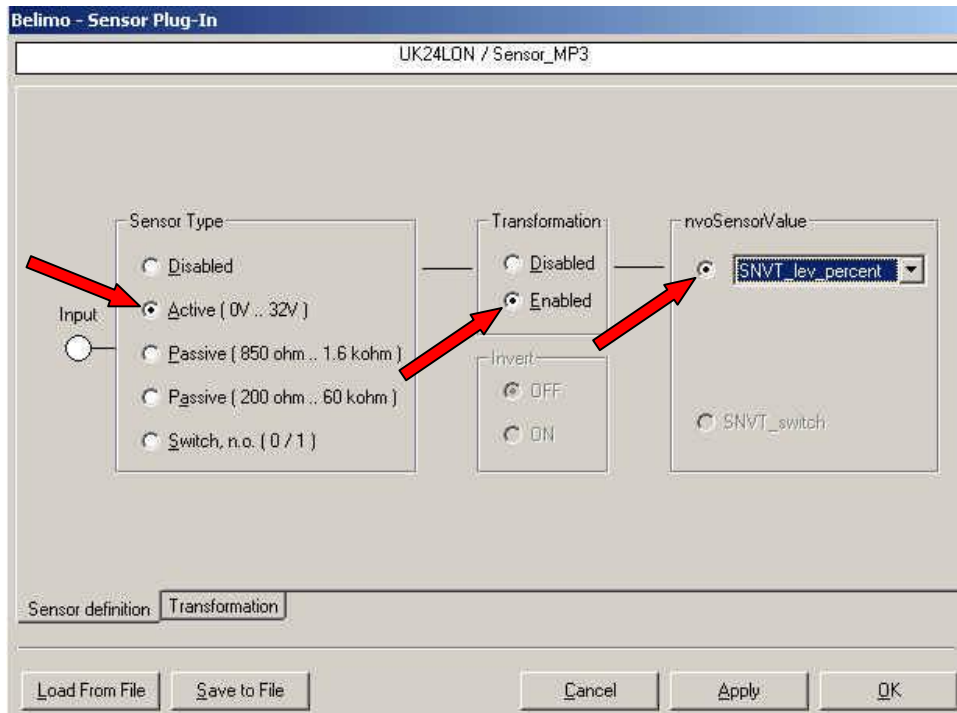
#### Possible application

- Issuing a setpoint for a LonWorks device with a simple DC 0...10 V signal.

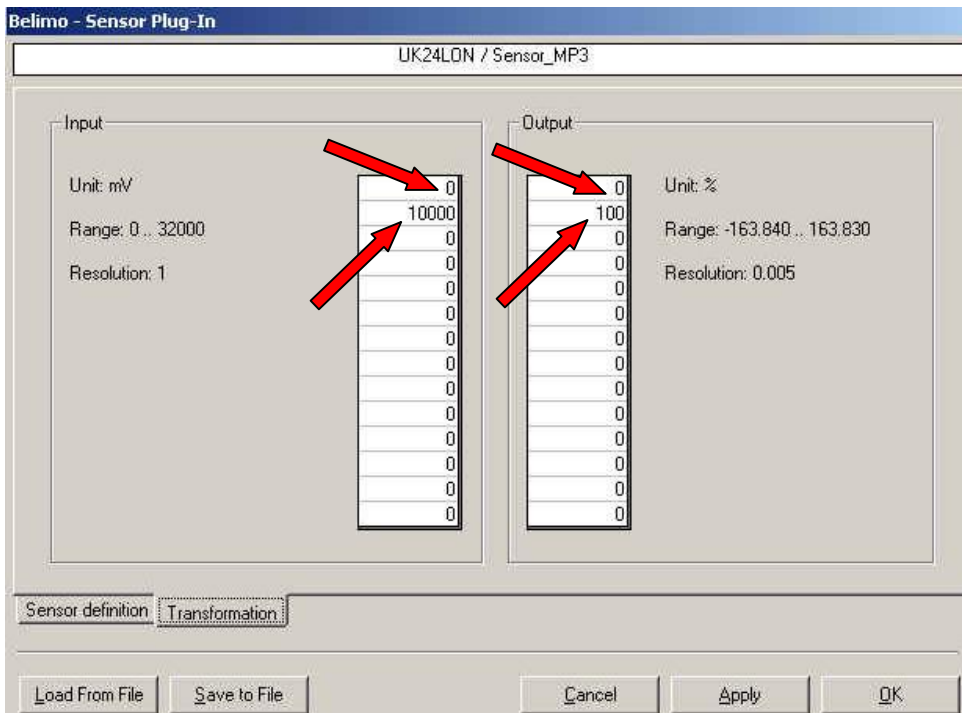
#### Wiring and function diagram



9.4.1 Settings on Function page: "Sensor definition"



9.4.2 Settings on Function page: "Transformation"





## 9.5 Transferring a temperature value from an active sensor to LonWorks

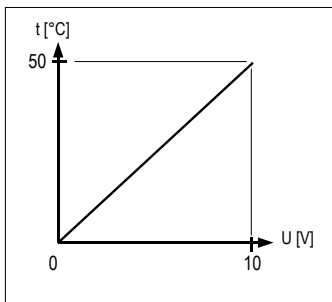
The active sensor has a linear temperature/voltage characteristic. According to its temperature range of 0...50°C the sensor generates an output signal of DC 0...10 V. This voltage value is copied from the actuator and transferred to LonWorks as a temperature value via SNVT\_temp\_p.

Range SNVT\_temp\_p = -273.17... + 327.66°C (0.01°)

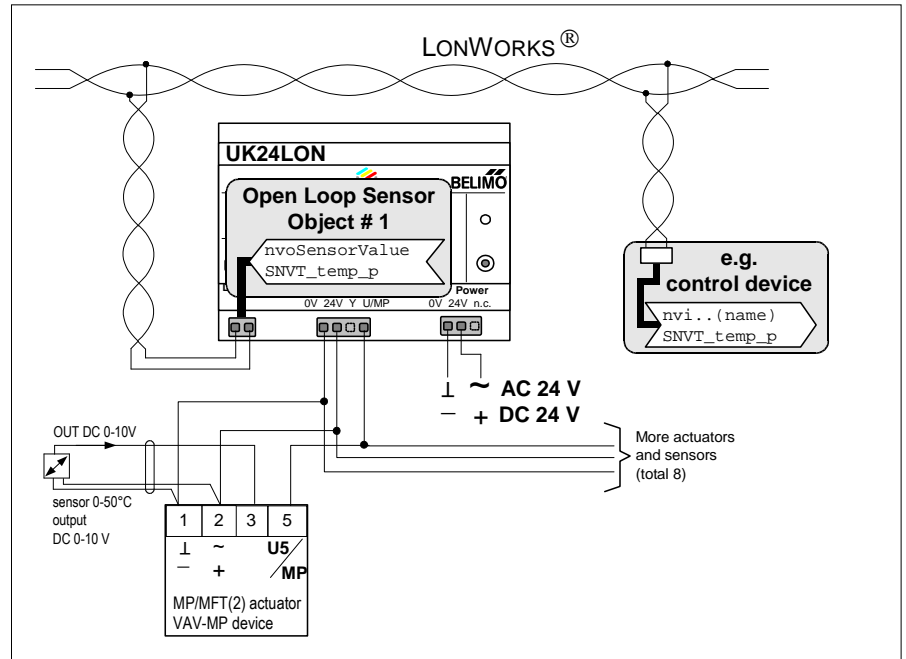
### Possible application

- To give the temperature characteristic of an active sensor "LON capability".

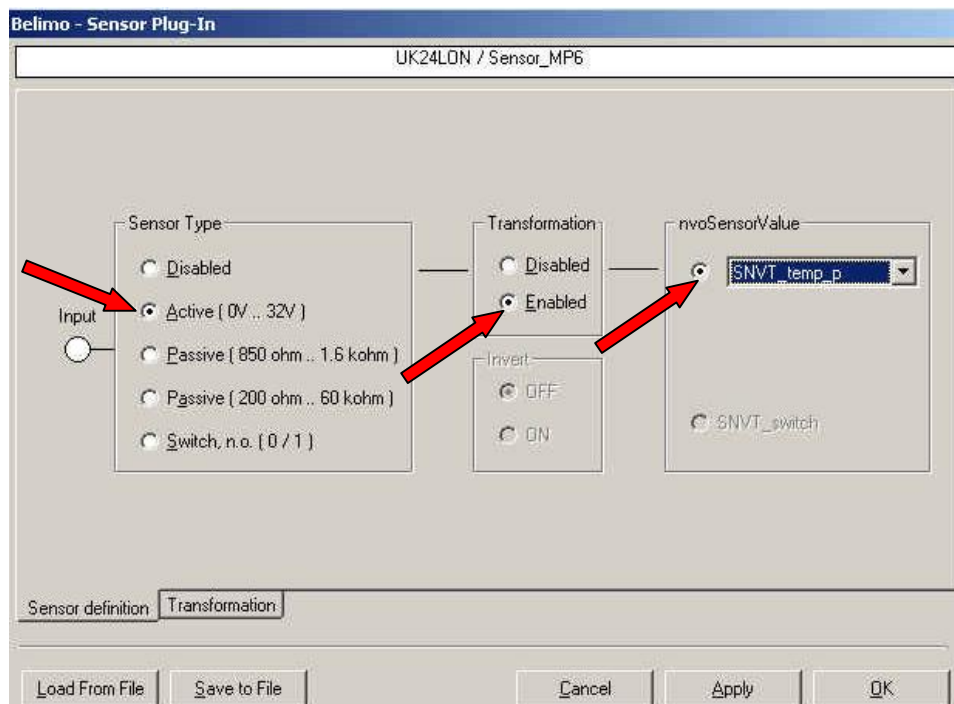
Sensor temperature characteristic UA = 0...50°C@DC 0...10 V



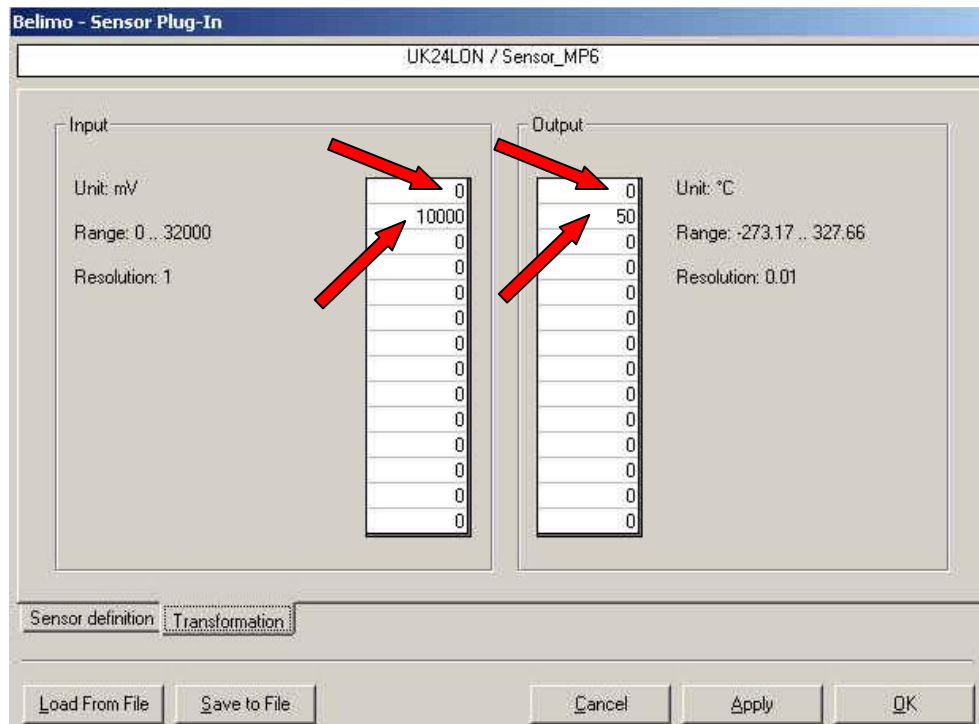
### Wiring and function diagram



### 9.5.1 Settings on Function page: "Sensor definition"



### 9.5.2 Settings on Function page: "Transformation"



Note: Since the sensor has a linear characteristic, two points are sufficient for the definition.