

SPECIFICATION GUIDELINE RECIRCULATION SYSTEM OPTIMISATION



SCOPE

This specification describes an energy efficient system for temperature maintenance of a domestic potable hot water supply.

GENERAL

The domestic hot water supply has been designed as a hybrid system, with recirculation loops on the main supply pipes optimised by the use of a self-regulating heating cable system on all branch pipe run outs, known as nVent RAYCHEM HWAT as manufactured by nVent.

The system shall be complete with self-regulating heating cables, advanced energy efficient controller and cold applied components for interconnection and termination.

All electrical system components shall be sourced from a single manufacturer, under no circumstances shall any components be installed other than those supplied by the cable manufacturer, to ensure system integrity and meet warranty requirements.

The manufacturer shall offer an extended warranty of 10 years for heating cables and components and 2 years for controllers, subject to the system being designed, installed, tested and commissioned strictly to their requirements. The warranty shall be extended to 12 years on heating cables/components and 6 years on controls when installed by the manufacturer or by a trained installer recognised by them. All subject to the completion of the online warranty registration.

The system shall be capable of being designed within a BIM model and the manufacturer shall provide a BIM add-in for Autodesk Revit MEP to automate the design process.

The heating cables, controls and system components shall be CE marked and certified according to EN codes by BSI, VDE, CSTB, SEV, ÖVE and fulfil the hygiene requirements of DVGW and SVGW.

Document submittal shall include all of the following: data sheets (for heating cables, interconnection/termination components and controller), system design guide, typical system schematic drawings, controller wiring diagrams, system installation and operation manual, along with approval certificates upon request.

SELF-REGULATING HEATING CABLES

The self-regulating heating cables shall be specifically designed for this application, tested and approved to IEC 62395 and IEEE 515.1, suitable for use with 20A circuit breakers and with a minimum bend radius less than or equal to 10mm.

The manufacturer shall demonstrate minimum 40 year experience in producing self-regulating heating cables and be ISO-9001 registered.

The manufacturer shall provide an extensive global reference list for this application, including installations that have been in operation for over 15 years.

The self-regulating heating cables shall be qualified and tested to demonstrate a useful lifetime in excess of 40 years.

The construction of the self-regulating heating cables shall include a conductive polymer core (qualified for hot water temperature maintenance), modified polyolefin electrical insulation (radiation cross-linked, to ensure long life expectancy), laminated aluminium foil layer (to protect the heater core from chemical ingress), tinned copper braid with minimum 70% coverage and modified polyolefin over jacket printed with cable model, batch number and metre marks (for ease of installation within maximum circuit length).

[Select One Option]

[Option 1]

The self-regulating heating cable shall be nVent RAYCHEM HWAT-R and provide pipe maintained temperatures in the range 50-65°C

[Option 2]

The self-regulating heating cable shall be nVent RAYCHEM HWAT-M and provide pipe maintained temperatures in the range 50-55°C

INTERCONNECTION AND TERMINATION COMPONENTS

Interconnection and termination shall be with cold applied insulation displacement connectors and gel type end seals, which are UV resistant, IP68 and 65°C rated, suitable for 2500Vdc insulation resistance test, with Torx head fittings for ease of installation and both audible & visual installation confirmation, known as RayClic, manufactured by nVent.

THERMAL INSULATION

Insulation selection and thickness shall be strictly in accordance with the self-regulating heating cable system design guide, with variations in ambient temperature fully considered. Insulation sections shall be applied without delay after the heating cable installation, affixed with suitable warning labels less than 3 m apart on alternate sides and visible from all sections.

ENERGY EFFICIENT, CONTROL SYSTEM

[Select One Option]

(Option 1)

Multi-Circuit, Multi-Application Distributed Digital Control System

All hot water temperature maintenance circuits shall be controlled and monitored using a centralised control system with distributed power and control modules, known as nVent RAYCHEM ACS-30, complete with integrated HWAT ECO, manufactured by nVent.

The centralised control system shall provide pre-programmed parameters to provide concurrent control for heating cables used for hot water temperature maintenance, pipe freeze protection, flow maintenance, surface snow melting, roof and gutter de-icing and floor heating applications.

The control & monitoring system shall be modular for easy design and include:

[select some or all of the following product modules]

User Interface Terminal (UIT): a colour touch-screen central user interface terminal for control and monitoring up to 260 heating cable circuits, known as ACS-30-EU-UIT2, manufactured by nVent **[always included in the system]**

Power Connection Module (PCM): to provide distributed power connection, control and monitoring of heating cable circuits, and integrated electrical protection, known as ACS-30-EU-PCM2, manufactured by nVent **[at least 1 PCM shall be included in the system, up to 52 PCMs may be connected to each UIT]**

Remote Monitoring Modules (RMM): to measure additional temperatures for control and monitoring of heating cable tracing circuits, known as ACS-30-EU-Moni-RMM2-E, manufactured by nVent **[up to 16 RMM modules may be controlled via a single UIT, with up to 8 RTDs per RMM]**

The centralised control system shall have the following functions:

Multiple circuit, multiple heating cable applications

Modular design and installation - to provide total flexibility, including any future building modifications

Control and monitoring of up to 260 heating cable circuits - through a single user interface terminal (UIT)

Central programming through the UIT

3 user programmable alarm relays for user specified communication of alarm conditions

ProtoNode high performance protocol gateway connection to allow translation from native ModBus to BacNet protocols

Distributed power control modules (PCMs) - for placement throughout the building or group of buildings, to provide power connection, circuit protection and integrated control & monitoring in proximity to all required heating cable applications and to limit the power cabling needed

PCMs with 1 sensor input per circuit for individual circuit temperature monitoring

Remote monitoring modules (RMMs) - to measure additional temperatures for control and monitoring

RMMs with up to 8 additional resistance temperature detectors (RTDs)

UIT communication with up to 52 PCMs and up to 16 RMMs

PCMs shall additionally

- Provide 5, 10 or 15 circuits with integrated electrical and circuit protection (either 20A or 32A)
- Contain control logic circuitry to ensure continuity of heating cable operation in the event of power failure or communication failure with the UIT
- Provide circuit by circuit monitoring of line or ambient temperature, energy consumption, energy usage pattern and ground fault/earth fault detection
- Enable circuit by circuit alarm function, with the UIT providing details of the alarm, the circuit(s) affected and capture automatically in the event log.
- Connect to the UIT via RS-485 cable for communication, control & monitoring purposes

The control system shall be compliant with IEC61439 and be tested and CE approved to this standard.

The integrated energy efficiency controller shall have the following functions:

Adjustable maintenance temperatures in the range 50-65°C

Water heater temperature sensor (HWS flow temp) and alarm system

Integrated power off timer function with 7 day programmable temperature versus time function, 8 editable built-in building specific programs for temperature maintenance, thermal shock program (for use with HWAT R), automatic summer/winter time and leap year correction

Visible and audible alarm

5" Colour touch screen user interface

Password protection

IP54 rated

(Option 2)

Single Circuit, Single Application Controller

All self-regulating heating cable circuits shall be controlled with an energy saving thermostat, known as HWAT-T55, manufactured by nVent.

The controller shall have the following functions:

Digital display for pipe temperature and alarm

Pipe sensing temperature control with preset temperatures (55°C or 50°C)

Maximum circuit length 50m

3 operation modes (ON/ECO/OFF)

Built in timer for ECO mode

DIN rail mountable (35mm)

EXECUTION

Design Deliverables

The manufacturer shall be able to provide heat loss calculations and corresponding selection of self regulating heating cables with variations in ambient temperature and pipe size and thermal insulation fully considered, system layout and schematic drawings indicating power connections, tees and end seals, electrical schedules indicating cable length and circuit protection, controller configuration listing and wiring diagrams.

Installation Deliverables

The self-regulating heating cables shall be installed in accordance with the design plans, 'straight traced' (i.e. not spirally wound) within the manufacturers defined maximum circuit lengths, tested and commissioned strictly in accordance with the manufacturer's instructions. Installation of thermal insulation shall be closely coordinated with the responsible sub-contractors.

[Select One Option]

[Option 1]

The system shall be installed, tested and commissioned by the manufacturer.

[Option 2]

The system shall be installed and tested by installers trained and recognised by the manufacturer and then commissioned by the manufacturer.

[Option 3]

The system shall be installed, tested and commissioned by installers trained and recognised by the manufacturer.

[Option 4]

The system shall be installed, tested and commissioned under periodical supervision by the manufacturer.

Electrical Connection

All connections between the electrical supply, control panel and self-regulating heating cable circuits shall be installed by an approved electrical contractor. All self-regulating heating cable circuits shall be electrically protected by MCB (BS EN 60898 type C or D) and RCD (30 mA sensitivity, tripping within 100ms).

ENGINEERING DRAWING NOTES

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The circuits shall be controlled via an energy saving, programmable controller

[Select One]

(Option 1)

ACS-30 as manufactured by nVent

(Option 2)

HWAT-T55 as manufactured by nVent

The self-regulating heating cables shall be installed in accordance with the design plans, 'straight traced' (i.e. not spirally wound) within the manufacturers defined maximum circuit lengths, tested and commissioned strictly in accordance with the manufacturer's instructions. Installation of thermal insulation shall be closely coordinated with the responsible sub-contractors.

Insulation selection and thickness shall be strictly in accordance with the self-regulating heating cable system design guide, with variations in ambient temperature fully. Insulation sections shall be applied without delay after the heating cable installation, affixed with suitable warning labels less than 3 m apart on alternate sides and visible from all sections.

All connections between the electrical supply, control panel and self-regulating heating cable circuits shall be installed by an approved electrical contractor.

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