



# APPLICATION REPORT Heating, Ventilation & Air Conditioning (HVAC)

## Temperature measurement during aircraft de-icing



- Reduction in glycol consumption for de-icing
- Mixture of different de-icing liquids at different temperatures
- Reliable, maintenance-free operation

### 1. Background

Depending on weather conditions, aircraft must be de-iced to ensure safe operation in the winter. This task is performed using SAFEAERO de-icing vehicles, which are available in different versions and sizes. All vehicles are designed for one-man operation. They are equipped with 2–7 tanks totaling a volume of up to 14000 litres. A single tank can have a maximum capacity of 4500 litres. The glycol/water mixing ratio can be adapted directly on site depending on weather conditions.



Cabin and swivel arm on vehicle

### 2. Measurement requirements

Strictly observing the glycol water mixing ratio will ensure that the de-icing process runs smoothly. The temperatures of the mixing substances in the tanks must be strictly adhered to as well, regardless of the ambient temperature. All of the tanks are heated using heat exchangers and electric heating. Temperatures must be measured with very rapid response times in order to react immediately to changing ambient conditions.

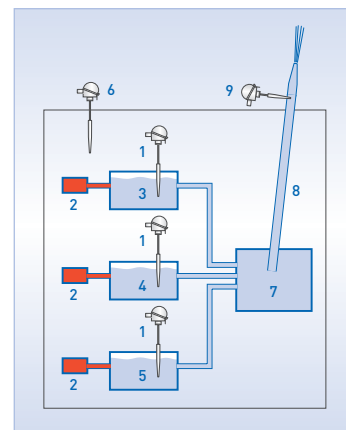
#### De-icing criteria

Glycol/water mixing ratio:	3...75%, infinitely adjustable, or 100% on request
Temperature of the de-icing substances in the tanks:	up to max. 98 °C
Properties of the de-icing fluid at the spray nozzle:	Temperature 60...85 °C, discharge volume 30...230 Liter/min., max. pressure 15 bar
Ambient temperature:	≥ -40 °C



## 3. KROHNE solution

KROHNE provided five OPTITEMP TRA S11 temperature sensors and five transmitters (4" TT11C and 1" TT11R) for this application. Three temperature sensors (1) with corresponding transmitters measure the temperatures in the three tanks (3 = tank with water / 4 = tank with type I glycol / 5 = tank for type IV glycol). All tanks are equipped with heating (2). Depending on the lowest measured ambient temperature (sensor 6), measured either on the vehicle or at the cabin, the required de-icing mixture ratio will be mixed accurately with water and glycol (7). This takes place with the help of mixing valves. The de-icing fluid then flows via the telescoping arm and the swivel arm (8) to the spray nozzle where the temperature is measured once again (9). On the brand new SAFEAERO 223XXL, up to 11 temperature sensors with corresponding transmitters are used.



Functional principle of a de-icing vehicle

## 4. Customer benefits

KROHNE's ability to quickly and easily supply all temperature sensors and transmitters, even the special versions, was a big advantage for SAFEAERO. No maintenance and reliable temperature measurements guarantee smooth use throughout the entire winter. Replacements are sent without delay. Exact temperature measurements reduce glycol consumption which, in turn, protects the environment as well as giving the customer an economic benefit.



Temperature sensor on telescoping arm



Temperature sensor on swivel arm of spray nozzle

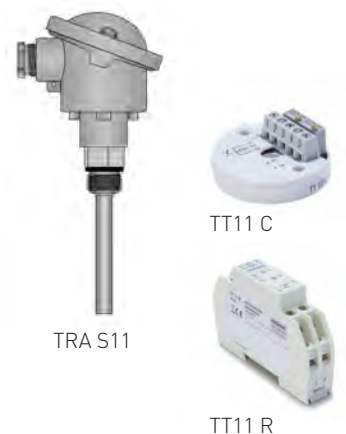
## 5. Products used

### OPTITEMP TRA S11 Temperature Sensor

- Temperature measurement in tanks and process pipes (gases, liquids)
- Waterproof version available (OPTITEMP TSR W 10)
- Also used with very quick response time
- Many process connections including screw-in, insertion-type, flange etc.
- Also available with thermowell

### OPTITEMP TT11 Transmitter

- Transmitter for direct installation in temperature sensors (= C)
- Transmitter for line connection of sensor; rail mounting (= R)
- Input Pt 100, 3-wire connection
- Output for C: 0...10 V, 3-wire connection for R: 0...10 V
- Power supply for C and R: 15...30 V DC
- Operating temperature for C: -40...+85 °C for R: -20...+70 °C



## Contact

Please visit our website for a current list of all KROHNE contacts and addresses.



[www.krohne.com](http://www.krohne.com)