

EFC1 SNOW MELTING CONTROLLER SYSTEM

INSTRUCTION MANUAL



At Your Service

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To Be the **#1 HEATING CABLE BRAND** for Homes

SAFETY INSTRUCTIONS

Please read this manual carefully before installation, wiring, or operation.

Improper installation, wiring, or use may cause electric shock, fire, equipment damage, or system malfunction.

This controller must be installed and wired by a qualified electrician in accordance with local electrical codes.

⚠ WARNING

- Disconnect power before installation, wiring, or maintenance.
- The controller must be installed indoors or inside a weatherproof electrical enclosure suitable for the installation location.
- The controller is designed for 35 mm DIN rail installation only.
- A circuit breaker and GFCI/leakage protection device are strongly recommended.
- Do not exceed the controller relay rating: 16 A maximum.
- For longer service life, continuous load current is recommended to be 11 A or less.
- For loads over 16 A, 3-phase power, or voltage over 265 V, use an external AC contactor (relay).
- Do not install the controller near flammable materials or heat sources.
- Do not use this product in hazardous or explosive atmospheres.
- Keep sensor wiring away from high-voltage wiring whenever possible.

⚠ CAUTION

- Do not install the moisture sensor where debris may permanently cover the sensor surface, or where standing water cannot drain properly.
- Do not allow the heating cable to directly touch the moisture sensor.
- Avoid routing sensor cables parallel to power cables unless shielded cables are used.
- Incorrect sensor installation may affect snow detection accuracy.

IMPORTANT OPERATING NOTES

This system detects WATER on the moisture sensor surface, not snow directly.

Because snow and ice are poor electrical conductors, the moisture sensor uses its built-in heating element to melt snow or ice into water before detection.

Because of this operating principle, the following conditions are normal:

- Heating may not start immediately when snowfall begins.
- Heating may continue after snowfall stops due to the drying delay function.
- Snow accumulation, wind direction, and sensor location may affect response time.
- Regular sensor cleaning is required for reliable operation.

Before Each Winter Season

To ensure reliable operation:

- Inspect all wiring connections.
- Inspect heating cables for visible damage.
- Check GFCI / leakage protection device.
- Clean the moisture sensor surface and remove leaves, dirt, stones, or debris.
- Check that meltwater can drain properly from the sensor area.
- Run a short system test before the first snowfall.

PRODUCT OVERVIEW

The EFC1 Snow Melting Controller is an intelligent control system designed for automatic snow and ice melting applications. The system uses both air temperature detection and moisture detection to determine when heating cables should operate.

Heating activates only when both conditions are met:

- The outdoor temperature is within the set range

AND

- Water or melted snow is detected on the moisture sensor

This dual-sensor logic improves energy efficiency and reduces unnecessary heating operation.

Typical applications include:

- Roof de-icing
- Gutter freeze protection
- Downspout ice prevention
- Driveway snow melting
- Walkway snow melting
- Sidewalk snow melting
- Loading dock snow melting
- Porch and stair snow melting

SYSTEM COMPONENTS

The system consists of three main components:

Component	Model	Function
Controller	EFC1	Main control unit with WiFi capability
Air Temperature Sensor	NTC 10kΩ / 77°F (25°C)	Detects ambient temperature
Moisture Sensor	EFS-G or EFS-R	Detects water on sensor surface

Versions:

- EFC1 + EFS-G (Ground) :
For ground applications – driveways, walkways, ramps, porches
- EFC1 + EFS-R (Roof):
For roof applications – roof edges, gutters, downspouts

SPECIFICATIONS

EFC1 Controller

Parameter	Value
Voltage	85-265 V AC, 50/60 Hz
Max. Relay Current	16 A
Standby Power	2 W
Relay Type	AC-1
Mounting	DIN 35 mm rail
IP Class	IP20
Terminal Wire Size	Max. 2.5 mm ² / 13 AWG
Dimensions	3.54×2.09×2.56 in / 90×53×65 mm
Ambient Temperature	32-113 °F / 0-45 °C
Storage Temperature	14-122 °F / -10-50 °C
Air Temperature Sensor	NTC, 10 kΩ / 77 °F (25 °C)
Sensor Cable Length	9.8 ft / 3 m

Note:

- The controller relay is rated for 16 A maximum. For long-term continuous operation, keeping the load at or below 11 A is recommended when possible.
- If the load exceeds 16 A, or if the system uses 3-phase power or voltage over 265 V, use an external AC contactor (relay).

Moisture Sensors

Parameter	EFS-G (Ground)	EFS-R (Roof)
Ambient Temperature	-58~158 °F / -50~70 °C	
Measured Range	-22~167 °F / -30~75 °C	
Sensor Length	32.8 ft / 10 m	
Temperature Sensor	NTC, 10 kΩ / 77 °F	
Internal Heating	5 W	
IP Class	IP68	
Operating Temp	-58~158°F (-50~70°C)	
Dimensions	2.36×2.36×1.42 in / 60×60×36 mm	4.72×1.18×0.59 in / 120×30×15 mm
Weight	758 g / 26.74 oz	473 g / 16.68 oz

Note:

The internal 5W heater inside the moisture sensor is used only to melt snow or ice on the sensor surface for detection. It is not designed to melt snow in the protected area.

WORKING PRINCIPLE

The EFC1 controller operates using dual-sensor intelligent detection. Both temperature and moisture conditions must be satisfied before heating starts.

Stage 1 — Temperature Monitoring

The controller continuously monitors outdoor air temperature.

When the temperature enters the user-defined operating range, the controller activates moisture monitoring.

Stage 2 — Moisture Detection

The system detects WATER, not snow directly.

Because snow and ice are poor electrical conductors, the moisture sensor uses a built-in heater to melt snow or ice into water before detection.

Once water is detected, the controller activates the heating cable.

Stage 3 — Snow Melting

The heating cable warms the protected area.

Snow and ice melt into water and drain away from the surface.

The moisture sensor continuously monitors remaining moisture during operation.

Stage 4 — Drying Delay

When water is no longer detected, heating does not stop immediately.

The system continues heating for a preset delay period to:

- Remove remaining moisture
- Prevent re-freezing
- Keep the protected surface dry

After the drying delay period ends, heating stops automatically.

Stage 5 — Abnormal Condition Monitoring

If moisture remains continuously detected for an unusually long time, the controller triggers an alarm.

Possible causes include:

- Leaves covering the sensor
- Poor drainage
- Ice blockage
- Sensor contamination
- Sensor malfunction

The sensor surface should be inspected and cleaned regularly.

INSTALLATION INSTRUCTIONS

Controller Installation

The controller must be installed indoors or inside a waterproof enclosure.

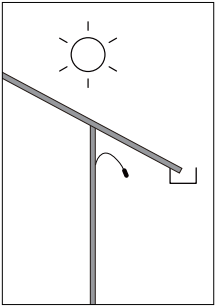
1. Mount the controller on a DIN 1.38 in (35 mm) standard rail.
2. Install at a height greater than 19.69 in (0.5 m) above ground.
3. Recommended ambient temperature: 23-95 °F (-5 °C to 35 °C).
4. Connect a circuit breaker and leakage protector in series before the controller.



⚠ The ground wire of the heating cable must be connected to the mains ground wire!

Air Temperature Sensor Installation

- 1.Install in a shaded outdoor location protected from direct sunlight, rain, and snow. Under the eaves is recommended when available.
- 2.Keep sensor cable away from power cables (unless power cable has shielding).
- 3.Cable can be shortened if necessary.
- 4.If extending, use two-core shielded cable ≥1.0 mm², max. 328 ft (100 m).



EFS-G Ground Sensor Installation

For driveway, walkway, porch, and ramp applications, the moisture sensor must be placed horizontally and facing upwards, even if the area to be melted is a slope!

1. Installation Position

- Install on a solid concrete base; sensor top surface must be flush with the ground and not pressed down by vehicles or pedestrians.
- Place between two heating cables, at least 0.8 in (2 cm) away from each cable.
- Keep at least 3.3 ft (1 m) away from the edge of the melting area.
- Install in the lowest, wettest, shaded area of the melting zone.

2. Gap Sealing

Fill gaps between sensor and pavement to ensure meltwater flows over the sensor surface, not into gaps.

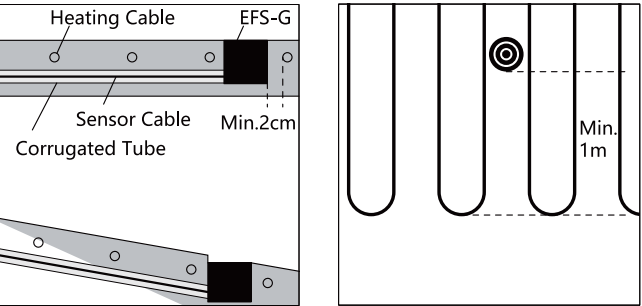
3. Protection & Cable

- Use corrugated conduit for protection if possible.
- For asphalt: Replace with metal conduit; do NOT install sensor before paving.

4. Cable Extension

If extension is required, use a 4-core shielded cable ≥16 AWG (1.5 mm²) and a maximum length of 328 ft (100 m).

⚠️ Note: All connections must be sealed in a waterproof junction box.



⚠️ IMPORTANT!
Keep sensor surface clean. Regularly remove leaves, stones, and debris.

EFS-R Roof Sensor Installation

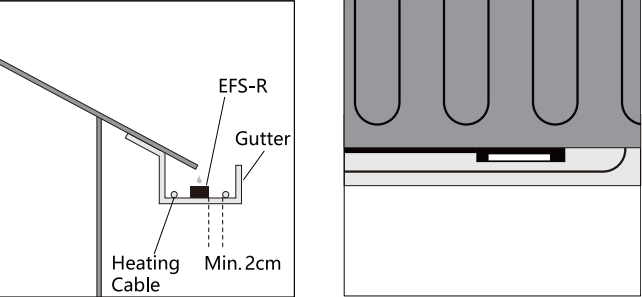
For roof, gutter, and downspout applications, the moisture sensor must be placed horizontally and facing upwards to ensure accurate detection.

1. Installation Position

- Install in the gutter, below the roof drip line, near the downspout.
- Place on the shaded, north or north-south side of the building.
- Position between two heating cables, at least 0.8 in (2 cm) away from each cable.
- Secure firmly to avoid movement.

2. Cable Extension

- Use 4-core shielded cable ≥16 AWG (1.5 mm²), maximum length 328 ft (100 m).
- All connections must be sealed in a waterproof junction box.



⚠️ IMPORTANT!
Keep sensor surface clean. Regularly remove leaves, stones, and debris.

WIRING INSTRUCTIONS

⚠️ ALWAYS DISCONNECT POWER BEFORE WIRING

Air Temperature Sensor

Connect NTC sensor to controller terminals.

Moisture Sensor

Connect wires by color.

Each sensor has 4 main wires and 4 backup wires (color with white stripe).

- Use backup wires **ONLY** if main wires are damaged.
- DO NOT connect main and backup wires to the same terminal – will damage the controller.

⚠️ Note: If main wires fail, use backup wires of same color. NEVER connect main and backup wires to same terminal simultaneously - this reduces accuracy and may damage controller!

Power Supply Wiring

The power input terminals are marked L1 and N/L2.

120V system:

- L1 = Line / Hot
- N/L2 = Neutral

240V split-phase system:

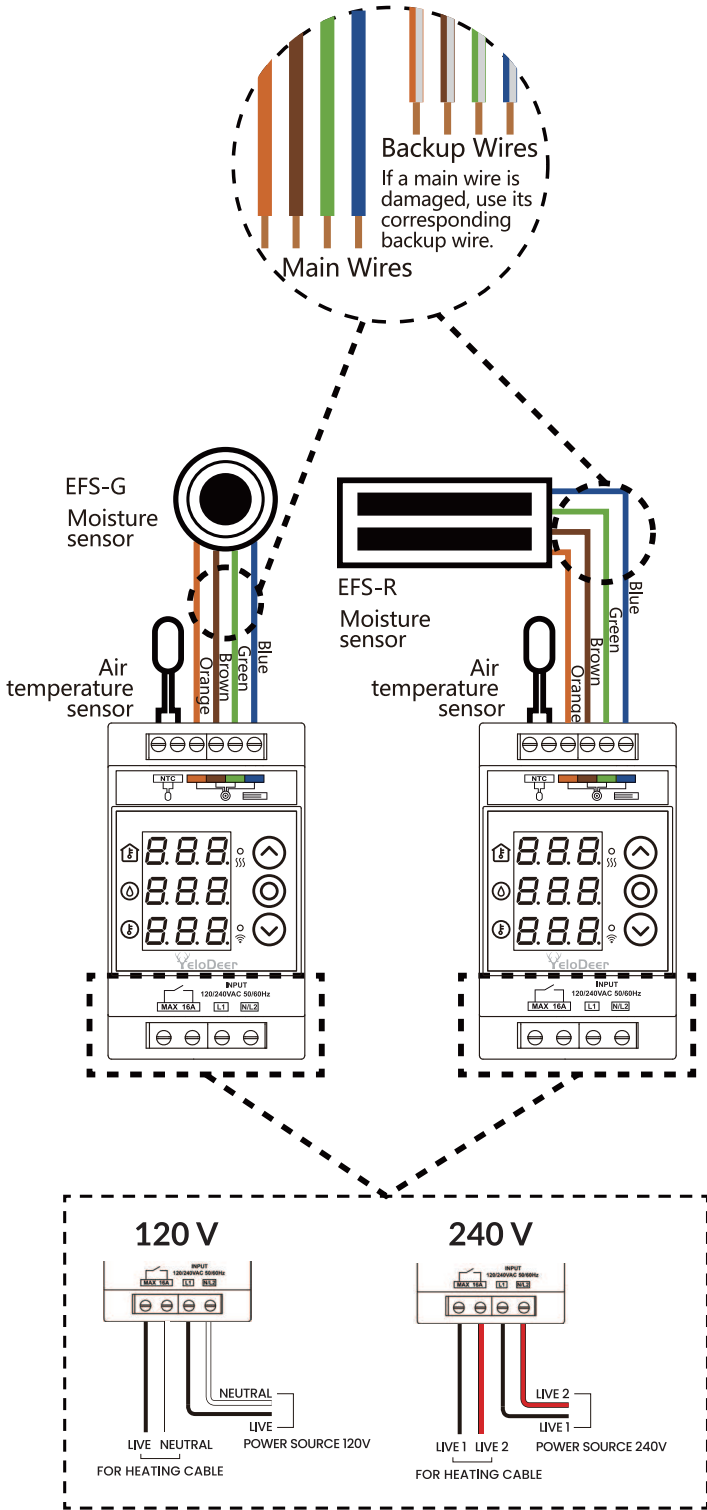
- L1 = Line 1 / Hot 1
- N/L2 = Line 2 / Hot 2

Note: In a 240V split-phase system, the N/L2 terminal is used as Line 2, not Neutral.

Load (Heating Cable) Wiring

The two LOAD terminals work as a switch. They do not provide power by themselves. A jumper wire is required to bring power from L1 to one LOAD terminal.

1. Connect the power supply wires to L1 and N/L2.
2. Add a short jumper wire from L1 to either LOAD terminal.
3. Connect one heating cable wire to the other LOAD terminal.
4. Connect the other heating cable wire directly to N/L2.
5. Connect the heating cable ground wire to the grounding system.



External AC Contactor (Relay) Wiring – For Larger Loads

For loads over 16 A, 3-phase systems, or systems over 265V, do not connect the heating cable directly to the controller LOAD terminals. Use an external AC contactor (relay).

In this setup, the controller output is used only to switch the contactor coil. The heating cable load current must pass through the main contacts of the external contactor, not through the controller.

Control circuit wiring:

1. Connect the power supply wires to L1 and N/L2.
2. Add a short jumper wire from L1 to either LOAD terminal.
3. Connect the other LOAD terminal to one side of the contactor coil.
4. Connect the other side of the contactor coil to N/L2.

Power circuit wiring:

Connect the heating cable power circuit through the main contacts of the external contactor according to the contactor manufacturer’s wiring diagram and local electrical codes.

IMPORTANT:

- The external contactor must be properly rated for the system voltage, current, and phase.
- The contactor coil voltage must match the controller output voltage.
- The controller controls only the contactor coil. The heating cable load current must not pass through the controller.
- Installation must be completed by a qualified electrician.

WIFI CONNECTION

The controller supports Smart Life app remote control.

Before connecting, please confirm:

- The WiFi network is 2.4 GHz only
- The WiFi signal is stable and strong
- Bluetooth is enabled on your phone
- The router is not overloaded with too many devices

IMPORTANT

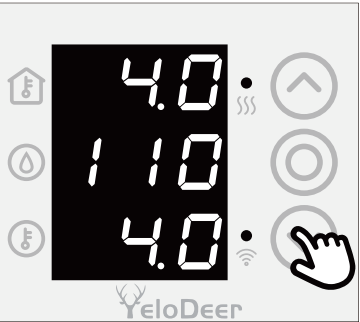
For stable WiFi communication:

- A non-metallic or plastic enclosure is recommended when possible.
- Do not install the controller inside a fully enclosed metal box, as it may weaken or block the WiFi signal.
- If a metal electrical box must be used, check WiFi signal strength before final installation.
- Keep large metal objects at least 19.7 in (0.5 m) away from the controller whenever possible.
- If WiFi connection is unstable, move the controller to a location with better signal or use a non-metallic enclosure.

Enter WiFi Pairing Mode

After powering on the controller:

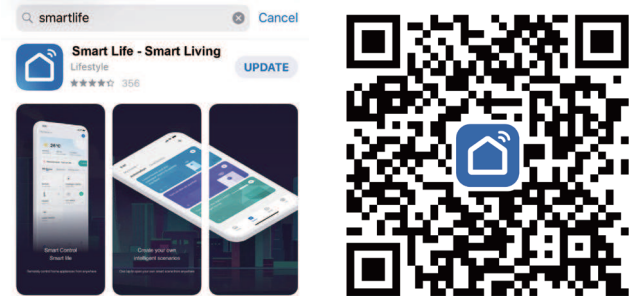
- Check whether the WiFi indicator is flashing
- If the indicator is not flashing, press and hold the ▼ button for 3 seconds
- The flashing WiFi indicator means pairing mode is active



Smart Life App Setup

1. Download the “Smart Life” app from the App Store or Google Play
2. Register or log into your Smart Life account
3. Enter the email address. Enter verification code. Set password.
4. Tap “+” or “Add Device”
5. Enter the WiFi password. Select the controller and click ‘Done’.

After successful pairing, the controller can be remotely monitored and controlled through the app.



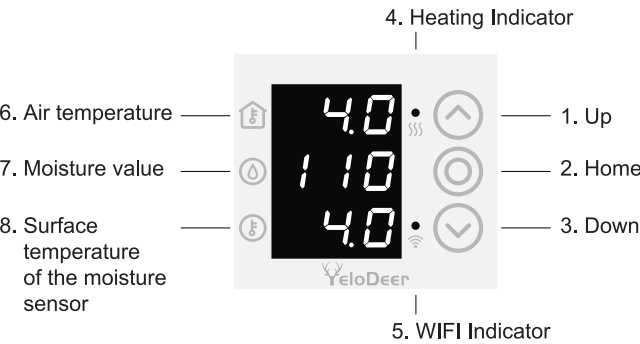
WiFi Connection Troubleshooting

If pairing fails:

- Confirm the WiFi network is 2.4 GHz.
- Move the phone and controller closer to the router.
- Restart the router and try pairing again.
- Make sure the WiFi indicator is flashing before pairing.
- Avoid fully enclosed metal boxes or large metal obstacles near the controller.

DISPLAY & BASIC OPERATION

Display Overview



No.	Button	Operation	Function
1	Up	Press	Adjust parameters
2	Home	Press	Confirm settings
		Press and Hold	Enter the advanced function settings
3	Down	Press	Adjust parameters
		Press and Hold	Enter WiFi pairing mode

No.	Indicator	Meaning
4	Heating Indicator	ON: In Forced Heating mode
5	WiFi Indicator	Flashing: In pairing mode Solid: Wifi Connected
6	Air temperature	Air temperature
7	Moisture value	Moisture value (Lower value = wetter sensor surface. ("dry" = no water detected on the sensor surface.)
8	Moisture Sensor Surface temperature	Moisture Sensor Surface temperature

Auto Mode

Auto Mode is the recommended normal operating mode. In Auto Mode, heating starts only when:

- Outdoor temperature is within the operating range
- Water is detected on the moisture sensor surface

Temperature Limit

Temperature Limit sets the temperature range where the system will start monitoring moisture.

The controller will only detect water/snow and activate heating when the air temperature is inside this range.

Setting Logic

- Above High Limit (HLI): Too warm → no monitoring
- Below Low Limit (LLI): Too cold → no monitoring
- Between HLI and LLI: System active → monitors moisture

This helps avoid unnecessary heating when it is too warm for snow/ice risk, or when it is too cold for effective melting or drainage.

Example Setting:

- Upper Limit: 41 °F / 5 °C
- Lower Limit: 14 °F / -10 °C

Operating Logic:

- **Activation:** The sensor starts monitoring surface water values only when the air temperature is between 14 °F (-10 °C) and 41 °F (5 °C).
- **Deactivation:** If the temperature rises above 41°F (5°C) or falls below 14 °F (-10 °C), the sensor will stop detection.

This prevents unnecessary heating during warm weather or extremely cold conditions.

How to Set Upper Temperature Limit

1. Press and “HLI” appears
2. Press or to adjust the upper limit
3. Press to confirm

How to Set Lower Temperature Limit

1. Press until “LLI” appears
2. Use or to adjust the lower limit
3. Press to confirm

Forced Heating Mode

Forced Heating Mode allows the heating cable to operate continuously for a preset period without checking temperature or moisture conditions.

Typical applications:

- System testing
- Emergency de-icing
- Drying wet surfaces
- Pre-heating before snowfall

IMPORTANT

Forced heating bypasses automatic detection logic.

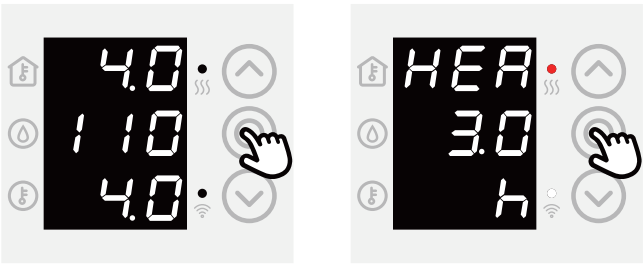
Use this mode only when necessary.

Operation

1. Press on the main interface and the forced heating interface appears
2. Use or to adjust heating hours
3. Press to confirm

The controller will continue heating for the selected duration.

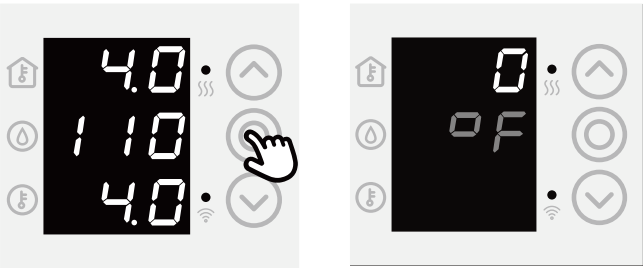
After the selected time ends, the controller exits Forced Heating Mode and returns to normal automatic operation.



ADVANCED SETTINGS

General Guide:

- Press and hold for 3 seconds to enter Advanced Settings.
- Press to switch between functions.
- Press or to adjust values.
- Press to confirm settings.



F#	Interfaces	Function	Default	Setting Range
0		Temperature Unit Selection (°F/°C)	°F	°F/°C
1		Drying delay time	2 hours	0.5-9 hours
2		Air Temperature Calibration	0 °F / 0 °C	±9 °F/±5 °C
3		Moisture Detection Threshold	200	10-990
4		Max Heating Alarm Time	36 h	1-240 h
5		Temperature Hysteresis	1 °F / 1 °C	1-18 °F / 0.1-10 °C
6		Total Heating Hours	—	View only
7		Heating Cycle Counter	—	View only
8		Software Version	—	View only
9		Factory Reset	NO	no / rSt

F0 – Temperature Unit Selection

Select between: °F/°C according to user preference.

F1 – Drying Delay Time

After no water is detected, the system continues heating for the preset period. Default: 2 hours. Range: 0.5–9 hours.

Purpose:

- Remove remaining moisture
- Prevent re-freezing
- Keep surfaces dry

Longer delay times improve drying performance but increase energy consumption.

F2 – Air Temperature Calibration

Used when the displayed temperature differs from the actual ambient temperature.

Example:

Actual temperature: 37 °F (3 °C)

Displayed temperature: 42 °F (6 °C)

Set calibration value: -5 °F (-3 °C)

This function improves temperature accuracy.

F3 – Moisture Detection Threshold

This setting determines when the controller identifies the sensor surface as wet. Default: 200. Range: 10–990.

IMPORTANT

Smaller values indicate MORE moisture.

Typical values:

- Heavy water or melting snow: 50–200
- Damp surface: 200–400
- Dry surface: 600–900

Example:

Threshold = 200

- Reading below 200 → Wet detected
- Reading above 200 → Surface considered dry

For most installations, keep the default value of 200 unless false triggering or missed detection occurs.

F4 – Maximum Heating Alarm Time

If the sensor continuously detects water beyond the preset time, the controller triggers an alarm. Default: 36 hours. Range: 1–240 hours.

Possible causes include:

- Leaves covering the sensor
- Blocked drainage
- Dirt accumulation
- Ice buildup
- Sensor malfunction

This function helps identify abnormal operating conditions.

If this alarm appears, first inspect and clean the moisture sensor surface and check drainage before replacing any components.

F5 – Temperature Hysteresis

Hysteresis creates a temperature buffer zone to prevent frequent ON/OFF switching caused by fluctuating outdoor temperatures. Default: 1 °C / 1 °F

This helps:

- Protect relay life
- Improve system stability
- Reduce unnecessary switching

Example:

Upper limit: 41°F Lower limit: 14 °F (-10 °C) Hysteresis: 1 °F

- When temperature drops below 40 °F (4 °C) → Start monitoring surface moisture
- When temperature continues below 14 °F (-10 °C) → Stop monitoring
- When temperature rises to 15 °F (-9 °C) → Start monitoring again
- When temperature continues to 41°F (5 °C) → Stop monitoring

F6 – Total Heating Hours

Displays the accumulated heating runtime of the system.

This value can be used for:

- Maintenance reference
- Energy usage estimation
- System operation records

F7 – Heating Cycle Counter

Displays the total number of heating activations.

This value helps evaluate long-term system operation frequency.

F8 – Software Version

Displays the current controller software version.

F9 – Factory Reset

Restores all parameters to factory default settings.

Use this function when:

- Reconfiguring the system
- Troubleshooting abnormal settings
- Clearing previous configurations

Factory reset restores parameter settings only. It will not correct wiring errors, sensor damage, or hardware faults.

TROUBLESHOOTING

Normal Conditions (Not Faults)

Condition	Explanation
Heating does not start immediately during snowfall	The sensor detects water, not snow directly. Snow must first melt into water before detection.
Heating continues after snowfall stops	The controller continues heating during the drying delay period to prevent re-freezing.
Display shows "dry"	Sensor surface is dry. Normal operation, no action needed.
System does not start in very cold weather	Outdoor temperature is below the lower temperature limit setting.

Error Codes

Error Code	Description	Possible Causes	Solutions
EOC	External Moisture Sensor OPEN CIRCUIT	Loose wiring, broken cable, sensor damage	Check wiring, cable or replace sensor if necessary
ESC	External Moisture Sensor SHORT CIRCUIT	Incorrect wiring, damaged cable, conductive debris on sensor	Check wiring, cable or replace sensor if necessary
E3C	Moisture Sensor Heating Element Fault	Heater damage, incorrect wiring	Check wiring or replace sensor
Ed	Sensor Dirty / Blocked Alarm	Leaves, ice, poor drainage	Clean sensor surface and check drainage

Error Code	Description	Possible Causes	Solutions
CtS Eoh	Controller Overheat Error	Excessive load, poor ventilation	Reduce load, improve ventilation
CtS ESC	Controller Internal Temperature Sensor Short Circuit	Controller internal failure	Replace controller
CtS EOC	Controller Internal Temperature Sensor Open Circuit	Controller internal failure	Replace controller

SENSORS TESTING

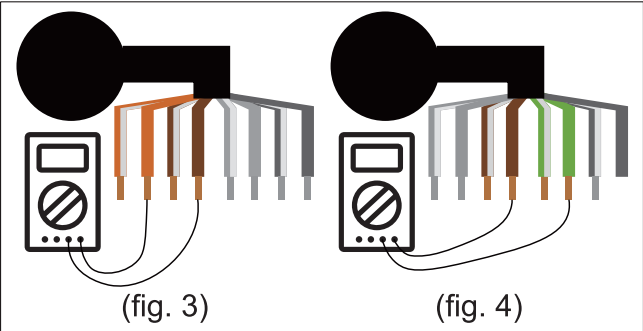
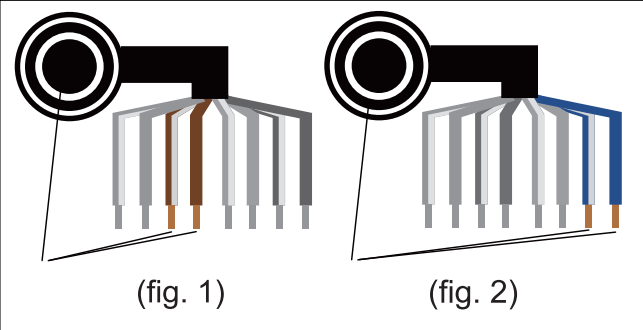
If abnormal sensor operation is suspected, the sensor can be checked using a multimeter.

IMPORTANT: Disconnect power before testing.

Moisture Sensor Wiring Check

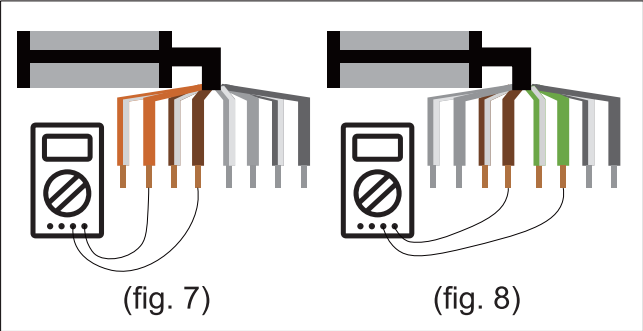
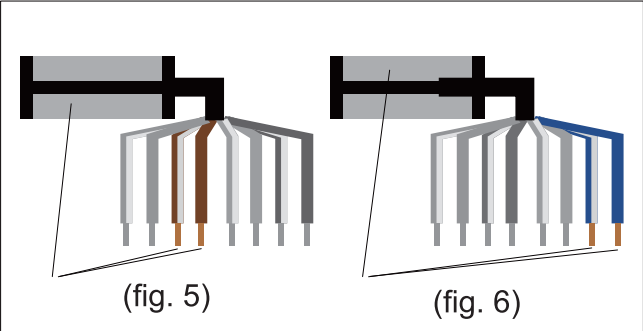
EFS-G

- The brown pair are interconnected with the center of the middle metal (fig. 1).
- The blue pair are interconnected with the second metal ring (fig. 2).
- The resistance between the brown wire and orange wire is 120 Ω (fig. 3).
- The resistance between the brown wire and green wire is in the range of 3 k to 178 kΩ (fig. 4).



EFS-R

- The brown pair are interconnected with the lower metal block (fig. 5).
- The blue pair are interconnected with the second metal ring (fig. 6).
- The resistance between the brown wire and orange wire is 120 Ω (fig. 7).
- The resistance between the brown wire and green wire is in the range of 3 k to 178 kΩ (fig. 8).



If the above four tests all passed, then the moisture sensor is in good condition.

Temperature Sensor Resistance Reference

Temperature	Resistance
-4°F (-20°C)	98,400 Ω
14°F (-10°C)	55,800 Ω
32°F (0°C)	32,800 Ω
50°F (10°C)	19,773 Ω
68°F (20°C)	12,419 Ω
86°F (30°C)	7,905 Ω

Resistance readings may vary slightly depending on temperature, meter accuracy, and wiring length. If readings are significantly outside the specified range, check wiring first before replacing the sensor.

WARRANTY

This product has undergone quality inspection and performance testing before leaving the factory.

A limited 1-year warranty is provided for product quality-related issues.

This warranty does not cover damage caused by:

- Improper installation or use
- Misuse or abuse
- Accidents
- Unauthorized modification
- Cutting, shortening, splicing, or altering the cable
- Damage to the factory-sealed end termination
- Failure to follow this manual

To request warranty service or technical support, please contact our customer service team with your order details, product photos, and a description of the issue.

Website: www.yelodeer.com Email: yelodeer@yelodeer.com

FAQ

Does the system detect snow directly?

No. The system detects WATER on the moisture sensor surface.

Because snow and ice are poor electrical conductors, the sensor uses a built-in heater to melt snow into water before detection.

Why does heating continue after snow stops?

The controller includes a drying delay function. This prevents remaining moisture from re-freezing after snowfall ends.

Why does the system not start immediately when snow begins?

The moisture sensor requires time to melt snow or ice into water before detection can occur. This is normal operation.

Why does the system not start in extremely cold weather?

The controller only monitors moisture when the outdoor temperature is within the set operating range. If the temperature is below the lower limit, the system will not start automatically. This helps avoid ineffective melting or refreezing problems in extremely cold conditions.

Why is the sensor surface important?

Debris covering the sensor may prevent accurate moisture detection. Regular cleaning improves reliability and prevents false alarms.

Can the controller directly power large snow melting systems?

Only if the load current is within the controller relay rating. Large systems must use an external AC contactor.

Can I switch between °F and °C?

Yes. The controller supports both temperature units. The setting can be changed in Advanced Function F0.

Can the controller be remotely controlled?

Yes. The controller supports Smart Life app remote control through WiFi connection.

Why does the display show “dry”?

It means no water is currently detected on the sensor surface. This is normal and not an error.