



Frost units

for use on the air side

QAF64.2 QAF64.6

- With active capillary tube sensing element for measuring the lowest temperature within a range of 0...15 °C
- With startup function
- Operating voltage AC 24 V
- Signal voltage DC 0...10 V

Use

On the air side of ventilating and air conditioning plants:

- Typically: hot water air heating coils where there is a risk of freezing due to cold incoming outside air
- Where fans are to be switched off, heating valves opened and air dampers closed to prevent freeze-ups
- Where risk of frost shall be signalled

Type summary

Type reference	Description
QAF64.2	Frost unit with 2 m capillary
QAF64.6	Frost unit with 6 m capillary

Accessories

Included in the scope of delivery

- 1 x Pg 11 cable gland for cable entry
- 2 x screw to DIN 7981-St 4.2 x 22 for direct mounting
- 1 x rubber grommet for capillary entries into air ducts (4 109 2106 0)

Not included in the scope of delivery

Type reference	Description	Parts
AQM63.0	Mounting flange	1 x depth-adjustable mounting flange for the housing
AQM63.2¹⁾	Capillary supports	3 x capillary tube clamp 3 x spacer

1) The **QAF63.6** requires two **AQM63.2**

Ordering and delivery

When ordering, please give name and type reference, e.g. frost unit **QAF64.2**.

The mounting accessories not included in the scope of delivery must be ordered as separate items.

Technical design

With the help of a vapour-filled capillary and diaphragm, the QAF64... acquires the lowest temperature which occurs along at least 250 mm length of capillary tubing.

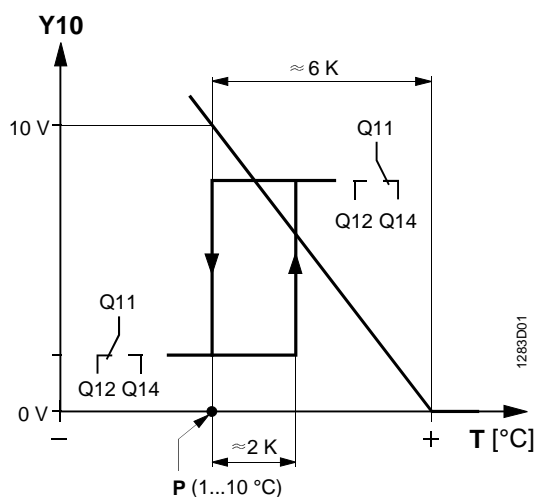
If the frost unit is correctly located at the air outlet of the air heating coil, it acquires the lowest air temperature even in the case of temperature stratification. The vapour pressure in the capillary tube produces a certain travel of the diaphragm. This movement is converted to an electric signal with the help of an inductive measuring system; it is then electronically amplified so that a DC 0...10 V measuring signal can be produced (terminal B).

The frost unit performs its task by providing three independent functions:

1. It opens the heating valve continuously within a proportional control range.
2. It switches off the fans and closes the air dampers via its relay contact.
3. It makes the measured temperature available for further handling.

The measuring signal is then used as a frost signal by the frost unit and for valve control. The frost signal starts rising at about 6 K above the adjusted frost value.

Function diagram



Legend

- P Frost value (adjustable)
- T Capillary tube temperature
- Y10 Valve control signal (at Y = DC 0 V)

Startup function

The frost signal is added to the valve control signal fed to signal input Y. This causes the heating valve to travel to the fully open position - resulting from the control signal received via signal output Y10 - before the output relay changes to the "Frost" position (Q11–Q12). This circuitry prevents frequent switching of the plant during the startup phase.

To make certain it is always the lowest temperature along the capillary that is measured, the temperature of the diaphragm inside the housing must always be higher than the temperature at the capillary tube. This is ensured by a heating element fitted inside the housing, which maintains the temperature at the diaphragm above 15 °C as long as the ambient temperature does not fall below –15 °C.

Operating modes

There are three operating modes that can be selected with a rotary selector:

Automatic operation
"Auto"

If, after shutdown due to frost, the capillary tube temperature rises (>2 K), the output relay will automatically return to its normal position.

Manual operation "Manu"

If, after shutdown due to frost, the capillary tube temperature rises (>2 K), the output relay will return to its normal position only if either the inbuilt reset button is pressed or the power supply is cut off (e.g. by an external reset button).

Test operation "Test"

In test operation, the output relay is forced to the "Frost" position. The valve control signal Y10 will not be affected.

When returning to the switch position "Manu", the frost position is maintained. It must be cancelled by pressing the reset button.

Mechanical design

The frost unit consists of a two-sectional housing - base and cover - and a capillary tube which is active over its full length.

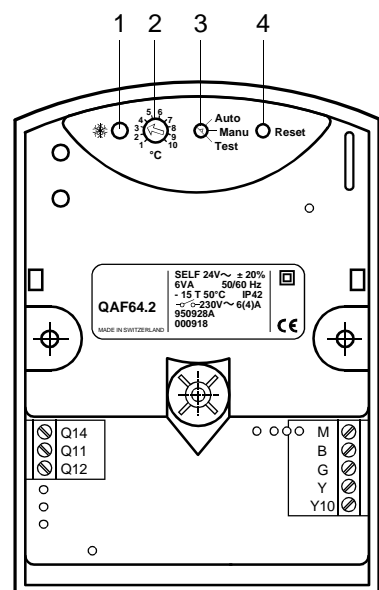
The cover is secured to the base with a fixing screw and can be removed.

The housing accommodates the electronics, the diaphragm with the heating element, the setting elements, the connection terminals and the type field.

Connection terminals, setting elements and type field can be accessed after removing the cover.

The cables are introduced to the housing from below. There is one hole for the enclosed cable gland Pg11, and two knockout holes for additional cable glands Pg11. The QFA64... can be fitted directly to the wall - with or without a test loop - or with the help of a mounting flange (if the air duct is insulated).

Setting elements



Legend

- 1 LED (red) for risk of frost
- 2 Potentiometer for setting the frost temperature
- 3 Operating mode selector with the positions "Auto", "Manu" and "Test"
- 4 Reset button for resetting to normal operation

The frost unit operates on AC 24 V. The transformer used must be suited for safety extra low voltage (SELV), 100 % duty, and must have separate windings.

Fuses, switches, wiring and earthing must be in compliance with local safety regulations. The permissible cable lengths must be observed.

If the capillary is mechanically damaged or if there is a leak in the diaphragm system, the frost unit signals a low temperature and assumes the "Frost" position. That is the case also if there is a power failure or if one of the major electronic components fails.

In the case of large cross-sectional areas of the air duct, an air heating coil can be monitored by several QAF64...:

- QAF64... valve control signal outputs / inputs in series, and
- QAF64... relay contacts in series



If the relay contacts Q11/Q12/Q14 are not operated on safety extra-low voltage (SELV) the following applies:

- Only authorized personnel may open the unit to perform settings or the relay circuit must be de-energized.
- For manual operating mode, an external button must be installed for the Reset function (see Connection diagram).

Fitting notes

Mounting location

On the hot side of the air heating coil.

Mounting of housing

Direct mounting

Fit the housing (by using the two fixing holes) to the wall of the air heating coil. Introduce the capillary tube in the air duct and protect it by using the rubber grommet supplied with the unit (refer to "Accessories").

When fitting the unit inside the air duct: secure the housing to the inner wall of the air heating coil and lead the capillary tube through one of the lateral grooves.

Direct mounting, with test loop for functional test

Fit the housing (by using the two fixing holes) to the wall of the air heating coil and lead the capillary tube through one of the lateral grooves.

Bend the capillary to form a test loop, introduce the capillary to the air duct and protect it by using the enclosed rubber grommet (refer to "Accessories").

This mounting method is not recommended when the ambient temperature at the external test loop may fall below the temperature at the measuring location in the air duct (the measuring signal of the sensing element always represents the lowest temperature, no matter where it occurs along the capillary tube!).

With mounting flange (refer to "Accessories")

This mounting method is suited for air ducts having an insulation of up to 70 mm.

Fit the mounting flange to the wall of the air heating coil and introduce the capillary tube through the flange in the air duct.

Fitting the capillary tube

Coil the capillary tube evenly across the entire cross-sectional area of the air heating coil and attach it to the coil with the help of the clamps, maintaining a spacing of 40 mm (refer to "Accessories").

Note!

The capillary tube must not be sharply bent. The bending radius should be as great as possible.

Installation notes

The low voltage terminals are protected against wiring errors with own voltages up to AC 24 V. They are not protected against wiring errors with AC 230 V mains voltage.

Commissioning notes

The frost unit must be commissioned and set as specified in the instructions supplied with the unit. Using a test loop, the proper functioning of the QFA64... can be checked with the help of a mixture of ice and water.

The relay output can be checked with the aid of the operating mode selector ("Test" position).

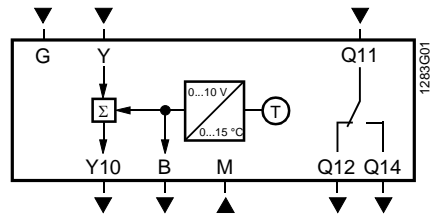
Technical data

Power supply	Operating voltage (SELV)	AC 24 V \pm 20 %
	Frequency	50/60 Hz
	Power consumption	6 VA
	At ambient temperatures >10 °C (with no heating)	3.5 VA
Analog input	Valve control (terminal Y)	DC 0...10 V
	Current	0.1 mA max.
	Perm. cable length with 1.5 mm ²	300 m
Analog outputs	Sensing element temperature (terminal B)	DC 0...10 V \cong 0...15 °C
	Valve control (terminal Y10)	DC 0...10 V
	Current	\pm 1 mA max.
	Perm. cable length with 1.5 mm ²	300 m
Relay output (terminals Q11, Q12, Q14)	Output	potentialfree
	Min. switching capacity	DC/AC 5 V, 5 mA
	Max. switching capacity	AC 250 V, 6(4) A
Functional data	Measuring range	0...15 °C
	Setting range for frost	1...10 °C
	Switching differential	approx. 2 K
	Time constant	
	in still air	approx. 90 s
	in moving air	<40 s
	Capillary tube	
	Min. active length Material	250 mm
	Perm. temperature	110 °C max.
	Protective data	Degree of protection of housing
Safety class		II to EN 60 730
Electrical connections	Screw terminals for	2 x 1,5 mm ² or 1 x 2,5 mm ²
	Cable entry	Pg 11 cable gland
Environmental conditions	Operation to	IEC 721-3-3
	Climatic conditions	class 3K5
	Temperature	-15...+60 °C
	Humidity	<85 % r. F.
	Storage/transport	IEC 721-3-2
	Climatic conditions	class 2K3
	Temperature	-25...+65 °C
Humidity	<95 % r. F.	
Mechanical conditions	class 2M2	

Materials and colors	Housing base	Wellamid 6600 HWC8, RAL 7001 (silver-grey)
	Housing cover	PC Lexan 161R, transparent
	Mounting flange	PA 66, black
	Capillary tube	copper
	Packaging	corrugated cardboard
Norms and standards	Product standards	
	Automatic electrical controls for household and similar use	EN 60 730
	Electromagnetic compatibility	
	Emissions	EN 50 081-1
	Immunity	EN 50 082-2
Weight	CE conformity to	
	EMC directive	89/336/EEC
	Low voltage directive	73/23/EEC
	QAF64.2	approx. 0.34 kg
	QAF64.6	approx. 0.41 kg

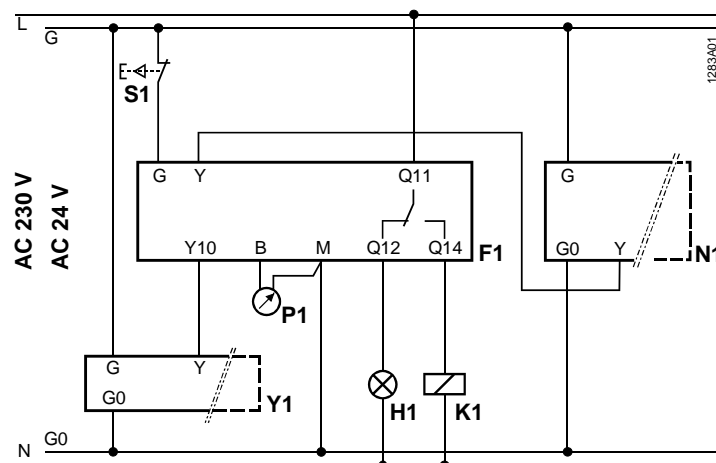
Diagrams

Internal diagram



G	System voltage (SELV) AC 24 V	
M	System neutral, measuring neutral	
B	Measuring signal output DC 0...10 V $\hat{=}$ 0...15 °C	
Y	Signal input for valve control signal from the controller, DC 0...10 V	
Y10	Signal output for valve control, DC 0...10 V	
Q11		} Relay contact AC/DC 5...250 V
Q12	Closed when there is a risk of frost	
Q14		

Connection diagram



F1	Frost unit QAF64...
N1	Controller delivering a DC 0...10 V control signal
H1	E.g. external frost alarm device
K1	E.g. fan contactor
P1	E.g. temperature indication
S1	If required: reset button for external cancellation of frost condition
Y1	Regulating unit

