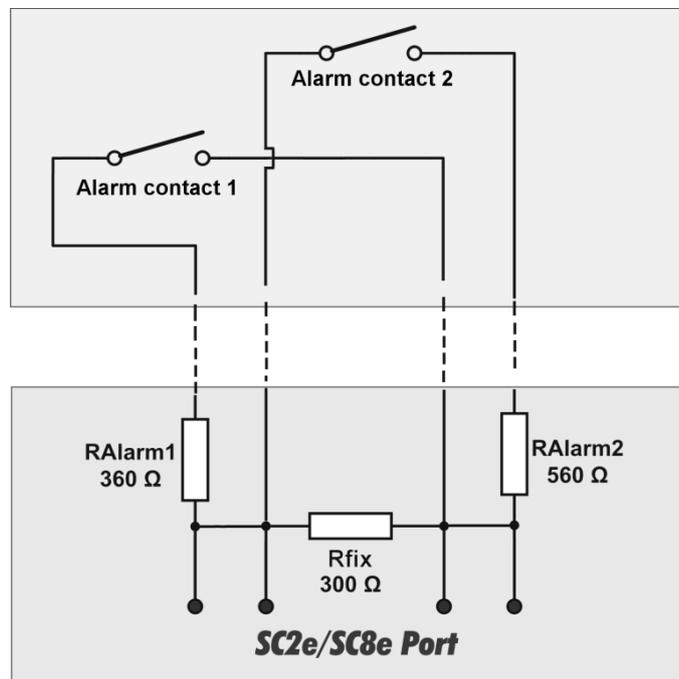


Thermoguard Alarm Relay Channel Version 2.90 (as of April 26, 2014)



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Introduction / Requirements

The "Alarm Relay Channel" Feature provides the ability to monitor one or two factory-installed alarm relays of a device to be monitored in addition to the standard PT 100 sensor. Often the relay contacts are called "potential-free contacts".

The alarm conditions which trigger the relays are device dependent. A "Door open" detection is a usual purpose. If there is no factory-installed relay you may install your own micro-switch as an alarm contact alerts if a door has left open. A relay may also switch in case of a Power Failure: Normally closed ("NC"), the relay drops off and opens the alarm contact.

Via the *Thermoguard* Software an appropriate custom alarm text can be defined for each of the two relays.

The software still supports the "Sensor Port Switch Function" (see System Manual), but only for backward compatibility reasons.

The new "Alarm Relay Channel" Feature should be used instead due to the following advantages compared to the " Switch Function":

- Needs only one SCx port to monitor up to two relays
- Support of "Retry/Serial/Event" alarm modes
- AOF Support ("Alarm On Fail")

Requirements:

Hardware:

- An SC1eP or a free Port on a sensorcontroller SC2e or SC8e
Old products SC1, SC2 respectively SC8 (without "e") are not able to support the alarm relay channel feature, because their upper measuring limit is +75 °C only ("e"-models up to +650 °C).

At the device to be monitored:

- One or two factory-installed alarm relays operating in NC (normally closed) or NO (normally open) mode
(or one or two self-installed contacts/switches)

At the device to be monitored or alternatively at the SCx port utilized:

- Three resistors 300 Ω, 360 Ω und 560 Ω, wired according to the following wiring diagrams

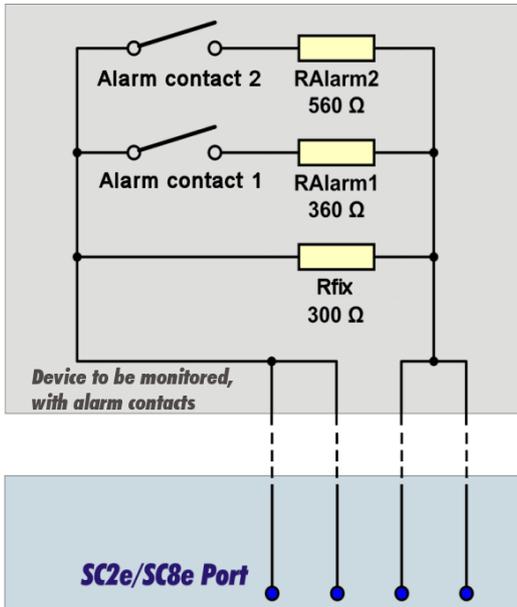
Software:

- *Thermoguard* main program version 2.90 or newer

Resistor Wiring - Two Alternatives

Concerning the wiring of the three resistors, you have the choice between two alternatives: "On device side" and "On SCx side":

Alternative 1: On device side



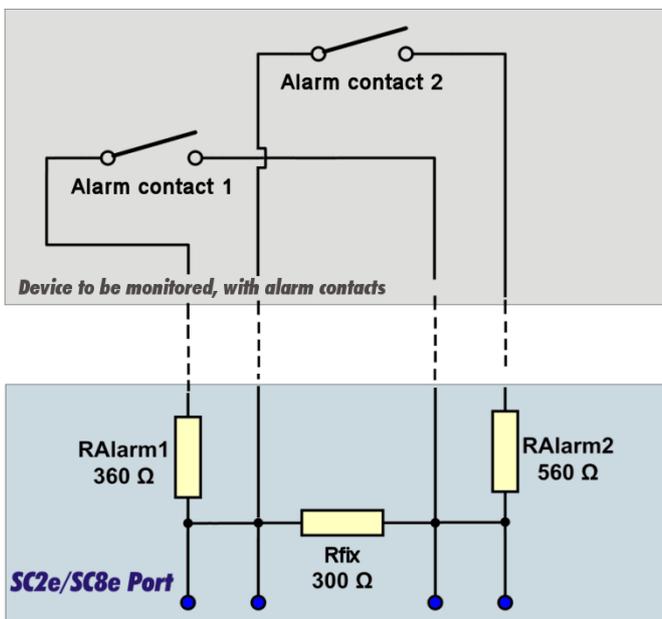
Here, the three resistors are installed at the device to be monitored. Please refer to the adjacent schematics.

If only one alarm contact is available, bridge "Alarm contact 2" permanently. In this case, the two resistors RAAlarm2 and Rfix can be replaced with one single 200 Ω resistor.

Advantage:

If the device changes its location and is to be attached to another SCx, the wiring "travels" along with the device.

Alternative 2: on SCx side



The three resistors are connected directly at the SCx port as shown in the adjacent diagram.

Again, the following applies: If only one alarm contact is available, bridge "Alarm contact 2" permanently.

This variant may be more "convenient" (wiring in a control cabinet or similar). But it has the disadvantage that the SCx port is permanently assigned to function as an "alarm channel port" and cannot be used without re-modification for a standard PT100 sensor.

Table of Values

R1=360 Ω, Rfix=300 Ω, R2=560 Ω

Precise (theoretical) Values:	Ranges in Software
① R1Cl + R2Cl: 126,63 Ω => +68,85 °C	+50.0 °C to +80.0 °C
② R1Cl + R2Op: 163,64 Ω => +166,98 °C	+150.0 °C to +180.0 °C
③ R1Op + R2Cl: 195,35 Ω => +253,53 °C	+230.0 °C to +270.0 °C
④ R1Op + R2Op: 300,00 Ω => +557,99 °C	+530.0 °C to +595.0 °C
⑤ Value outside any supported range:	(see below)

- ①: Contact 1 closed + Contact 2 closed
- ②: Contact 1 closed + Contact 2 open
- ③: Contact 1 open + Contact 2 closed
- ④: Contact 1 open + Contact 2 open

⑤: No alarm is triggered. However, the following log message is output:
Unsupported value read ([value]) for [Sensor label] - Incorrect cabling?

Alarm for **R1** dependent on configuration either as NC or NO:

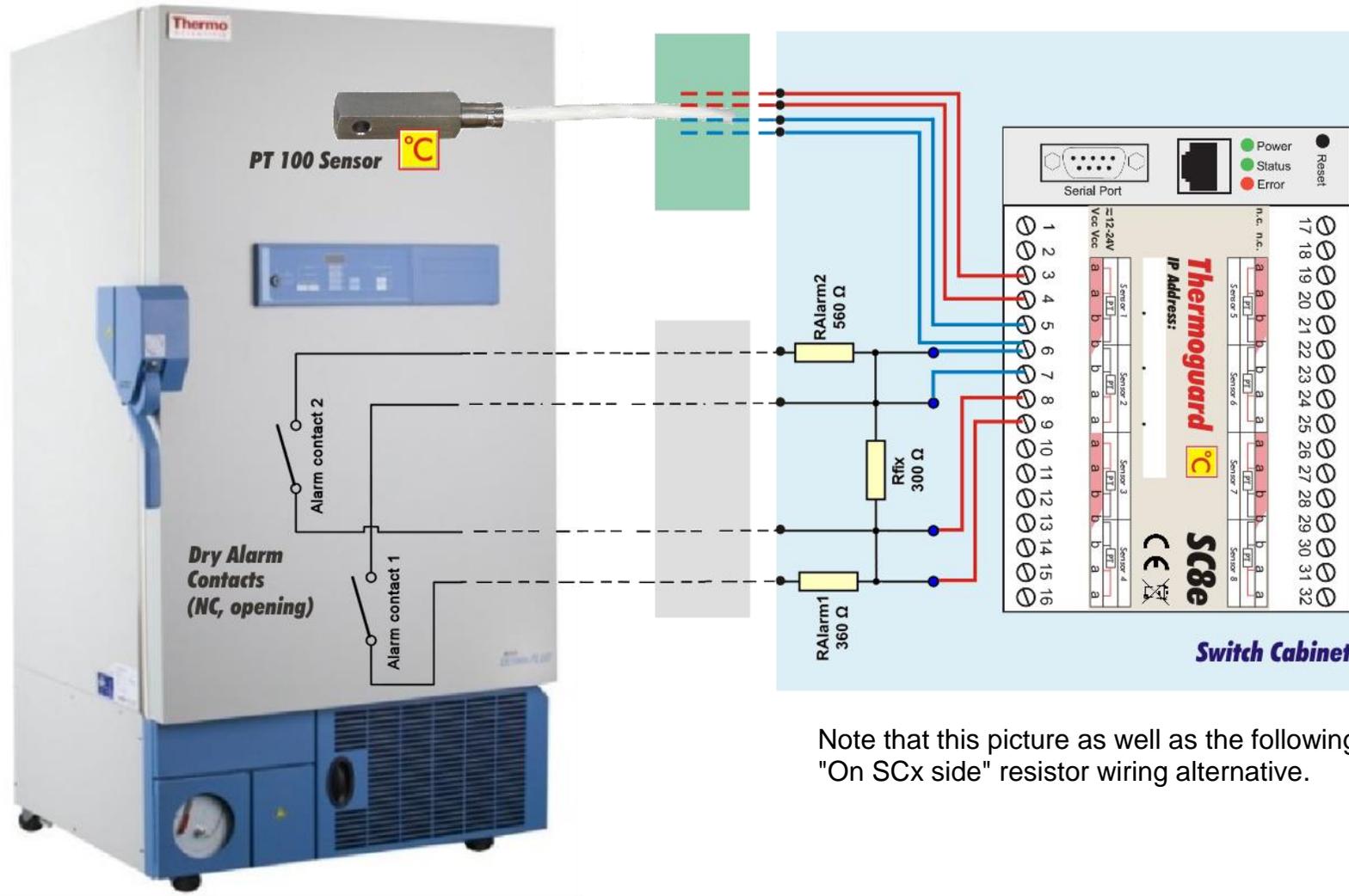
	as NC:	as NO:
① R1Cl + R2Cl: +50.0 °C to +80.0 °C	-	ALARM R1
② R1Cl + R2Op: +150.0 °C to +180.0 °C	-	ALARM R1
③ R1Op + R2Cl: +230.0 °C to +270.0 °C	ALARM R1	-
④ R1Op + R2Op: +530.0 °C to +595.0 °C	ALARM R1	-

Alarm for **R2** dependent on configuration either as NC or NO:

	as NC:	as NO:
① R1Cl + R2Cl: +50.0 °C to +80.0 °C	-	ALARM R2
② R1Cl + R2Op: +150.0 °C to +180.0 °C	ALARM R2	-
③ R1Op + R2Cl: +230.0 °C to +270.0 °C	-	ALARM R2
④ R1Op + R2Op: +530.0 °C to +595.0 °C	ALARM R2	-

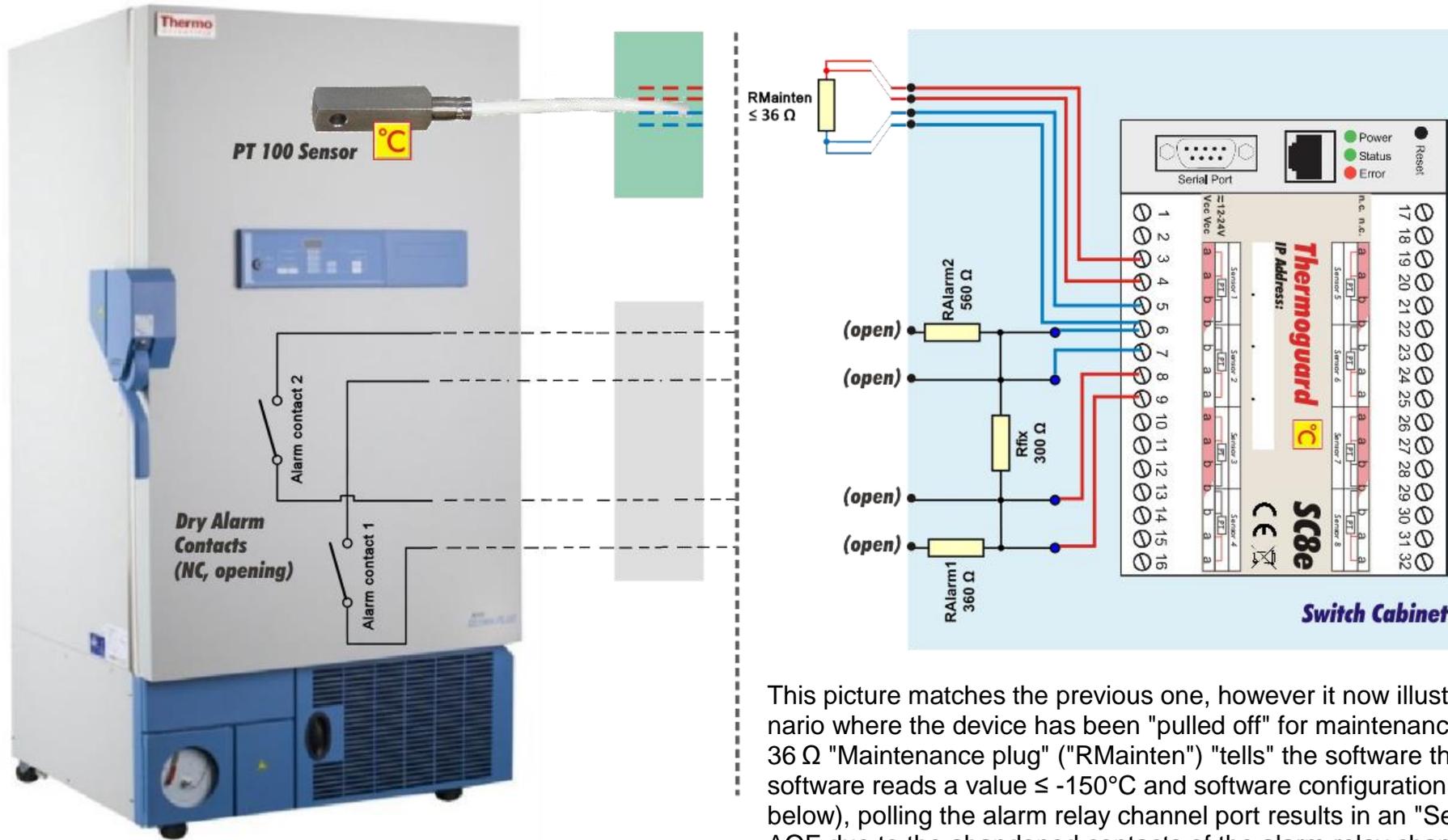
Additionally (e.g. if cable(s) are cut) an AOF (Alarm On Fail) will be recognized and treated as such.

Overview 1: 1x PT100 and two alarm relays - Operation



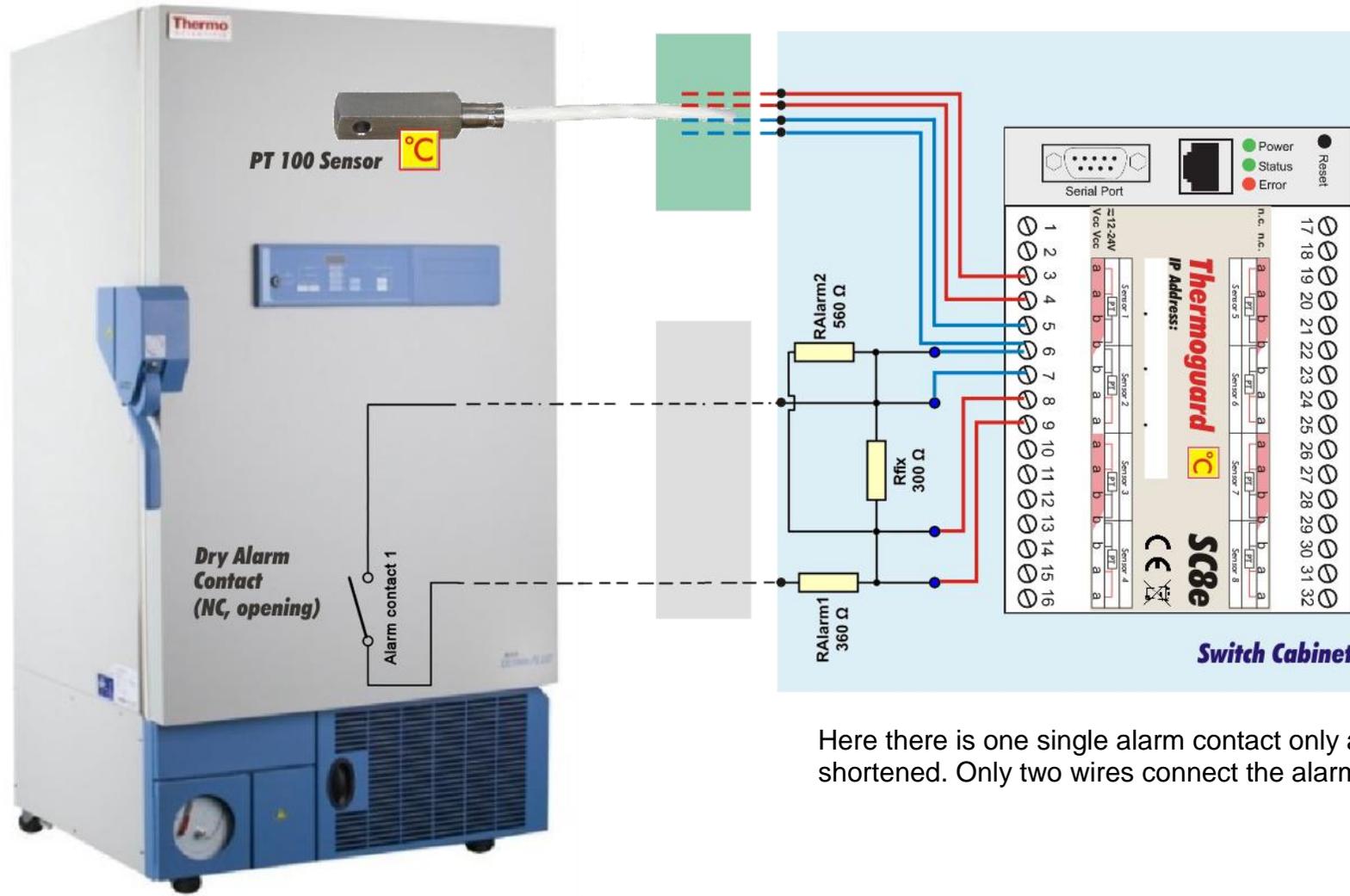
Note that this picture as well as the following all show scenarios using the "On SCx side" resistor wiring alternative.

Overview 2: 1x PT100 and two alarm relays - Maintenance



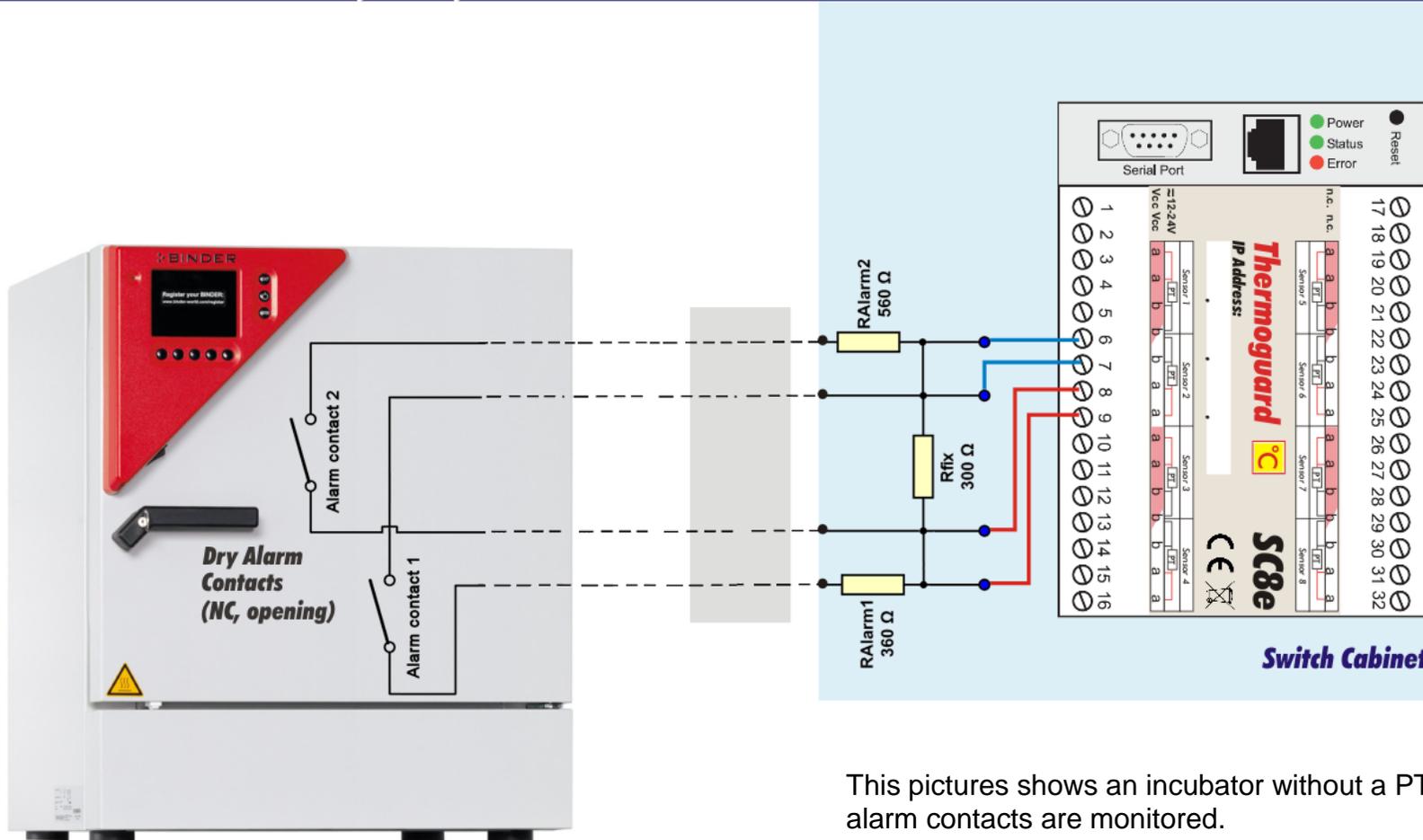
This picture matches the previous one, however it now illustrates the scenario where the device has been "pulled off" for maintenance purposes. A 36 Ω "Maintenance plug" ("RMainten") "tells" the software this state. If the software reads a value $\leq -150^{\circ}\text{C}$ and software configuration is correct (see below), polling the alarm relay channel port results in an "Sensor missing" AOF due to the abandoned contacts of the alarm relay channel port (marked "(open)" in the picture). This AOF will be logged, but not executed.

Overview 3: 1x PT100 and one alarm relay



Here there is one single alarm contact only and hence alarm contact 2 is shorted. Only two wires connect the alarm relay channel port to the device.

Overview 4: Alarm relays only



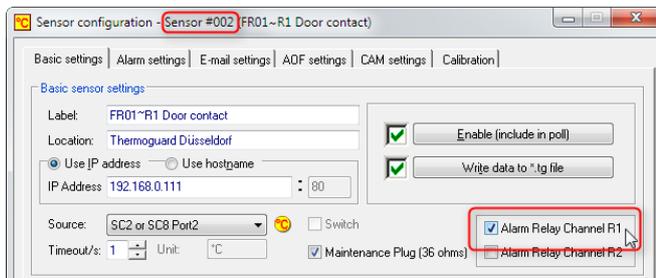
This picture shows an incubator without a PT100 sensor. "Only" its two alarm contacts are monitored.

Configuration in *Thermoguard* Software

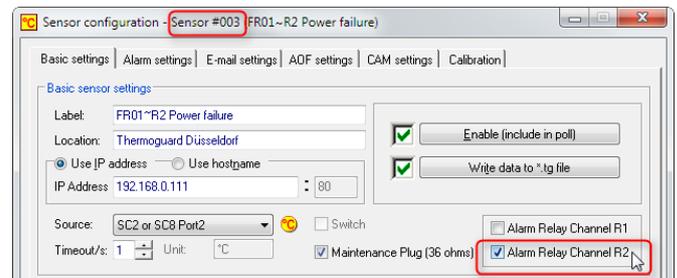
The "Alarm Relay Channel R1/R2" checkboxes on the Sensor configuration's "Basic settings" tab are enabled as soon as one of the following Sources has been selected:

- SC1
- SC2 or SC8 Port1
- SC2 or SC8 Port2
- SC8 Port3
- SC8 Port4
- SC8 Port5
- SC8 Port6
- SC8 Port7
- SC8 Port8
- Simulation file Temperature

Relay 1 serves as door contact for FR01 here:

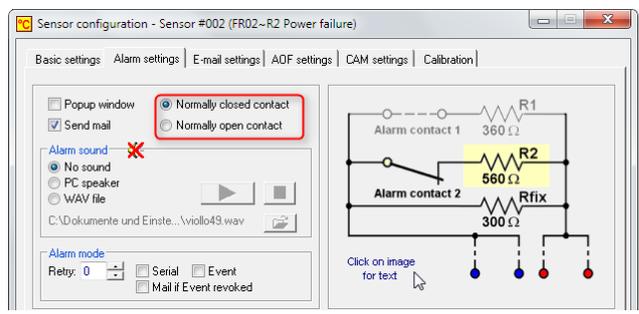
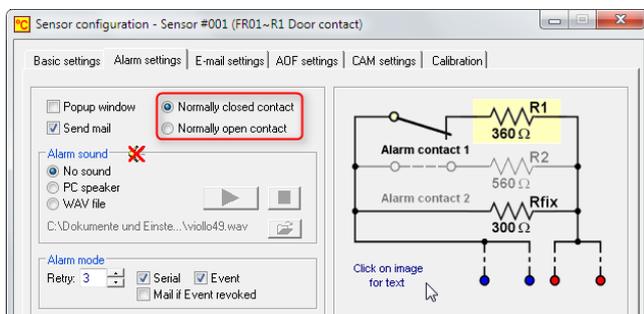


Relay 2 alerts about a power failure of FR01:



You can either activate checkbox "Alarm Relay Channel R1" or alternatively R2, but not both at the same time, because each alarm relay gets its own sensor list entry. In the example shown above, Port 2 of an SC8e is used as the Alarm Relay Channel for device FR01, so Port 2 must be selected for both alarm relay "sensor" entries as "Source".

On the Alarm settings tab the High alarm settings are replaced with a schematic diagram of the required resistor wiring. Depending on the Relay number set (1 or 2) the respective resistor is highlighted in the picture. If the NC/NO option is changed, the schematic symbol will also change.



Please note that in this example: For R1 (Door contact) 3 "Retries" are set together with the "Serial" and "Event" option. This ensures that no alarm will be fired in case the door is open just for a relatively short amount of time.

Whereas a power failure (R2) shall trigger an alarm asap. You may want to set the "Event" option for R2 here as well if you like.

Click the diagram picture to show a short description of the alarm behavior. The Alarm conditions are highlighted and correspond to the appropriate tables on page 5:

Alarm Relay Channel R1 as "Normally closed contact":

- +50,0 °C ... +80,0 °C No Alarm (R1 closed)
- +150,0 °C ... +180,0 °C No Alarm (R1 closed)
- +230,0 °C ... +270,0 °C **Alarm (R1 open)**
- +530,0 °C ... +595,0 °C **Alarm (R1 open)**

Click on text to show wiring diagram. 

Alarm Relay Channel R2 as "Normally closed contact":

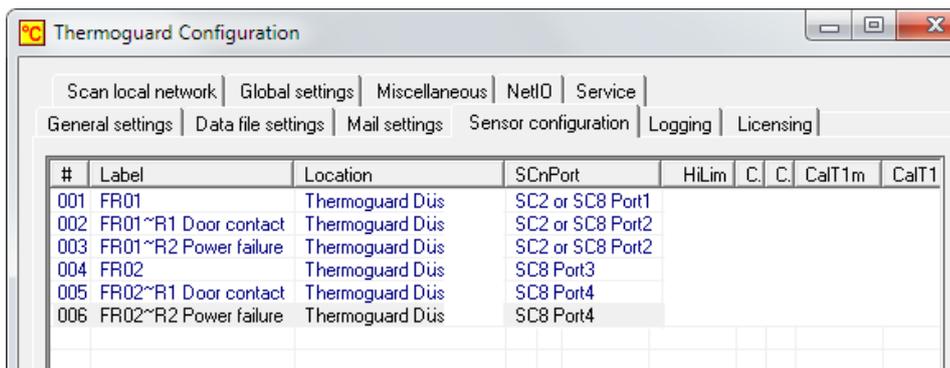
- +50,0 °C ... +80,0 °C No Alarm (R2 closed)
- +150,0 °C ... +180,0 °C **Alarm (R2 open)**
- +230,0 °C ... +270,0 °C No Alarm (R2 closed)
- +530,0 °C ... +595,0 °C **Alarm (R2 open)**

Click on text to show wiring diagram. 

Below you see a sensor configuration where 2 refrigerators FR02 and FR01 are equipped with a standard PT100 temperature sensor (Sensor #001 using SC8Port1 and Sensor #004 using SC8Port3). Additionally 2 alarm relays of each fridge are monitored:

For FR01: R1 ("Sensor" #002, using SC8Port2) and R2 ("Sensor" #003, sharing SC8Port2)

For FR02: R1 ("Sensor" #005, using SC8Port4) and R2 ("Sensor" #006, sharing SC8Port4):



#	Label	Location	SCnPort	HiLim	C.	C.	CalT1m	CalT1
001	FR01	Thermoguard Düs	SC2 or SC8 Port1					
002	FR01~R1 Door contact	Thermoguard Düs	SC2 or SC8 Port2					
003	FR01~R2 Power failure	Thermoguard Düs	SC2 or SC8 Port2					
004	FR02	Thermoguard Düs	SC8 Port3					
005	FR02~R1 Door contact	Thermoguard Düs	SC8 Port4					
006	FR02~R2 Power failure	Thermoguard Düs	SC8 Port4					

Note on naming Relay "sensors" (applies only to maintenance plug operation):

The following requirements must be met in order to gain from the maintenance plus scenario:

1. The "Maintenance plug" checkbox must be checked for the "main", "real" sensor list entry and for the 2 Relay "sensors" as well.
2. The label of the Relay "sensors" must start with the label of the main sensor including a "~" character. We recommend to keep the part of the labels for the Relay sensors following the "~" as short as possible, e.g. "*Label of main sensor~R1*" etc.
The suffixes "Door contact" and "Power failure" in the sample configuration are entered only for a better understanding of the roles of the list entries.
3. Order of list entries: The Relay "sensors" entries should always follow their main sensor's entry.

The list entries are basically independently of one another, therefore the software can only "connect" them by their labels using the "~" specification to check if the maintenance plug has been installed at the main sensor's SCx port.