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COOL-FIT 4.0

Heat Tracing

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1 Intended Use

Frozen pipes can cause high costs. When water-filled COOL-FIT pipes are exposed to temperatures below zero °C without circulation and for extended periods of time, the water freezes and proper operation of the cooling system can no longer be maintained.

The heat-tracing system for COOL-FIT 4.0 offers an effective solution for the freeze protection of COOL-FIT lines. The self-regulating heating tape in combination with the insulation of the COOL-FIT 4.0 pipe system prevents the cooling pipe from freezing.

2 Design and function

2.1 Function

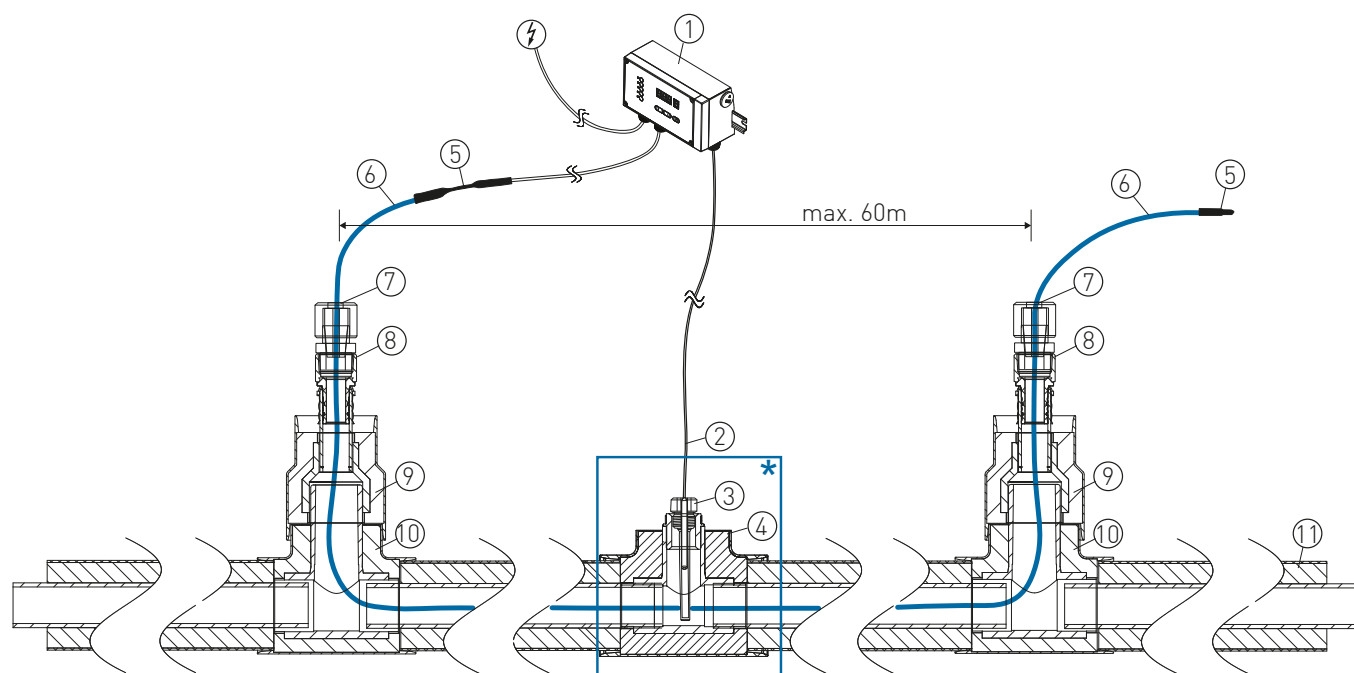
The COOL-FIT heat-tracing system uses a self-regulating heat-tracing cable installed inside the pipe. This efficiently protects the medium from freezing directly and without heat loss through the pipe wall insulation.

The entry and exit of the cable into the COOL-FIT system is performed via cable glands, which are connected to the COOL-FIT system via metallic thread transitions. The thermostat with surface sensor enables efficient control directly via the media temperature. The temperature sensor is installed via COOL-FIT installation fittings using a suitable immersion sleeve. As an alternative, a Proportional Ambient Sensing Control (PASC) for enhanced energy savings in ambient sensing mode is possible.

With the COOL-FIT 4.0 heat tracing, reliable frost protection down to -30°C ambient temperature is provided across all COOL-FIT 4.0 dimensions from d32 - d450.

Please contact GF if you need antifreeze protection at ambient temperatures below -30°C.

2.2 Components



No.	Designation	No.	Designation
1	Thermostat	7	Cable glands ¾" male thread R
2	Temperature sensor	8	Adaptor fitting d32-¾" female thread Rp
3	Immersion sleeve for sensor*	9	COOL-FIT 4.0 Reducer to d32
4	COOL-FIT 4.0 Installation fitting ½" Rp*	10	COOL-FIT 4.0 T90°
5	Cold lead connection and end seal kit	11	COOL-FIT 4.0 pipe
6	Heating cable		

* Not applicable for control via ambient temperature

2.3 Specification

2.3.1 Self-regulating heating cable R-ETL-A

Self-regulating technology

The self-regulating technology automatically adjusts the heating output at each point to the ambient temperature. It never overheats even when overlapped.



Produktmerkmale

- Cut to length on site
- Small geometry for ease of installation
- Jacketed versions for in-pipe applications (Fluoropolymer-Jacket)
- 16W/m version (in pipe)
- Zero maintenance after installation and commissioning
- No risk of overheating due to self-regulating technology

Technical data

Attribute	Value
Power Output @ 5 °C	16 W/m (in pipe)
Supply Voltage	230 V AC
Maximum Exposure Temperature (Heater Power off) Max. 800 Hours Exposure	65°C
Dimensions	8.5mm x 5.8mm
Electrical Grounding Method (Earthing)	Nickel Plated Copper Braid
Primary (Inner) Jacket Material	Radiation cross-linked modified Polyolefin
Final (Outer) Jacket Material	Fluoropolymer
Minimum Installation Temperature	-20°C
Minimum Bend Radius	10mm
Maximum Circuit Length (5 °C Switch-on)	60 m (10A) In Pipe
Certification & Approvals	Test & Approved to IEC62395. CE Marked.

Easy to design and install

Unlike heating cables with constant heating power, the COOL-FIT ETL heating cable can be laid out on site and cut to length. One end closure is sufficient for assembly.

The components designed for optimum performance and safety have been tested and approved by the manufacturer.

Range circuit lengths for installation In-Pipe

R-ETL-A (16W/m @ 5°C)	Circuit supply current (Amps)		
Switch-on Temperature (°C)	10 A	13 A	16 A
0	60 m	60 m	60 m
5	60 m	60 m	60 m
10	60 m	60 m	60 m

Circuit Lengths are based on 230Vac supply and C-Type characteristic circuit protection devices.

2.3.2 Electronic Controller for pipe freeze protection of COOL-FIT 4.0 piping systems



Product overview

The controller is designed to provide userfriendly measurement and control for the self regulating heating cable for COOL-FIT.

The Controller has a 25 A control relay and an SPDT alarm relay. Parameter and eventual alarm conditions are shown on the digital display and settings can be programmed easily even without power supply.

The controller is supplied with an NTC temperature sensor for efficient media temperature sensing, and mountable DIN rail 35mm for easy mounting option on walls.

Benefits/Features

- Easy set-up and programming of the unit
- Flexible temperature control of pipe freeze protection
- Line sensing and/or ambient sensing
- Proportional Ambient Sensing Control (PASC) algorithm for enhanced energy savings in ambient sensing mode
- Alarm relay with change over contact to signal power, temperature or communication problems
- Pipe temperature monitoring with high and low temperature alarm
- Offsite configurable - can be set up prior to final installation
- On wall mountable for outdoor location

Technical data

General

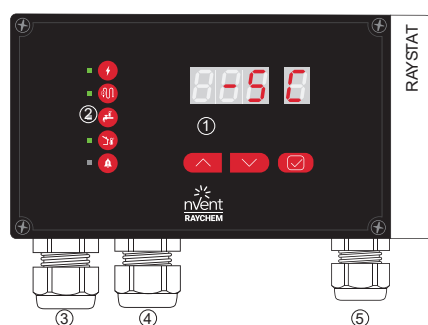
Area of use	Non-hazardous locations, for COOL-FIT heating cables. Not for EX areas. Sensing in zone 1 or zone 2 possible with MONI-PT100-EXE (separately available).
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Electrical properties

Supply voltage	230 VAC (+10%, -15%); 50/60Hz
Operating temperature	-40°C to +40°C ambient
Power consumption	Max. 3,5 W
Switching capacity output relay	25 A 230 VAC
Size power supply terminals	3 x 6 mm ² max.
Size heating cable terminals	3 x 6 mm ² max.
Size alarm terminals	3 x 1,5 mm ² max.
Size pipe sensor terminals	2 x 1,5 mm ² max.
Alarm relay	Single pole double throw relay, volt-free; Max. switching capacity (resistive load only). 1 A/30 VDC 0.5 A/125 VAC, Max.: 60 VDC/125 VAC
Keylock	Password protection for parameter settings
USB port	For pre-setup in power off mode on using a powerbank (not included in the package)

Enclosure

Dimensions	210 mm x 110 mm x 85 mm
Ingress protection class	IP65
Enclosure material	Polycarbonate
Mounting option	On wall; mountable DIN rail 35 mm (included in the package)
Cable entries	2 x M25 and 1 x M20; 2 x M20 pre-punched
Storage temperature	-40°C to +50°C
Flammability class	DIN EN 60730/VDE 0631-1
Weight	990 g

Module layout

1. LED Display
2. LED Green: a - Power to the unit
b - Power to the heating cable
c - Line sensor connected or
d - Ambient sensor connected
e - Alarm/Error info
3. M25 Gland: Power cable
4. M25 Gland: Heating cable
5. M20 Gland: Sensor/Sensor pipe/External alarm

Programming

Selectable set temperatures	0°C to +90°C (line sensing) and 0°C to +30°C (ambient sensing);
Parameter	Operation modes, high and low temperature alarm, hysteresis

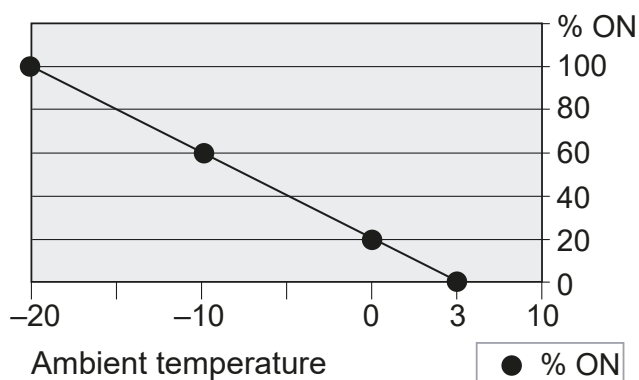
Energy saving with proportional ambient sensing control (PASC)

Duty cycle (power to heater on) depends on the ambient temperature.

For example: If minimum temperature = -20°C and if maintain temperature (set point) = +5°C

Ambient temperature °C	% ON	
-20	100	Min. Ambient
-10	60	
0	20	
3	0	Set point

Result: At ambient temperature of -10°C, 50% energy is saved



Sensor

Temperature sensor type	NTC 2 kOhm / 25°C, 2-wire
Sensor tip dimensions	Ø 5 mm; length 20 mm
Sensor cable length	Ø 4 mm; length 5 m, Polyolefin
Cable extension	Up to 150 m, cross section extension cable: 2 x 1,5 mm ²
Temperature range	−40°C to +90°C

Monitoring

Temperature alarm	High temperature alarm	Adjustable range: maintain temperature to +2°C to +90°C, OFF
	Low temperature alarm	Adjustable range: maintain temperature to −40°C to +85°C, OFF
Sensor alarm	Sensor open circuit	
	Sensor short circuit	
Heating cable connection	Heating cable open circuit	

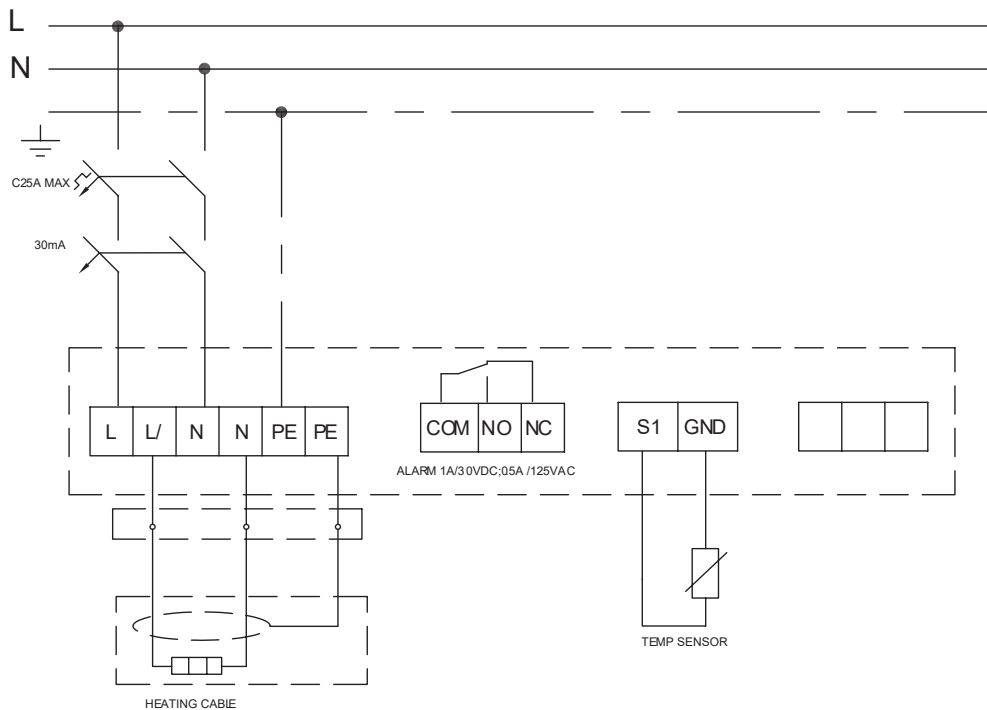
Memory

Parameters	All parameters are stored in nonvolatile memory.
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Approvals

Approvals	CE, ROHS, WEEE
Electromagnetic Compatibility (EMC)	EN 61000-6-1: 2007; EN 61000-6-3:2007 + A1:2011

Electrical scheme



* observe local regulations

Important: The controller is for use with the COOL-FIT heating cables only.
The warranty and system listing will be invalidated if the controller is used with other heating cables.

3 Installation and Maintenance Manual

NOTICE!

For the warranty to apply, the instructions that are included in this manual and product packages must be followed.

- The installation must be compatible with local requirements applicable to electric heat-tracing systems.

WARNING!

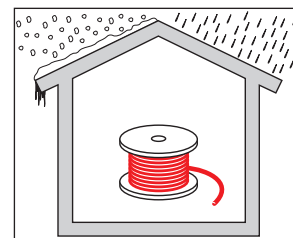
As with any electrical equipment or wiring installation operating at line voltages, heating cable and component damage or incorrect installation that allows the penetration of moisture or contamination can lead to electrical tracking, arcing and potential fire hazard.

- Do not connect heating cable conductors together or this will result in a short circuit. Any unconnected heating cable end must be sealed with an approved end seal.

3.1 Product testing and handling

Storage and handling of the heating cable

- Store in a dry and clean place.
- Temperature range: -40°C to $+60^{\circ}\text{C}$.
- Protect any cable ends with an end seal.



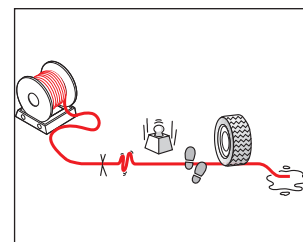
Pre-installation checks

- Temperature exposure must not exceed that specified in the product literature. Exceeding these limits will impair product performance. Check that expected exposure is within these limits.
- Ensure that the heating cable voltage rating is suitable for the service voltage available.
- Do not energize cable when it is coiled or on the reel.
- Inspect heating cable and components for in-transit damage. An insulation resistance test (see section 10) on each reel is recommended.

Heating cable handling

When pulling the heating cable, avoid:

- sharp edges
- high tractive force
- kinking and crushing
- walking or driving over the cable
- moisture at cable interfaces



Heating cable pulling tips:

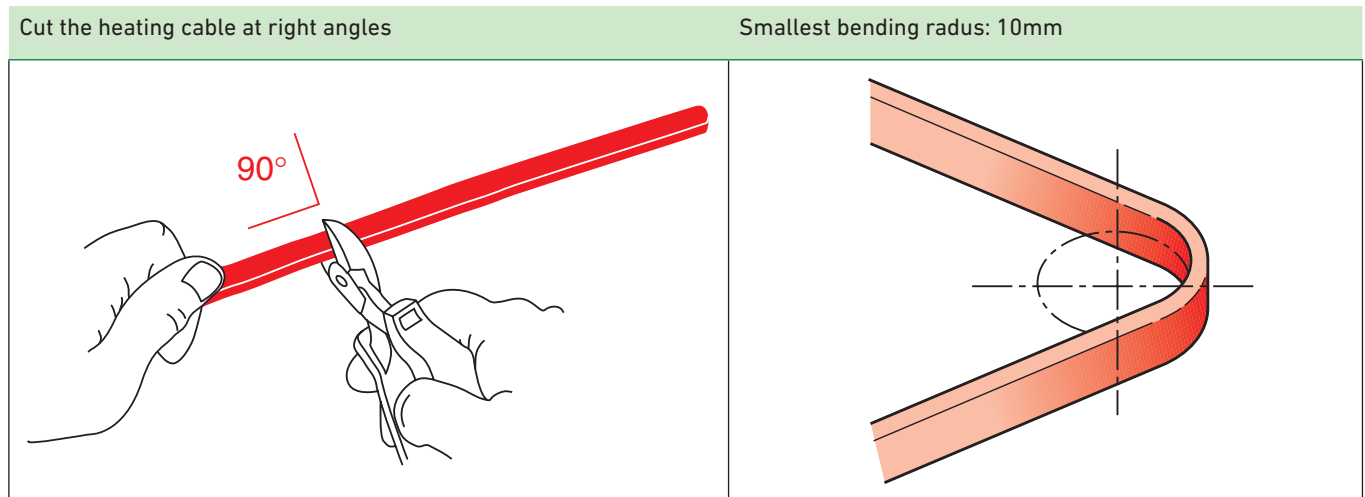
- Use a reel holder that pays out smoothly with little tension.
- Keep heating cable strung loosely but close to the pipe being traced to avoid interference with supports and equipment.
- Pay out designed length and mark (i.e. with fixing tape) on cable while still on reel.
- Leave the appropriate amount of heating cable at all power connection and end seal locations (Refer to component installation instructions).
- Protect all heating cable ends from moisture, contamination and mechanical damage or other interference if left exposed before component installation.

Cutting the heating cable

- Cut the heating cable to length after it is attached to the pipe
- Heating cables can be cut-to-length without affecting the heat output per metre.

Installation details

Follow the recommendations for cutting and stripping heating cables; they are included in the component installation instructions.



3.2 Components installation

General notes:

Installation instructions included in the kit must be followed, including those for preparation of the heating cable conductors for connections. Before assembly, use the guide given in the instructions to ensure that the kit is correct for the heating cable and environment.

- Self-regulating and power-limiting heating cables are parallel circuit design. Do not twist the conductors together as this will result in a short circuit.

Components required

For the installation of all components refer to the relevant component installation instructions.

Required for each heating cable run:

- Cold lead connection and end seal kit
- Cable entry and exit
- Fittings for inlet and outlet

Required for the installation the temperature sensor of each thermostat (for temperature control via media temperature)

- COOL-FIT 4.0 Installation fitting ½" Rp
- Immersion sleeve for NTC sensor

Procedure

- Insert the heat tracing cable into the inner pipe during installation of the piping components and out again at the end of the heating circuit. If there are more than 2 changes in the direction of the pipe equipped with the heating tape, the use of a suitable lubricant is recommended for simpler installation.
- Note that the heating cable must not be routed through the inside of valves. If valve heat tracing is required, the cable must be routed outwards on both sides of the valve and the valve has to be heated from the outside.

Thermostats and control systems

- Follow the installation instructions supplied with the thermostat or control. Use the proper wiring diagram for the heating cable layout and control method desired.
- After switching on the heating cable, the cable ends must be warm after 5 to 10 minutes.

3.3 Electrical protection

Overcurrent protection

Size circuit breakers according to the design specification or applicable product literature. If devices other than those specifically identified are used, consult the representative for the appropriate sizing information.

Residual current (earth fault) protection

The system requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Ground fault protection is required in any installation.

The metal braid covering the trace heater shall be connected to an earth terminal for electrical protection of the circuit.

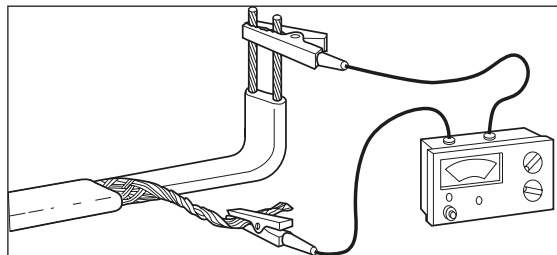
3.4 Heating cable testing

Recommendations

It is an insulation resistance (Megger) test before installing heating cable recommended; prior to initial start-up (disconnected from the controls).

Test method

After completing heating cable installation, the insulation resistance between the conductors and the braid should be checked using a 2.500 VDC megger tester. Minimum readings should be 100 Megohms regardless of the heating cable length. The installer should record the original values for each circuit.



3.5 Operation, maintenance and Pipe repairs

Heating cable operation

- ▶ Temperature exposure must not exceed that specified in product literature. Exceeding those limitations will shorten the service life and may permanently damage the heating cable.

Inspection and maintenance

De-energise all power circuits before installation or servicing and maintenance.

- ▶ Function testing of electrical protection and temperature control systems should be carried out before the winter months each year (see section 10). Temperature maintenance systems should be tested at least twice a year.

3.6 Heating cable damage

- ▶ Do not repair damaged heating cable. Remove entire damaged section and splice in a new length using the appropriate splice kits.
- ▶ Replace damaged heating cable at once. Damage allowing moisture and contamination to enter the heating cable may result in arcing earth faults and potential fire hazards.
- ▶ Heating cable exposed to fire or flame may cause further fire damage if powered. Remove from service at once and replace before re-use.

Commissioning / Protocol

Test report

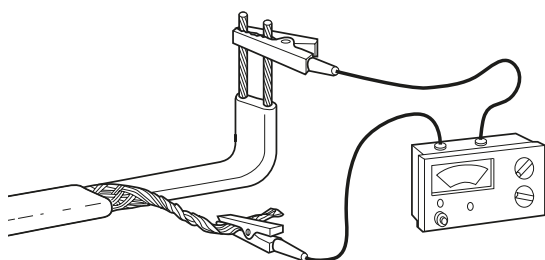
Object:

1. Application

☐ Frost protection on pipes

2. Verification of the installation

2.1. Electrical connection



I. Supply voltage and fuse protection according to COOL-FIT trace heating documentation. ☐

II. Circuit breaker with C-characteristic ☐

III. Residual current circuit breaker 30mA ☐

IV. Insulation resistance measurement: It is recommended to carry out the measurement with an insulation tester at a test voltage of 2500 V, but at least 500 V, according to the relevant regulations. The insulation resistance, regardless of the strip length, must not fall below 100 mΩ. If it falls below this value, the source of the fault must be sought and eliminated.

- Measurement: Phase and neutral conductor against protective braid ☐

2.2. Cable assembly

I. Visual inspection for damage and faultless installation of the accessories. ☐

II. After connection to the mains, each end of the cable must be warm after 5 to 10 minutes. ☐

3. Setting of the control units

3.1. Correct programming according to the specifications of the construction management and in compliance with the instructions of the enclosed operating instructions

3.2. Instruction to the operating personnel and handover of the system to the client

Inspection of electrical connection, carried out by

Date:

Signature:

Inspection belt assembly, performed by

Date:

Signature:

Adjustment of control devices and handover to the client, carried out by

Date:

Signature:

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