

Snow Melt Control SMC-1

The SMC series is an ice and snow detector which combines moisture and temperature sensors for the early detection of ice and snow conditions. Open areas like sidewalks, stairs, driveways, parking lots and loading ramps are monitored using pavement sensors which will with-stand mechanical stresses caused by heavy vehicles. By activating the BLR-1 or any heating system, the monitored surface is kept free from ice and snow. The SMC series can be used in small or large systems where reliable automatic operation is critically important and effective operation affords substantial energy savings when compared with thermostatic or manual control. The SMC series consists of a control enclosure and the patented pavement mounted moisture and temperature sensor connected by a 65 foot (20 m) cable and a brass sensor holding sleeve.



Features

Control Enclosure

- Controls hydronic or electric systems
- Operates on 24 VAC 10VA
- Adjustable upper limit: 26 to 40°F (-3 to 5°C)
- Adjustable minimum heating time: 30 to 90 minutes
- Adjustable lower limit: -10 to 25°F (-25 to -5°C)
- Adjustable moisture sensitivity: 1 to 5
- Digital dry contact 24 V~ output
- LED status indicators
- Manual test / On bottom

Pavement sensors

- Compact heavy duty brass 2 11/16" (68mm) diameter
- Sensor holding sleeve
- No exposed electrodes
- Maintenance-free
- Detects both moisture and temperature
- Safe low voltage operation
- U.S. Patent 6,276,202



Purpose of This Guide

The *SMC Series Application Manual* provides application information for the SMC series controls. The reader should understand basic HVAC concepts, intelligent environmental control automation, and basic LONWORKS networking and communications. This Application Manual is written for:

- Users who engineer control logic
- Users who set up hardware configuration
- Users who change hardware or control logic
- Technicians and field engineers

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Applicable Documentation

Part Number	Description	Audience	Purpose
563010201	BLR -1 Series Application Manual	<ul style="list-style-type: none"> – Application Engineers – Wholesalers – Contractors 	Provides specific application information about the BLR-1, including sequence of operation and configuration information.
5630112201	BZU -1 Series Application Manual	<ul style="list-style-type: none"> – Application Engineers – Wholesalers – Contractors 	Provides specific application information about the BZU-1, including sequence of operation and configuration information.
563013401	LCI User's Guide	<ul style="list-style-type: none"> – Application Engineers – Installers – Service Personnel – Start-up Technicians – End user 	Provides instructions for setting up and using the Local Control Interface.
Additional	<i>LonWorks FTT-10A Free Topology Transceiver User's Guide</i> , published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.		

Overview

The SMC series consists of a control enclosure and the pavement mounted moisture and temperature sensor connected by a 65 foot (20 m) cable. The control enclosure allows for adjustments of moisture, temperature, minimum heating time and low limit temperature setting. The pavement sensor senses both moisture and temperature thus assuring optimum control. Together they provide the perfect combination of a compact pavement sensor and adjustable remote mounted electronic control enclosure. An isolated form A (SPST) relay contact closes during precipitation which can activate BLR-1 or control a valve, boiler or circulator. This relay dry contact output can be used as a discrete input for commercial and residential building automation systems employing computer or PLC control. SMC Series provides automatic control of electric or hydronic ice and snow melting heating system while minimizing the cost of energy.

Patented Technology

Older known methods of ice and snow detection used exposed metal electrodes on the surface of the detector to measure conductivity of moisture. The accuracy of this moisture measurement would deteriorate over time because of environmental contamination of the exposed metal electrodes on the surface of the sensor. These older type of sensors frequently required a regular sensor maintenance schedule to clean these exposed metal electrodes on the surface of the sensors. However, the SMC series implements a new patented sensor technology that does not have exposed metal electrodes on the surface for the moisture detection. This patented technology guarantees a maintenance-free, safe and economic operation even under the most severe environmental conditions and thus avoids extra maintenance costs.

Operation

The function of the SMC's measurement and control system is based on the behavior of a PTC resistor which replaces the exposed metal electrodes normally used in older systems. Exposed metal electrodes can collect dirt, suffer from corrosion or get shorted by external conductive objects – strictly speaking: they need maintenance. The power consumption of a PTC resistor does not only depend on the ambient temperature but is also affected to a very high degree by the presence or absence of water. If the temperature sensor detects a temperature within the adjustable “critical” temperature range the PTC sensing element is heated by applying a small control power. After a time delay of approximately four minutes the detector system is capable of determining whether the sensor surroundings are wet or dry by evaluating the power consumption of the PTC sensing element. Any snow potentially present on the sensor surface will have been melted within this time interval. If moisture is detected the heating system will be activated and will be kept operative for at least the minimum heating time (adjustable from 30 to 90 minutes). If no moisture is present the control power of the sensing PTC resistor will be switched off for approximately 25 minutes. Both the critical temperature range upper limit 26 to 40° F (-3 to +5° C) and the lower limit -10 to 25° F (-25 to -4° C) are adjustable. In some areas, there may be a regulatory requirement to disable the snow melt function below certain ambient temperatures when using an electrical heating snow melt systems. If this does not apply, it is recommend to set the critical low limit value to -10° F (-25° C).” (See “Critical Temperature Lower Limit”).

Control Adjustments

Temperature Upper Limit

This dial is used to set the critical temperature range upper limit. At ambient temperatures above this limit the unit will be switched off. Adjustable values range from 26 to 40° F (-3 to +5° C).

Moisture Sensitivity

This dial is used to adjust the moisture sensitivity of the ice and snow detector. The least sensitivity is achieved in position 1, i.e. the sensor must be considerably wet to detect moisture. In position 5 the sensor is very sensitive, i.e. even slight moisture will be detected. Adjustable values of the sensitivity setting range from 1 to 5.

Critical Temperature Lower Limit

This dial is used to adjust the critical temperature threshold below which the unit will be switched off. To get back into the Active mode this temperature must be exceeded. Adjustable values range from -10 to 25° F (-25 to -4° C), it is recommend to set this value to -10° F (-25° C).

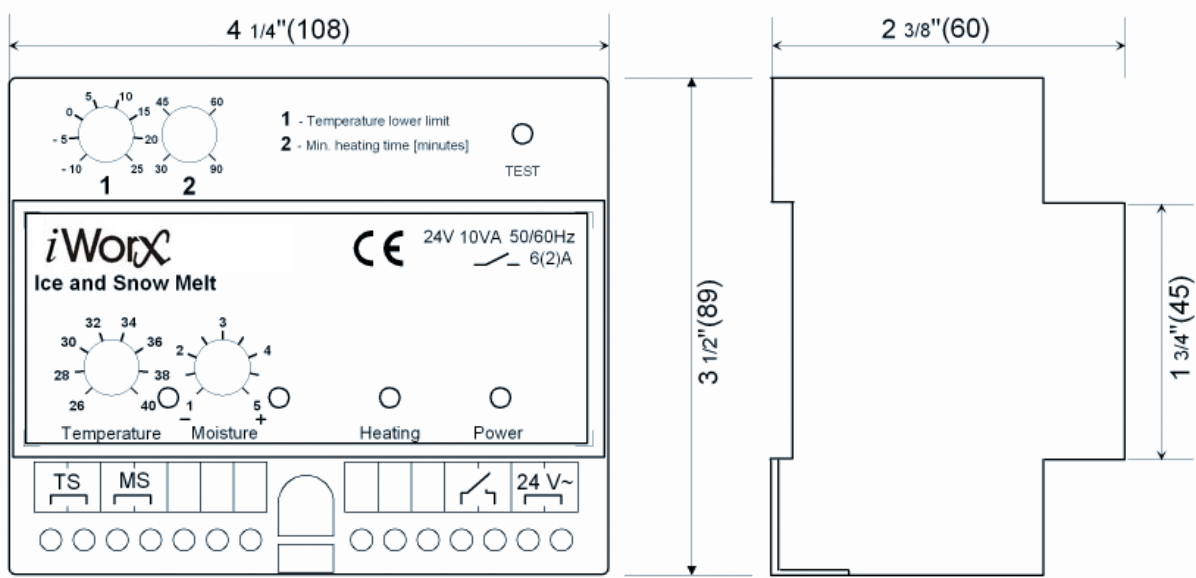
Minimum Heating Time

This dial is used to set the minimum time for which the heating system will be kept operative once an ice or snow condition has been detected. Adjustable values range from 30 to 90 minutes.

Test Button

The recessed button “Test” is used to force the output contact ON for the minimum heating time, independent of the actual temperature or moisture. A flashing yellow LED during this test period indicates a moisture sensor failure.

Figure 1: Control Enclosure



Operating Status Indicators

The operating status of the snow melt control system is indicated by four LED's.

Temperature

The temperature LED indicates that the ice sensor reports a temperature value inside the critical temperature range which is defined by the critical temperature range upper and lower limit (see section Control Adjustments). This also implies the state “Ready for Moisture Detection”.

Moisture

The moisture LED indicates that moisture above the selected moisture threshold is detected. This indicator is active only if the temperature indicator is also active (no moisture detection outside the critical temperature range).

Heating

This red indicator light shows the operating state of the heating system (output relay ON).

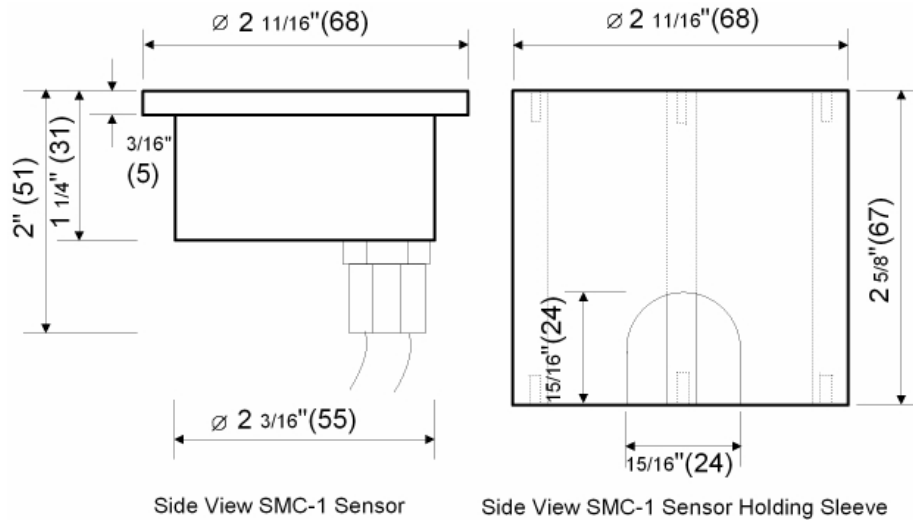
Power

This indicator is a dual-color LED. A **green** light indicates that supply power is present and the sensor heating is off. A **red** light indicates an active sensor heating (only during the “waiting time”, approximately 4 minutes).

Pavement Sensor

The patented sensor technology is embedded into the cast brass body which has been specifically designed for open areas used by vehicles or pedestrians. The **SMC-1** control and pavement sensor has an axial cable entry at the bottom which may be installed in a sensor holding sleeve which simplifies installation and replacement if ever required.

Figure 2: Pavement sensors



Pavement Sensor Check

To check the pavement sensor after it is installed, the following resistance values can be measured at the end of the cable before connecting to detector enclosure.

Resistance value between **brown** and **blue** wires at corresponding ground temperatures:

- 6752 ohms at 23° F ground temperature
- 5634 ohms at 32° F ground temperature
- 4721 ohms at 39° F ground temperature
- 3974 ohms at 46° F ground temperature
- 3360 ohms at 53° F ground temperature

Resistance value between **red** and **red/black** wires must be 25 to 40 ohms

Pavement Sensor Locations

When determining the location for installing the pavement sensor, unfavorable conditions like aisles, shadow areas, warm air exhausts of underground parking garages etc. must be taken into consideration. Preferably the sensor should be installed at the place where the critical criteria “moisture and low temperature” causing the formation of ice are most likely to occur first. The sensor is placed inside the area to be heated or monitored such that the sensor surface is level with the surrounding ground surface and is unobstructed see Figure 3. When embedded in an inclined surface the sensor must be installed with the sensor surface horizontally in order to retain snow or water from melted ice see Figure 4.

Figure 3 and 4: Pavement sensors Locations

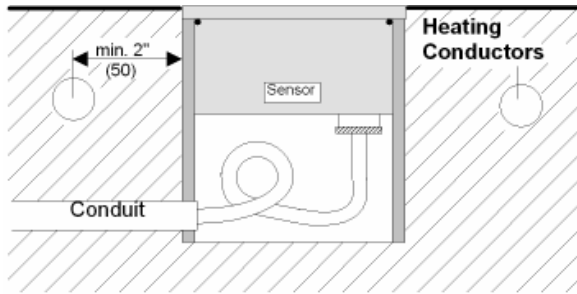


Figure 3

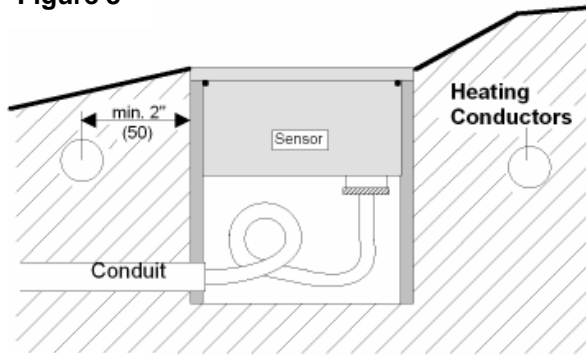
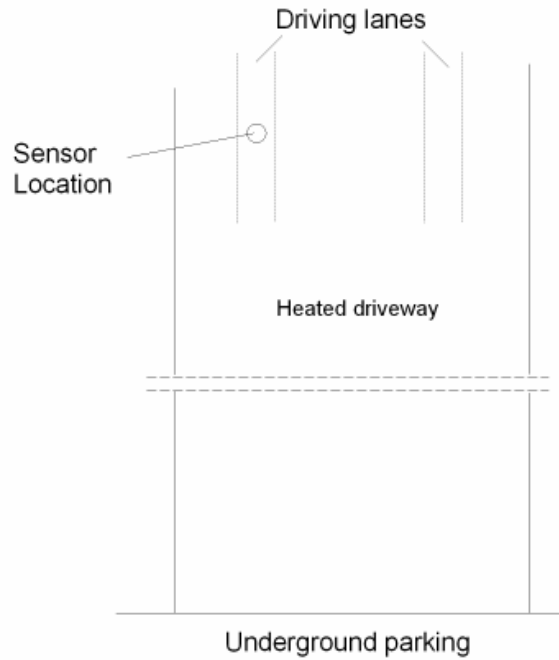


Figure 4



Commissioning

- Once power is applied and the internal timer circuit starts, the controller will retain the timer's setting even when power is removed. Powering the controller down does not reset the internal timers.
- When the TEST button is pushed, the output relay is forced ON for the minimum time selected on the Minimum Heating Time dial. Powering the controller down does not reset the internal timers.
- Before commission the controller, it is recommended to set the Minimum Heating Time dial to 30 minutes. This is advised because powering the controller down does not reset the internal timers. When commission is completed select a time from 30 to 90 minutes.
- When turning on the power for the first time, the controller may immediately energize the output relay to ON. If this happens, the relay will stay ON for the minimum time selected on the Minimum Heating Time dial. When the minimum time has elapsed $\pm 20\%$, the controller will return to normal operation.
- Detection of moisture occurs at regular time intervals and is not performed continuously. As a result of this detection principle, any changes of the moisture sensitivity setting will take effect only at the next detection cycle.
- In standby operation, moisture detection occurs approximately every 30 minutes. Once moisture is detected, the next detection cycle will occur approx. 5 minutes before the minimum heating time has elapsed. In the intermediate periods, the controller will not recognize changes of the moisture condition or changes of the sensitivity setting.
- When the detection cycle starts, the power dual-color LED changes from green to red. The detection cycle takes about 90 seconds of which the first 80 seconds is the sensor heating phase, followed by the actual moisture detection. While the actual detection takes place the yellow moisture LED indicates if moisture is detected and will illuminate for about 4 seconds. Once the detection is complete the yellow moisture LED will go off again and the output relay energizes. If no moisture is detected the yellow moisture LED will not illuminate and power LED changes back to green. In case of a sensor failure the yellow moisture LED will keep flashing.

Installation

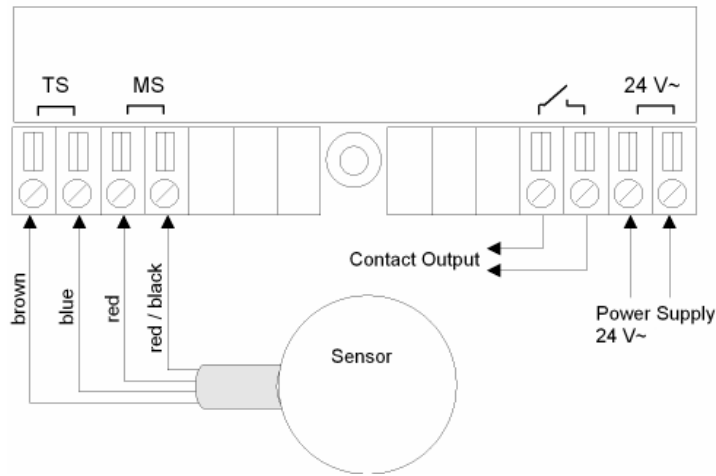


Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Select mounting location. Enclosure mounting is recommended.
2. Loosen the center screw on the face of the enclosure; gently pull down and out to separate the controller base (back) from the electronics module (front).
3. Do one of the following:
 - a. Using two #6 pan head screws, mount base of controller to a panel.
 - b. Snap controller base on a 35 mm DIN mounting rail (not provided). Multiple units can be mounted side by side on a DIN mounting rail.
4. Wire controller base (See “Wiring Diagram” Figure 5).
5. After wiring:
 - a. Line up terminal pins with the correct sockets on the terminal blocks.
 - b. Push gently until the cover snaps into place.
 - c. Tighten the center cover screw.

Figure 5: Wiring Diagram



Connecting Power

Connect the wiring from the 24 VAC transformer to the control enclosure to the terminal marked 24V~. A 24 VAC Class II transformer must be used with a minimum 10VA rating. Do not connect either of the transformer secondary wires to ground.

Connecting Pavement Sensor

The sensor must be SMC-1 only. To connect the temperature sensor wires to the control enclosure, attach the (brown) and (blue) wire to the terminals marked TS. To connect the moisture sensor wires to the control enclosure, attach the (red) and (red/black) to the terminals marked MS.

Connecting Output Relay

Connect the wires from the isolated form A (SPST) normally open relay contact to the digital input of the BLR-1. Attach one wire of the relay contact to (T25) and the other wire to the adjacent common (T26).

Specifications

Electrical

Inputs - Pavement sensor

- SMC-1

Output – Relay

- Digital dry contact 24 V~
- 6 Amp resistive / 2 Amp reactive
- 144VA @ 24 VAC
- 18 AWG recommended

Power Requirements

- 24 VAC \pm 6% 50/60 Hz (requires an external supply)

Power Consumption

- 10 VA (including sensor power)

Mechanical

Control Enclosure

- Dimensions in inches (mm): 3 7/16" (88) high, 4 1/4" (108) wide, 2 5/16" (61) deep
- ABS Polycarbonate
- Weight: 13.4 ounces (380 grams)
- Ambient Temperature: Indoor use only , 0 to 120° F (0 to 50° C)
- Humidity: 0 to 95% non-condensing

Pavement Sensor

- Dimensions in inches (mm): 2 11/16" (68) diameter, 1 1/4" (31) high
- Cast Brass
- Weight: 10.1 ounces (286 grams)
- Cable length: 65 feet (20 meters) Polyurethane cover
- Ambient Temperature: -22 to 175° F (-30 to 80° C)
- Moisture: 0 to 100%

Controllability

- Minimum Heating Time - 30 to 90 minutes
- Critical upper limit - Standby, 26 to 40°F (-3 to 5°C)
- Melting range - On, -10 to 40°F (-25 to 5°C)
- Critical lower limit - Standby, -10 to 25°F (-25 to -5°C)
- Moisture sensitivity: 1 to 5

Agency Compliances

- CE EMC Directive
- DOC regulations for EMI/RFI
- FCC Part 15 Class B