Description

ADM Line monitoring and differential evaluation

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» The digital inputs of the ADM support line monitoring and are monitored for short circuit and line breakage

» Function difference evaluation: The difference between two analog inputs can be of two analog inputs can be evaluated

1 Line monitoring details

The digital inputs of the ADM now support line monitoring. The line is monitored for line break and short circuit.
For monitoring, the line must be terminated with a resistor and for tripping, the input must be pulled to ground via another resistor.

Terminating resistor	3,9 kOhm
Release resistor	1,0 kOhm

Table 1: ADM line monitoring resistance value

Up to 12 monitored lines can be connected to the ADM. The function of the inputs can be freely configured in each case.
When used in SHEV links these are:

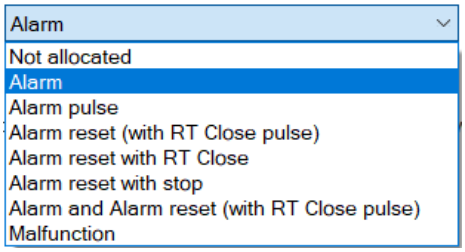

Figure 1: Digital input Functionalities SHEV

If a line fault is detected, the assigned SHEV link is automatically set to fault.
The line monitoring can be used e.g. for the connection of a fire alarm system or for the connection of RT keypads.

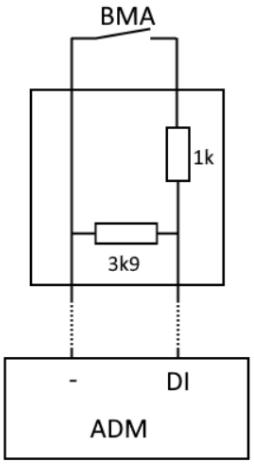

Figure 2: Connection fire alarm panel

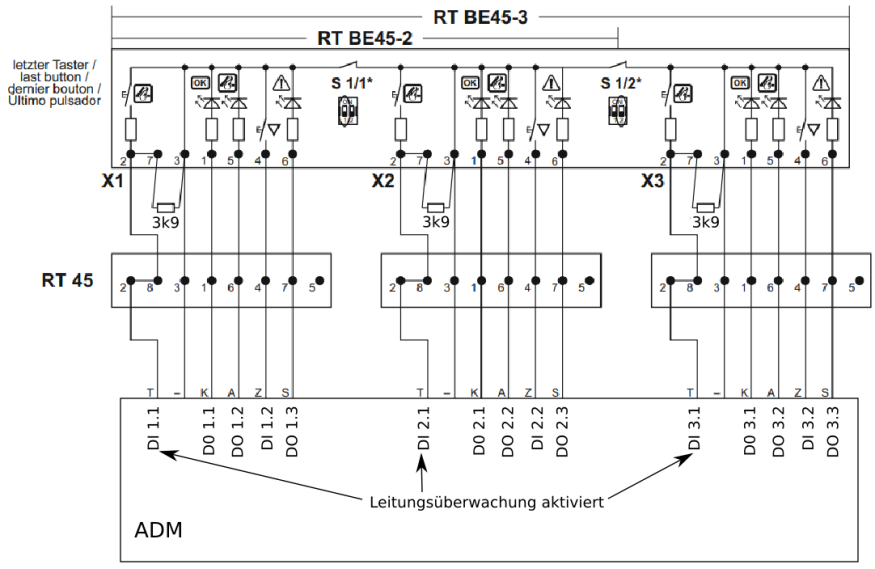

Figure 3: RT BE45 keypad connection

2 SCS parameterization

If line monitoring is to be used for a digital input, it must be activated on the configuration tab.

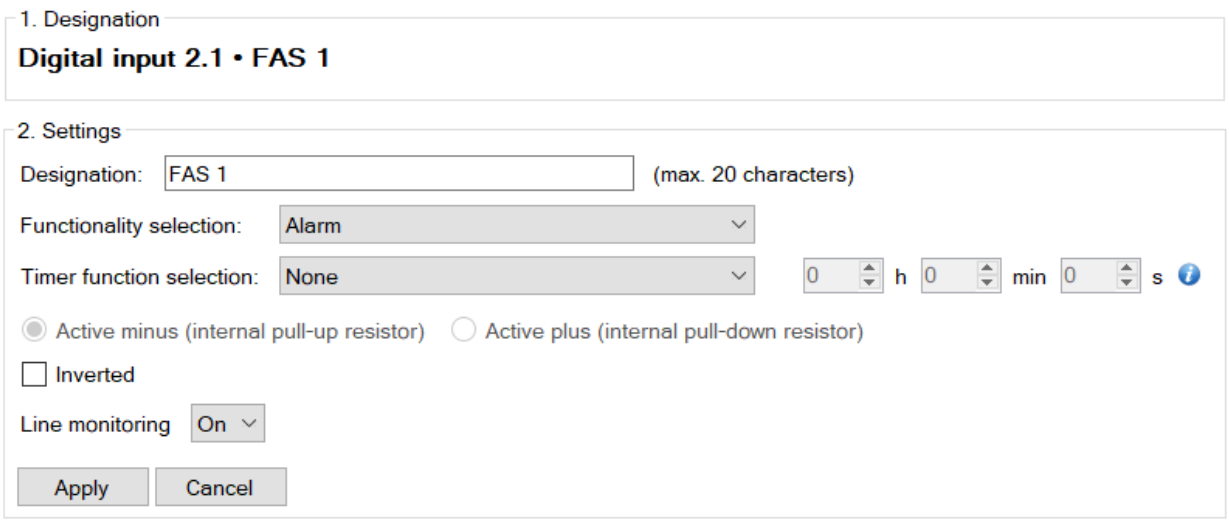

Figure 4: SCS configuration digital input with line monitoring

Plus active evaluation is then not possible. As with any digital input, the functionality can be freely configured. In this way, SHEV links can be switched directly to alarm, or an alarm pulse can be displayed, which can also be reset in the event of a continuous signal.
If a line fault is detected, then, regardless of the function for which the input has been configured, the fault is passed on via the assigned SHEV link.
Digital inputs with line monitoring can also be used directly as a condition in a logic operation. Here, both the actual value of the input and other statuses, such as the fault reasons line break and short circuit, can be used as conditions. In this way, the fault reasons can be forwarded via AdComNet to a Modbus gateway, for example, and from there to a touch panel or a BMS.

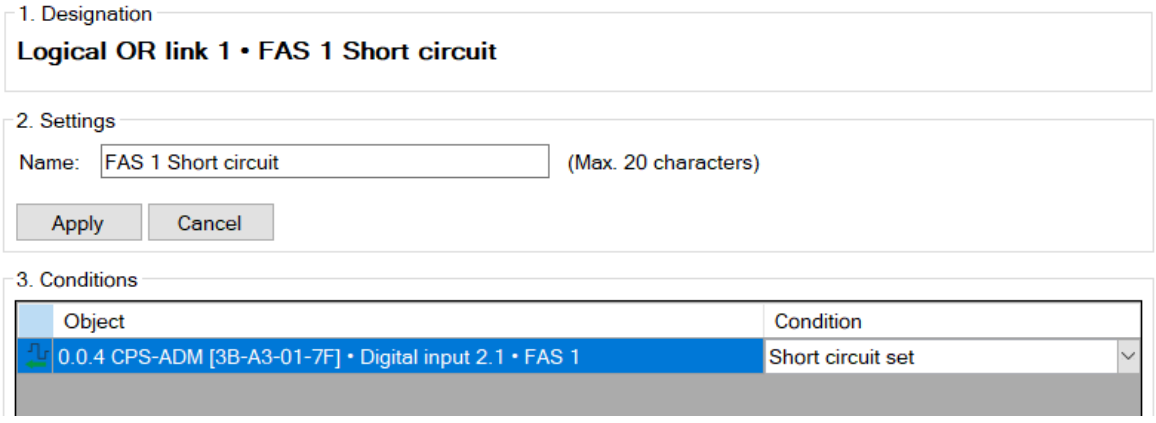

Figure 5: SCS digital input as condition in logic operations

3 Details of the difference evaluation

With the new function ADM difference evaluation, threshold switches can evaluate the difference of two analog inputs. The values of the analog inputs are subtracted from each other and the result is compared with the set threshold. If the difference exceeds the threshold, the threshold switch is activated.

Each threshold switch has a fixed assignment to another analog input. During differential evaluation, the difference between the analog input to which the threshold switch belongs and the permanently assigned second analog input is formed and evaluated.

Assignment of the analog inputs to the threshold switches

Beside the parameter in the SCS in "i" symbol, with which one can start an info window, in which a table shows the assignment of the analog inputs to the threshold switches. The difference between the own analog input and each other is always formed.

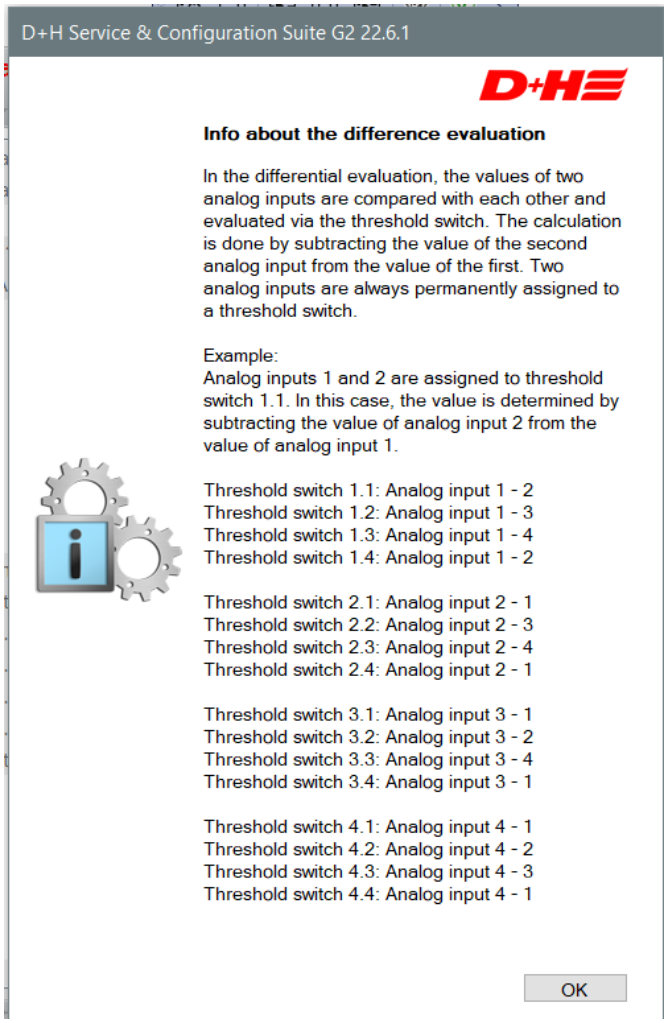

Figure 6: Info window with assignment of the analog inputs to the threshold switches

Application example when using outdoor and indoor temperature

For automatic ventilation, one threshold switch can be used per room, e.g. to open the window at a temperature of 23° C or higher. This is used as a normal threshold switch without differential evaluation.

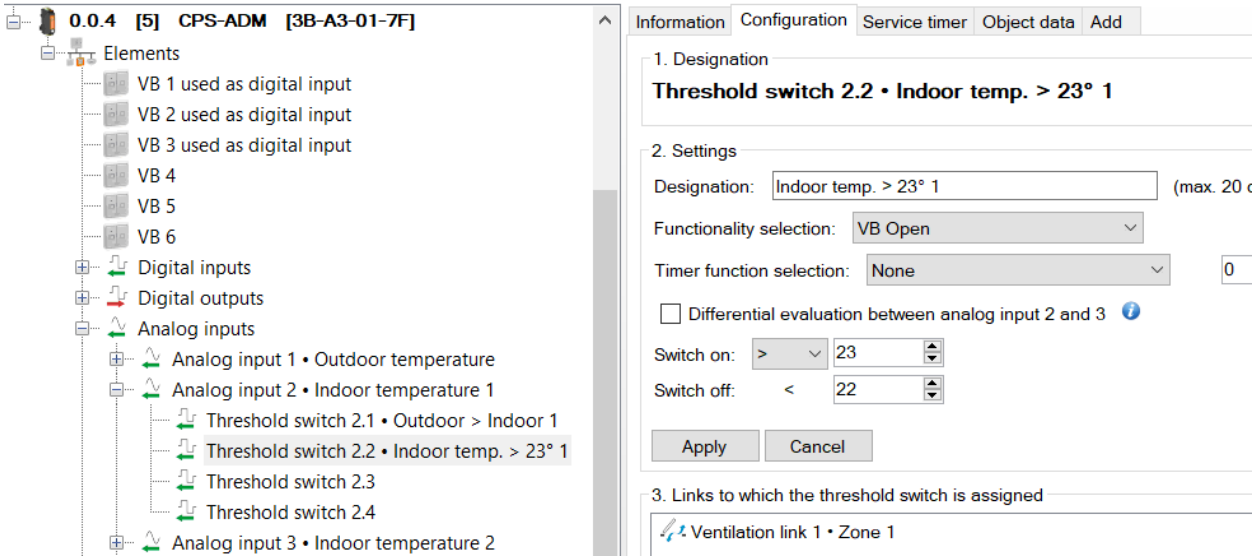

Figure 7: Automatic ventilation with threshold switch

A differential evaluation can be used to close the windows in an automatic ventilation system when the outside temperature is higher than the inside temperature.
For this purpose, one can proceed as follows, for example. Assume you have 2 rooms that are equipped with automatic ventilation. Connect a 0-10V outdoor temperature sensor to the first analog input of the ADM and 0-10V indoor temperature sensors to each of the analog inputs 2 and 3.
With the threshold switches 2.1 and 3.1 you can compare the inside temperature with the outside temperature. If inside minus outside is less than 0, then a Zu can be sent to the ventilation link.

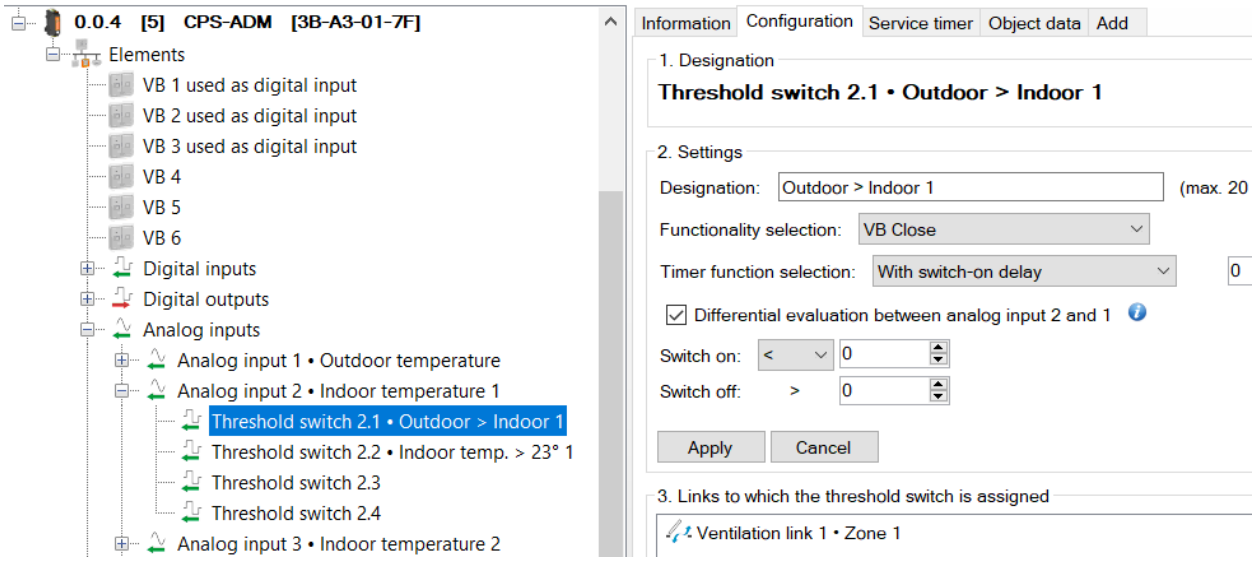

Figure 8: Threshold switch for outdoor and indoor temperature comparison

Application example MSE differential pressure sensors

In the case of MRA with purge operation, it may be necessary to perform an emergency shutdown of the fan if the pressure difference from the external pressure is too high. To evaluate the differential pressure, 0-10V differential pressure sensors can be connected to an ADM. A threshold switch can then be used to shut down the fan at a predetermined threshold.
In addition, there may be a requirement that there are two differential pressure sensors and if they differ too much, the fan should also be switched off. For this purpose, two threshold switches can be used to compare the values of the two differential pressure sensors.

Example:
Two differential pressure sensors
Switch off fan at maximum internal/external pressure difference of 50 Pa
Switch off fan at maximum difference between the two differential pressure sensors of 10 Pa

To do this, connect, for example, a differential pressure sensor 1 to analog input 1 and a differential pressure sensor 2 to analog input 2. In an AND operation, the actual trigger condition of the fan and the threshold switches 1.1, 1.2, 2.1 and 2.2 can then be used as conditions. The threshold switches must not be set for the fan to run.
The threshold value switches 1.1 and 2.1 are switched to differential evaluation and evaluate the maximum difference between the two differential pressure sensors. Threshold switch 1.1 must switch on when analog input 1 minus 2 is greater than 10 Pa and threshold switch 2.1 when analog input 2 minus 1 is greater than 10 Pa.

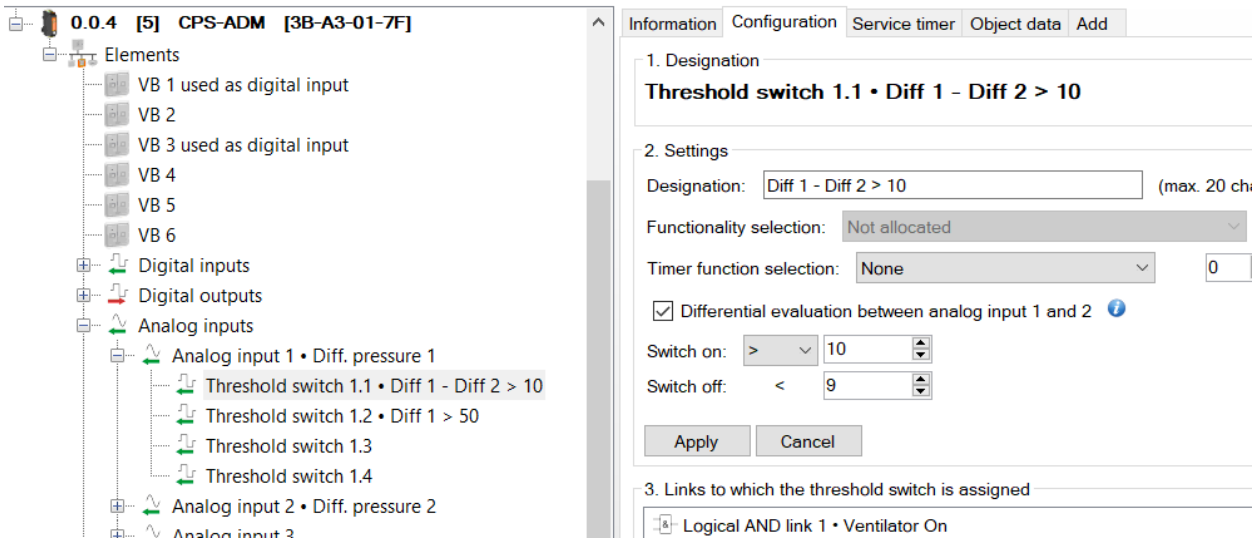

Figure 9: Threshold switch Differential pressure sensor comparison

The threshold switches 1.2 and 2.2 are to switch on when the values of the analog inputs go above 50 Pa.

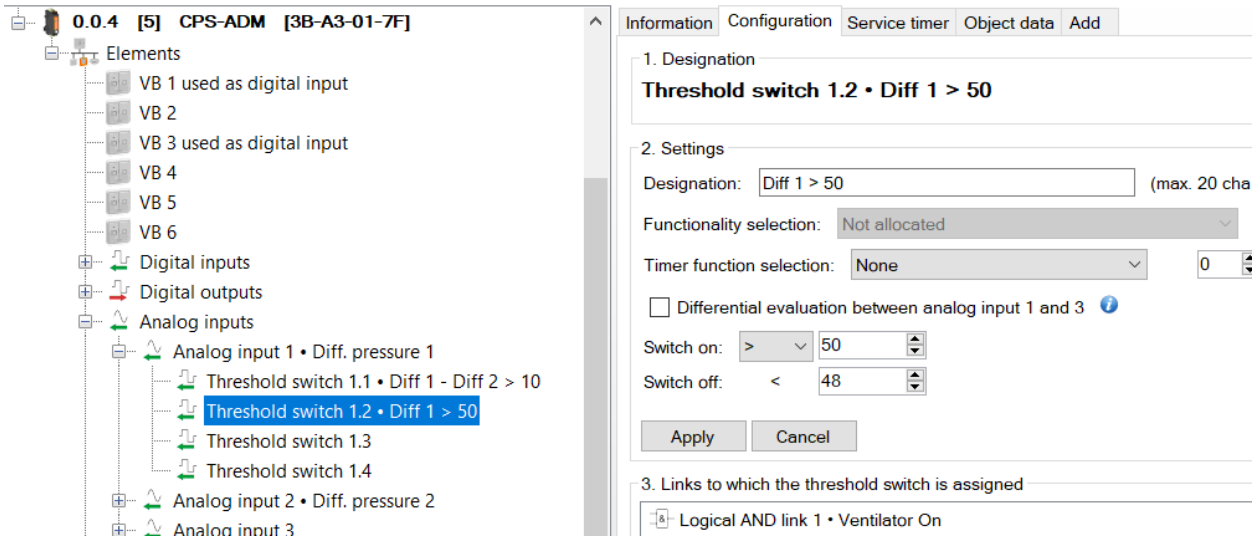

Figure 10: Threshold switch for overpressure shutdown with MRA

Sensors with line monitoring

The wires to the sensors used for SHEVS must be monitored for wire breakage and short circuit. This is implemented by using 2-10 V sensors and setting the range accordingly in the configuration of the analogue input. Below 2V, a fault is generated. I.e. if the line is short-circuited or interrupted, no more voltage arrives at the analogue input and a fault is generated.
Alternatively, 4-20 mA sensors can also be used. In this case, a resistor must be connected in parallel to the input against minus. If 500 ohms are connected, the 4-20 mA becomes exactly 2-10 V. Here, it must be ensured that a load of at least 10 V is permissible for the sensor. If the value is smaller, a smaller resistance can be selected and converted accordingly.

$$Voltage\ range\ Min = 0{,}004\ A \times Resistance\ value$$
$$Voltage\ range\ Max = 0{,}020\ A \times Resistance\ value$$

For the example "Application MSE differential pressure sensors", differential pressure sensors with 2-10 V are used. For this purpose, the voltage range of the analogue input is set to 2-10 V.

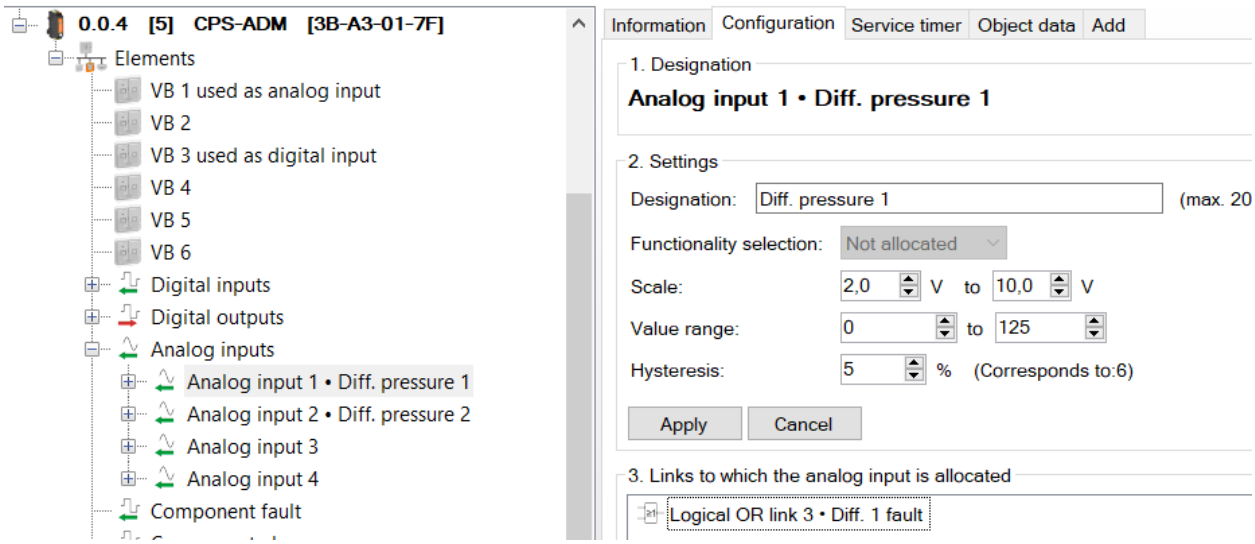

Figure 11: Differential pressure sensor setting 2-10V

Since the analogue input itself is not in a SHEV link, the fault is not automatically forwarded to lines or other outputs that are to indicate faults. Therefore, the fault must be forwarded with the help of logical links.
The analogue inputs are assigned to an OR logic operation as the condition "Fault set". With a connector, the result is then forwarded to a SHEV link.

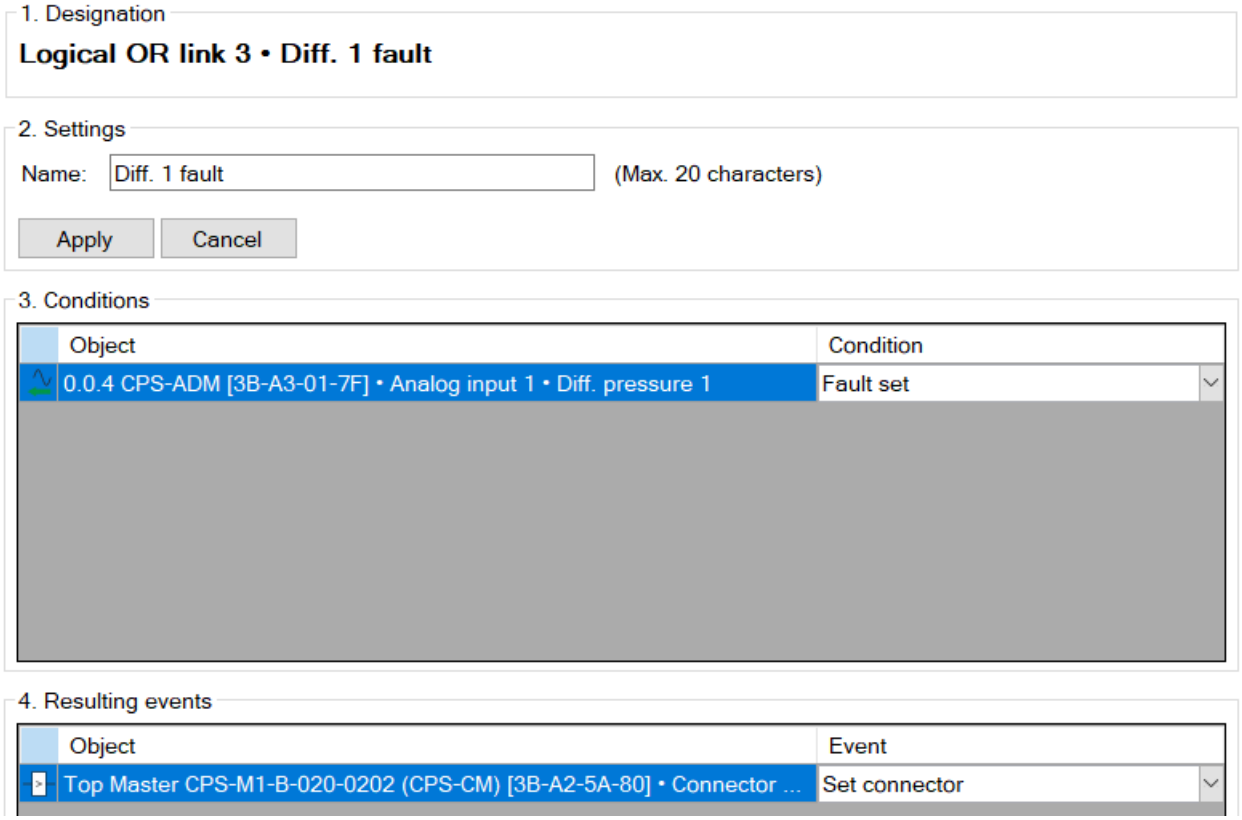

Figure 12: Forwarding the fault of an analogue input with logical linkage

In this case, the faults are forwarded to the higher-level collective SHEV link, as the fan is relevant for all smoke sections. For this purpose, the connectors of this SHEV link are assigned and set to "Connector sets: Fault".

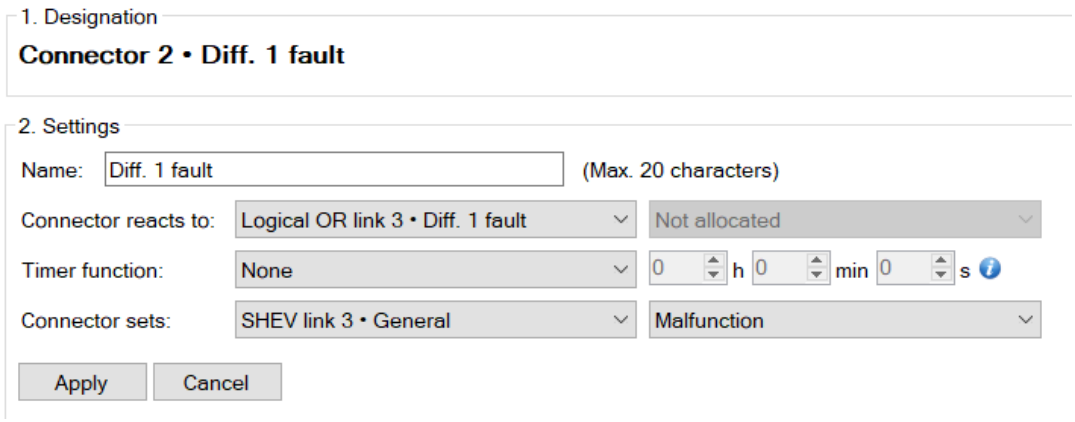

Figure 13: Connector for forwarding the fault

If there is now a fault in the line to the differential pressure sensors, this is reported and distributed in the higher-level SHEV link so that it is displayed in all smoke sections.
It can also be useful to link the malfunction of the analogue inputs with the fan so that it is also switched off in the event of a line malfunction.