ComfortScrim

# ComfortScrim
# Low-Voltage Radiant Heating Film
# Installation & Technical Guide

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March 2026

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# 1. Project Overview

## 1.1 Technical Definition

ComfortScrim (low-voltage heating film): a thin-film electric heating element installed on ceiling, wall, or floor surfaces. The system operates at a safe isolation voltage and delivers heat by means of infrared radiant emission. It is classified as a Safety Extra-Low Voltage (SELV) system.

## 1.2 System Components

The system comprises the following principal elements:

- **ComfortScrim heating film —** the primary heat-generating element.
- **Thermostat —** temperature sensing and control device.
- **Control power supply (transformer) —** voltage conversion and circuit protection.
- **Insulation materials —** thermal insulation boards to maximise heating efficiency.
- **Electrical connection system —** cables, terminals, conduit, and accessories.

## 1.3 System Advantages

- **Safe operating voltage:** 48 V AC SELV design — safe for direct human contact.
- **Energy efficient:** high thermal efficiency; reduced energy consumption compared with conventional heating.
- **Reliable and well-protected:** multiple layers of electrical and thermal protection.
- **Healthy and comfortable:** radiant heating provides uniform warmth with no draughts or dry air.

## 1.4 Application Scope

Suitable for the following building types:

1. Residential buildings: living rooms, bedrooms, studies, and similar spaces.
2. Commercial buildings: offices, retail premises, hotels, and similar.
3. Public buildings: schools, hospitals, libraries, and similar.
4. Industrial buildings: workshops, warehouses, and similar.

# 2. Pre-Installation Preparation

## 2.1 Site Preparation

### 2.1.1 Substrate Condition Checks

The following substrate parameters must be verified prior to commencing installation:

| Check Item | Technical Requirement | Test Method |
|---|---|---|
| Flatness | ≤ 3 mm deviation over 2 m | 2 m straight-edge with feeler gauge |
| Dryness | Moisture content ≤ 8% | Cover with polythene sheet for 24 hours; check for condensation |
| Cleanliness | Free of oil, grease, and dust | Visual inspection |
| Structural integrity | No hollows, cracks, or delamination | Tap-test across the surface |
| Plumb (walls) | ≤ 2 mm/m | Plumb bob or digital level |

### 2.1.2 Electrical Load Assessment

The following load calculations must be completed before installation:

5. **Total power:** rated power per panel × number of panels.
6. **Circuit capacity:** total power × 1.2 (providing a 20% safety margin).
7. **Cable selection:** conductor cross-section selected based on total current.
8. **Protective device:** residual current device (RCD) with trip current ≤ 30 mA.

### 2.1.3 Construction Drawing Review

Before commencing work, the following information must be confirmed on the approved drawings:

- ComfortScrim layout positions and dimensions.
- Electrical cable routes and specifications.
- Thermostat and control power supply (transformer) locations.
- Crossings and clearances from other services.
- Required safety distances and spacing.

## 2.2 Tools and Equipment

### 2.2.1 Principal Installation Tools

- **Measuring instruments:** multimeter (accuracy class ≥ 0.5), spirit level (accuracy 0.5 mm/m), tape measure (5 m/10 m), try square (300 mm), infrared thermometer.
- **Cutting tools:** craft knife (sharp blade), stainless steel scissors, wire strippers (insulated handle), cable cutters (heavy-duty).
- **Crimping and joining tools:** crimping tool with matched dies, hydraulic crimping tool (4 mm² die), adjustable heat gun.
- **Fixing tools:** insulated screwdriver set, spanner set (ring/open-ended), percussion drill with variable speed, drill bit set (masonry and metal), hammer (rubber/metal).

# 3. Material Technical Requirements

## 3.1 ComfortScrim Technical Parameters

### 3.1.1 Basic Parameter Table

Table 3.1.1 — ComfortScrim Parameter Table

| Product Number | PG11-048-220-600R (perforated) | PG11-048-220-900R (perforated) | PG11-048-400-600R (perforated) | PG11-048-400-900R (perforated) |
|---|---|---|---|---|
| Installation Surface | Floor | Floor | Wall/Ceiling | Wall/Ceiling |
| Power (W/m²) | 220 | 220 | 400 | 400 |
| Power (W/lm) | 121 | 187 | 220 | 340 |
| Total Width (mm) | 600 | 900 | 600 | 900 |
| Heating Width (mm) | 550 | 850 | 550 | 850 |
| Copper Strip Width (mm) | 20 | 20 | 20 | 20 |
| AC Voltage (V) | 48 | 48 | 48 | 48 |
| Current (A/lm) | 2.52 | 3.9 | 4.6 | 7.1 |
| Max. Current (A) | 16 | 16 | 16 | 16 |
| Max. Heating Length (M) | 6.4 | 4.1 | 3.4 | 2.2 |
| Resistance (Ω/m²) | 34.6±10% | 14.5±10% | 19±10% | 8.0±10% |
| Weight (g/㎡) | 350 | 350 | 350 | 350 |

Table 3.1.2 — Product Code Reference

| 1 | P | G | 1 | 1 | 0 | 4 | 8 | 4 | 0 | 0 | 9 | 0 | 0 | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Code position** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| Bits 1,2,3,4 | Model code | | | | | | | | | | | | | |
| Bits 5,6,7 | Rated voltage | | | | | | | | | | | | | |
| Bits 8,9,10 | Rated heating power of electric heating film per square meter | | | | | | | | | | | | | |
| Bits 11,12,13 | Width of electric heating film (mm) | | | | | | | | | | | | | |

Table 3.1.3 — ComfortScrim Heating Length vs. Resistance Reference Table

| Product Name | PG11-048-220-600R（perforated） | PG11-048-220-900R（perforated） | PG11-048-400-600R（perforated） | PG11-048-400-900R（perforated） |
|---|---|---|---|---|
| Application Scenario | Underfloor Heating | Underfloor Heating | Wall Heating | Ceiling Heating |
| Resistance +/- 10% | 34.6 Ω/m² | 14.5 Ω/m² | 19 Ω/m² | 8 Ω/m² |
| Power (W/sqm) | 220 | 220 | 400 | 400 |
| Voltage (vAC) | 48 | 48 | 48 | 48 |
| Heating Width (mm) | 550 | 850 | 550 | 850 |
| Heating Length (m) | Resistance (Ω)/Current (A) | Resistance (Ω)/Current (A) | Resistance (Ω)/Current (A) | Resistance (Ω)/Current (A) |
| 0.5 | 38.08Ω/1.26A | 24.64Ω/1.95A | 20.95Ω/2.29A | 13.55Ω/3.54 |
| 1 | 19.04Ω/2.52A | 12.32V/3.90A | 10.47Ω/4.58A | 6.78Ω/7.08A |
| 1.5 | 12.69Ω/3.78A | 8.21Ω/ 5.84A | 6.98Ω/6.88A | 4.52 Ω/10.63A |
| 2 | 9.52Ω / 5.04A | 6.16 Ω/ 7.79A | 5.24 Ω/9.17A | 3.39Ω/14.17A |

| | | | | |
|---|---|---|---|---|
| 2.5 | 7.62Ω / 6.30A | 4.93Ω/9.74A | 4.19Ω/11.46A | 2.71Ω/17.71A |
| 3 | 6.35 Ω/ 7.56A | 4.11Ω /11.69A | 3.49Ω/13.75A | |
| 3.5 | 5.44 Ω/ 8.82A | 3.52 Ω/13.64A | 2.99 Ω/16.04A | |
| 4 | 4.76 Ω/10.08A | 3.08Ω/15.58A | | |
| 4.5 | 4.23Ω/11.34A | 2.74Ω/17.53A | | |
| 5 | 3.81 Ω/12.60A | | | |
| 5.5 | 3.46 Ω/13.86A | | | |
| 6 | 3.17Ω /15.13A | | | |
| 6.5 | 2.93 Ω/16.39A | | | |
| Maximum Single Sheet Length | 6.4m | 4.1m | 3.4m | 2.2m |

### 3.1.2 Quality Requirements

- **Appearance:** surface must be flat and even, free of bubbles or scratches.
- **Electrodes:** copper bus bars must be free of oxidation; soldered joints must be secure.
- **Insulation:** insulation resistance ≥ 20 MΩ.
- **Power tolerance:** within ±5% of rated value.
- **Service life:** ≥ 100,000 hours.

## 3.2 Insulation Material Requirements

### 3.2.1 Insulation Board Technical Parameters

| Material | Fire Rating | Thermal Conductivity (W/m·K) | Density (kg/m³) | Thickness (mm) |
|---|---|---|---|---|
| Phospho-carbon phenolic foam board | A2 | ≤ 0.035 | 40–60 | 10–20 |
| Polyurethane (PUR) board | B1 | ≤ 0.024 | 30–50 | 10–20 |
| Extruded polystyrene (XPS) board | B1 | ≤ 0.030 | 30–50 | 20–30 |

### 3.2.2 Insulation Fixing Pin Requirements

- **Material:** plastic or metal.
- **Length:** selected according to insulation board thickness.
- **Diameter:** 8–10 mm.
- **Pull-out resistance:** ≥ 0.3 MPa.
- **Installation density:** minimum 9 pins/m².

## 3.3 Electrical Material Requirements

### 3.3.1 Cable Technical Parameters

| Cable Type | CSA (mm²) | Rated Voltage (V) | Application |
|---|---|---|---|
| RVV6 | 0.5–1 | 450/750 | Control wiring |
| RVV4 | 0.5–1 | 450/750 | Control wiring |
| RVV3 | 0.5–1 | 450/750 | Control wiring |
| WDZB-BYJ | 2.5 | 450/750 | Power supply wiring |
| ZC-BVR | 2.5 | 450/750 | Power supply wiring |

- **Cable quality requirements:** CCC-certified; insulation intact; conductor resistance within standard; temperature rating adequate for application.

# 4. Installation Procedure

## 4.1 Phase 1 — Preparatory Works

### 4.1.1 Conduit and Cable Installation

9. **Conduit installation:** establish conduit routes in accordance with the approved drawings. Use Ø20 mm flame-retardant insulating PVC conduit. Maximum fixing centres ≤ 1 m; minimum bending radius ≥ 10× conduit diameter.
10. **Cable pulling:** inspect conduit for clear passage before pulling. Allow a 10–15 cm tail at each draw-point. No cable joints are permitted within conduits. Cable colour-coding must comply with applicable wiring regulations.

Technical requirements:

- Maximum 4 conductors per Ø20 mm PVC conduit (control cables excepted).
- Total current I ≤ 40 A (4 conductors) or I ≤ 50 A (6 conductors).
- Conduit runs must be straight and level; conduit must be securely fixed.
- Cable insulation must not be damaged.

### 4.1.2 Substrate Preparation

11. **Substrate cleaning:** remove all dust and oil from the substrate surface. Hack off any projections and loose material. Fill cracks and holes. Ensure the substrate is flat and clean.
12. **Damp-proofing:** lay 0.3 mm PE damp-proof membrane in wet or below-ground areas. Overlap joints by ≥ 100 mm and seal with tape to form a continuous barrier.

13. **Levelling:** repair uneven areas with cement self-levelling compound or gypsum-based filler. For depths ≤ 5 mm, use jointing compound; for depths > 5 mm, use cement mortar. Sand smooth once dry.

Technical requirements:

- Substrate flatness tolerance: ≤ 3 mm over 2 m.
- Moisture content: ≤ 8% (no condensation after covering with polythene for 24 hours).
- No cracks, hollows, oil contamination, or sharp projections.
- Substrate strength meets design requirements.

## 4.2 Phase 2 — Insulation Layer Installation

### 4.2.1 Wall Insulation Installation

14. **Cutting:** cut insulation boards to suit the wall dimensions. Cut faces must be straight and square. Cut corners accurately. Allow for expansion gaps.
15. **Fixing:** apply bonding mortar to ≥ 80% of the back face of each board. Orient the long edge of the board perpendicular to the direction of ComfortScrim installation. Boards must be tightly butted; gaps must not exceed 2 mm.
16. **Pinning:** install a minimum of 9 fixing pins per m². Pins are to be fixed at board joints; each board must have at least one pin at centre.
17. **Joint treatment:** fill gaps with jointing filler, apply PVA adhesive, bed joint reinforcement tape, then apply fibre mesh (overlap ≥ 100 mm).

> ℹ Insulation board thickness must match the specified design. Fire performance must achieve a minimum B1 classification. Boards must be firmly bonded with no hollows. Surface flatness tolerance: ≤ 5 mm/2 m.

### 4.2.2 Ceiling Insulation Installation

18. **With suspended ceiling:** fix insulation boards to the ceiling framing. Orient the long edge perpendicular to the ComfortScrim installation direction. Boards must be tightly butted; fix with pins or self-tapping screws.
19. **Exposed ceiling (no suspended ceiling):** bond polyurethane insulation boards to the ceiling using bonding mortar. Orient the long edge perpendicular to the ComfortScrim installation direction. Install a minimum of 9 fixing pins/m².
20. **Fixing requirements:** boards must be fully bonded with no gaps; pins must be evenly distributed and firmly fixed; the surface must be flat.

### 4.2.3 Floor Insulation Installation

21. **Substrate preparation:** clear the floor substrate of debris, oil, and loose material. The substrate must be dry (moisture ≤ 8%), flat (tolerance ≤ 5 mm/2 m), and free from surface laitance or hollows. In damp conditions, lay a continuous damp-proof membrane (overlap ≥ 100 mm; seal joints with butyl tape).
22. **Board laying:** lay boards using full-bed or spot-bonding in accordance with the design. Orient the long edge perpendicular to the direction of ComfortScrim installation. Stagger board joints; gaps must not exceed 2 mm; fill gaps with matching insulation strip.
23. **Fixing:** lightweight insulation boards require additional mechanical fixing. Install ≥ 6 proprietary anchors/m². Anchors must penetrate through the board and embed ≥ 20 mm into the substrate.

24. **Joint sealing:** apply self-adhesive insulation tape (width ≥ 50 mm, overlapping the joint by ≥ 25 mm each side). Where additional reinforcement is specified, apply fibre mesh (overlap ≥ 100 mm) bonded with bonding agent.
25. **Protective screed:** cast a C20 fine concrete protective screed (≥ 30 mm thick) or cement mortar levelling layer (≥ 20 mm thick). Include Ø6@200 anti-crack mesh reinforcement. Cure by water spraying for ≥ 7 days after initial set.

ⓘ Insulation board thickness must match the design specification. Fire performance ≥ B1. Boards fully bonded with no hollows. Damp-proof membrane intact. Screed compressive strength ≥ 15 MPa (concrete) or ≥ 10 MPa (mortar). Overall flatness ≤ 5 mm/2 m. Screed surface free of cracks and surface laitance.

## 4.3 Phase 3 — ComfortScrim Installation

### 4.3.1 ComfortScrim Cutting

26. **Inspection:** check each panel for surface damage, oxidised bus bars, and compromised insulation. Test insulation resistance with a multimeter.
27. **Cutting:** unroll the required length from the roll. Lay flat and mark the cut line using a try square. Cut with scissors along the marked line.
28. **Quality control:** panels must be rectangular or square; angular deviation ≤ 10°. Edges must be straight and clean — wavy or angled cuts are not acceptable.
29. **Testing:** number each cut panel. Test with a regulated DC supply; measure current, power, and DC resistance. Record all results.

Maximum panel length is determined by the bus bar current rating, which must not exceed 20 A. Insulation resistance must be ≥ 20 MΩ. Power tolerance must be within ±5%. No damage to the surface or severe oxidation of the electrodes is permissible.

### 4.3.2 ComfortScrim Laying

30. **Wall installation:** apply bonding mortar 2–3 mm thick uniformly across the designated area. Immediately place the ComfortScrim panel. The panel orientation must be perpendicular to the long joints of the insulation boards. Ensure the panel is flat with no creases.
31. **Ceiling installation:** mark the installation zone on the ceiling as indicated on the drawings. Apply bonding mortar; lay the ComfortScrim immediately, ensuring it is flat.
32. **Floor installation:** snap chalk lines to mark the installation zones as shown on the drawings. Apply bonding mortar 2–3 mm thick uniformly (high-temperature double-sided adhesive tape may be used in addition). Immediately lay the ComfortScrim panel, oriented perpendicular to the long joints of the insulation boards. The panel must be flat with no creases, stretching, or distortion. Space panels as specified. Secure edges with proprietary tape to prevent displacement.

No air voids are permissible beneath any ComfortScrim panel. All panels must be firmly and reliably bonded. Panels must be correctly positioned in accordance with the drawings.

Technical requirements:

- Minimum spacing between any two adjacent ComfortScrim panels: 20 mm.
- Minimum clearance between ComfortScrim and interior wall boundary: 50 mm.
- Minimum clearance between ComfortScrim and flame-retardant insulating PVC conduit: 300 mm.
- ComfortScrim panels must be installed in parallel. Panels must never touch or overlap one another.

## 4.4 Phase 4 — Protection and Levelling

### 4.4.1 Mesh Reinforcement

33. **Cutting:** cut the fibre mesh to suit the wall dimensions. Cut edges must be clean; allow an overlap on all edges; minimise waste.
34. **Application:** apply 3–5 mm gypsum aggregate coat in the direction perpendicular to the ComfortScrim. Embed the mesh into the wet coat; overlap between adjacent mesh sheets must be 30–50 mm. The mesh must be flat and free of wrinkles.
35. **Quality:** the mesh must be fully bonded to the substrate with no hollows or lifting. Surface must be flat; overlaps must be well-formed.

Fibre mesh must be nylon (non-metallic). Metal mesh is strictly prohibited. Minimum mesh weight: 160 g/m². The mesh must have good alkali resistance; tensile strength must comply with the applicable standard.

### 4.4.2 Finish Application

36. **Walls:** apply heat-resistant skim coat (thickness ≤ 5 mm). Once dry, sand to a smooth finish. Apply thermally conductive paint or tile using the thin-bed method (adhesive thickness ≤ 3 mm).
37. **Floors:** for ceramic tile or stone: lay cement self-levelling compound (≥ 30 mm thick) incorporating anti-crack fibres; cure for 7 days. For timber flooring: lay thermally conductive underlay (thickness ≤ 3 mm; thermal conductivity ≥ 0.3 W/m·K).
38. **Ceilings:** apply moisture-resistant skim coat; sand to a smooth finish once dry. Apply emulsion paint or decorative surface finish to a flat and uniform standard.

i All finish materials must be water-resistant or anti-crack grade. Avoid materials containing metallic heat-blocking components. Combustible, self-extinguishing, or toxic insulating materials are strictly prohibited. Surface flatness must comply with the design specification.

## 4.5 Phase 5 — Control Equipment Installation

### 4.5.1 Thermostat Installation

39. **Location:** mount 1.2–1.5 m above finished floor level. Avoid proximity to heat sources and ventilation outlets. Install on a solid masonry wall only — hollow walls and plasterboard partitions are not acceptable. The thermostat should be on the same horizontal level as the room's lighting switches.
40. **Fixing:** form the wall opening to the size required by the thermostat. Insert the thermostat and fix securely with screws, ensuring the unit is level and plumb.
41. **Wiring and commissioning:** connect power, load, and signal cables in accordance with the manufacturer's wiring diagram. Identify and correctly connect the live, neutral, and earth conductors. Tighten terminal screws to a torque of ≥ 0.5 N·m. Energise and configure parameters; test all keys and the display. (Refer to the Appendix for detailed wiring configurations.)

i The thermostat must be located to accurately reflect the ambient room temperature. Avoid proximity to other heat sources, obstructions, direct airflow, and direct sunlight. The installation position must be well-ventilated and dry.

#### 4.5.2 Control Power Supply (Transformer) Installation

42. **Location:** select a well-ventilated, weatherproof location away from occupants — such as an outdoor area, balcony, kitchen, cloakroom, or dry area of a bathroom. Mount on a solid masonry wall. Installation on the timber back panel inside a cupboard or cabinet is strictly prohibited.
43. **Fixing:** mark the fixing positions on the wall. Drill holes and insert expansion anchors. Fix the transformer enclosure, ensuring it is level and plumb.
44. **Wiring:** connect the mains input cable; connect the load output cables; connect the control signal cables. Verify all connections are correct. (Refer to the Appendix for detailed wiring configurations.)

ℹ Minimum installation height: 1.5 m above finished floor level. Enclosure earth connection must be reliable. Good ventilation must be maintained to facilitate heat dissipation. No combustible materials must be present in the immediate vicinity.

# 5. Electrical Connection Standards

## 5.1 General Wiring Requirements

### 5.1.1 Fundamental Principles

- **Safety first:** all work must ensure the safety of both personnel and equipment at all times.
- **Secure connections:** all connections must be mechanically firm with good electrical contact.
- **Sound insulation:** all insulation must be intact with no damage.
- **Clear identification:** all conductors and circuits must be clearly and accurately labelled.
- **Maintainability:** all connections must be accessible for inspection and maintenance.

### 5.1.2 Permitted and Prohibited Connection Methods

Approved methods:

- **Soldering (tin-coat):** for connections between ComfortScrim bus bar and supply cables.
- **Crimping:** for cable-to-terminal connections.
- **Screw terminal connection:** for equipment terminal blocks.

Prohibited methods:

- Twisted joints covered only with insulating tape — prohibited.
- Direct connection between dissimilar conductor materials — prohibited.
- Excessive bending of conductors — prohibited.

## 5.2 ComfortScrim Terminal Fabrication

### 5.2.1 Terminal Fabrication Steps

45. **Bus bar preparation:** using a craft knife or soldering blade, carefully separate and remove the PET overlay from the bus bar to expose the copper strip. The exposed area should be approximately 10–15 mm (length × width). The copper surface must be clean and free of oxidation; the prepared surface must be flat and smooth.
46. **Terminal soldering:** align the terminal cable with the exposed copper bus bar. Using low-melting-point solder (melting point 180–220°C), perform a rapid low-temperature soldering operation with a dwell time of ≤ 3 seconds. The solder joint must be smooth and fully formed with no dry joints.

47. **Insulation treatment:** wrap the solder joint with insulating mastic compound. The mastic must cover a minimum of 20 mm beyond the joint in all directions. Press firmly to seal; no voids must remain. Repeat this treatment at the opposite end of the ComfortScrim panel.

> Use only low-melting-point solder for all ComfortScrim terminal joints in order to prevent heat damage to the film. Solder joints must be smooth and free of whiskers. Insulating mastic must be properly applied for full protection.

## 5.3 Cable Connection Technique

### 5.3.1 Connection Procedure

48. **Main cable preparation:** at the corresponding position on the main supply cable, strip approximately 15 mm of insulation to expose the copper conductors. The conductors must be free of oxidation and broken strands; the insulation cut must be clean and square.
49. **Copper ferrule connection:** position the pre-fitted copper ferrule over the exposed copper conductors. Strip the terminal cable end and insert both the terminal cable and main cable copper conductors together into the ferrule. Crimp with a crimping tool using appropriate pressure.
50. **Insulation and protection:** position the heat-shrink sleeve over the crimp joint. Apply heat using a heat gun at 120–150°C until the sleeve has fully contracted and encapsulates the joint without voids or wrinkles.
51. **Record keeping:** on completion, measure and record the resistance of each ComfortScrim panel.

## 5.4 Control Power Supply Connections

### 5.4.1 Mains Input Connection

52. **Circuit verification:** confirm mains input voltage is within normal range. Verify cable cross-section meets requirements. Confirm cable insulation is intact. Verify earthing is reliable.
53. **Terminal connection:** open the transformer enclosure. Connect the live, neutral, and earth conductors. Tighten terminal screws to the specified torque. Verify the connection is correct.
54. **Insulation check:** after connection, verify insulation — no bare conductors must be exposed. Close and secure the enclosure. Label clearly.

**Required mains input voltage:** 220 V ± 10%

**Earth conductor connection:** Reliable; earth loop resistance ≤ 4 Ω

**Terminal tightening:** All terminals must be firm with no looseness

### 5.4.2 Load Output Connection

55. **Load circuit verification:** confirm cable cross-section meets requirements. Verify cable insulation is intact. Confirm circuit connections are correct. Confirm load power rating is matched.
56. **Terminal connection:** route the main cable to the transformer output terminals. Crimp the cable end and apply solder. Connect to the output terminal; tighten the terminal screw securely.
57. **System test:** energise and verify output voltage. Test load operation. Verify protection functions. Confirm system operation is normal.

## 5.5 Electrical Connection Quality Control

### 5.5.1 Connection Quality Inspection

| Check Item | Inspection Method | Acceptance Criterion | Tool |
|---|---|---|---|
| Mechanical security | Visual inspection; manual pull test | No looseness; no dry joints | Spanner / screwdriver |
| Insulation performance | Insulation resistance test | ≥ 20 MΩ | Insulation resistance tester |
| Contact resistance | DC resistance test | ≤ 0.1 Ω | DC resistance tester |
| Connection correctness | Visual inspection; energised function test | Correct connections; normal function | Multimeter; energised test |

### 5.5.2 Common Faults and Remedies

| Symptom | Probable Cause(s) | Corrective Action |
|---|---|---|
| Loose connection | Terminal screw not fully tightened; poor mechanical contact | Re-tighten terminal screw; re-make connection |
| Poor contact | Contact surface oxidised; connection not sufficiently tight | Clean contact surface; re-make connection |
| Inadequate insulation | Insulation damaged; insulation treatment inadequate | Replace cable; re-apply insulation |
| Incorrect connection | Labelling unclear; workmanship error | Check labelling; re-terminate correctly |

# 6. Quality Control

## 6.1 Material Quality Control

### 6.1.1 Goods-In Inspection

- **ComfortScrim inspection:** model and specification must match the design. Surface must be flat and free of bubbles or scratches. Copper bus bars must be free of oxidation with secure soldered joints. Insulation resistance ≥ 20 MΩ. Resistance value tolerance within ±10%.
- **Insulation material inspection:** polyurethane or phospho-carbon phenolic foam board thickness must match the design specification. Fire rating must achieve a minimum of A2 classification. Surface must be flat and undamaged. Density and thermal conductivity must comply with the specification.
- **Electrical material inspection:** cable type and specification must comply with the design drawings. Insulation must be intact and undamaged. CCC certification must be present. No visible external damage.
- **Control equipment inspection:** transformer and thermostat specification must match the design. No visible damage. Function confirmed normal. Valid product conformity certificate must be present.

### 6.1.2 Material Storage

- ComfortScrim must be stored in a dry, well-ventilated environment.
- Protect from direct sunlight and moisture.
- Store away from chemical substances and corrosive gases.
- Stack height must not be excessive — avoid compression damage.
- Flammable materials must be stored separately in a designated location.

## 6.2 In-Process Quality Control

### 6.2.1 Workmanship Quality Control — Key Stages

- **Insulation layer:** verify substrate flatness and cleanliness; verify adhesion of insulation boards; verify fixing pin quantity and positions; verify joint treatment quality.
- **ComfortScrim installation:** verify panel cut quality; verify panel position and spacing; verify panel resistance values are within ±10% tolerance; verify panel adhesion quality.
- **Electrical connections:** verify cable specification and connection quality; verify terminal fabrication quality; verify insulation treatment quality; verify connection accuracy.

# 7. Intermediate Inspection

Following completion of the ComfortScrim low-voltage radiant heating system installation, and prior to application of the screed or finish layer, a formal intermediate inspection must be carried out as a concealed works inspection. A written notification must be submitted to the relevant parties before the inspection proceeds. The intermediate inspection must include:

- Photographic evidence confirming satisfactory completion of each installation stage.
- Testing of the ComfortScrim total installed power and control power supply functions.

The intermediate inspection of the system must satisfy all of the following requirements:

58. The thickness and installation of the polyurethane insulation board must comply with the design specification.
59. The installed wattage, specification, and type of the ComfortScrim panels must comply with the design specification.
60. **Panel installation:** panels must be securely fixed; no two panels may overlap; low-smoke halogen-free flame-retardant cables (WDZ-BYJR) emerging from the same side of any two adjacent panels must be the same colour.

Control power supply function tests during the intermediate inspection must satisfy all of the following requirements:

61. Repeated start-up of the control power supply must not cause protective devices to trip.
62. Over-temperature protection devices on the transformer, heat sink, and ComfortScrim panels must function correctly.
63. **Control circuit:** must be maintained in its 480-hour protection state.
64. On start-up, the control circuit must produce two consecutive relay contact closure sounds.
65. The programmed interactive control sequence must function correctly.
66. All cooling fans must start and stop automatically and correctly once operating conditions are met.

During the intermediate inspection, the measured installed power of each ComfortScrim panel must be compared against the rated power. A deviation of ≤ 10% is acceptable. All intermediate inspection records must be retained on file.

# 8. Inspection, Commissioning & Acceptance

## 8.1 Inspection, Commissioning & Acceptance Procedure

67. All completion inspection, commissioning, and acceptance activities for the ComfortScrim low-voltage radiant heating system must be formally documented, signed off by all parties, and filed.
68. The system must be checked for all of the following:

- All fixing screws at connection points must be re-tightened and confirmed secure.
- Use a digital multimeter and clamp meter to measure the actual operating voltage and load current of the heating system.
- Check for open circuits, short circuits, poor soldered joints, loose screws, and incorrect conductor specifications. Use a thermal imaging camera to verify uniform heat distribution across all ComfortScrim panels, and to check for hot spots on panels, and within the transformer enclosure. Any hot spot identified must result in an immediate power-down, investigation, and fault clearance.
- Verify thermostat installation and installation quality.
- Carry out commissioning and trial operation of the distribution circuit and the complete ComfortScrim low-voltage radiant heating system.

69. Commissioning and trial operation may commence once the system installation is complete, the finish layer has been applied, and the assembly is permitted to be heated.
70. During initial energisation, the system must be brought up to temperature gradually. The room temperature must not be raised by more than 5°C per day. The temperature must be increased incrementally until the design room temperature is achieved.
71. Thermostat commissioning must be carried out in accordance with the thermostat operating instructions.
72. During first operation, measure the actual operating voltage and load current of the ComfortScrim system. Calculate the total system power using the applicable formula. The total system power must not exceed 90% of the rated output of the control power supply.

## 8.2 Secondary Maintenance

Within the first 100 hours of system operation, a mandatory secondary maintenance inspection must be carried out. This step is intended to further reinforce system safety and reliability. The secondary maintenance inspection must include the following:

73. Re-tighten all connection points within the transformer enclosure, ensuring good contact at every point.
74. Use a thermal imaging camera to carry out a full inspection of the heat output from every ComfortScrim panel. All panels must heat uniformly and consistently. Any non-heating or uneven heating condition must be identified and rectified.
75. Adjust the secondary maintenance circuit to the continuously energised state to ensure stable operation.
76. Measure the current, voltage, and power of each heating zone, and compare with the reference data in the Acceptance Test Record Form held within the control enclosure. Deviations must not exceed ±7%.

# 9. Appendices

## 9.1 System Schematic

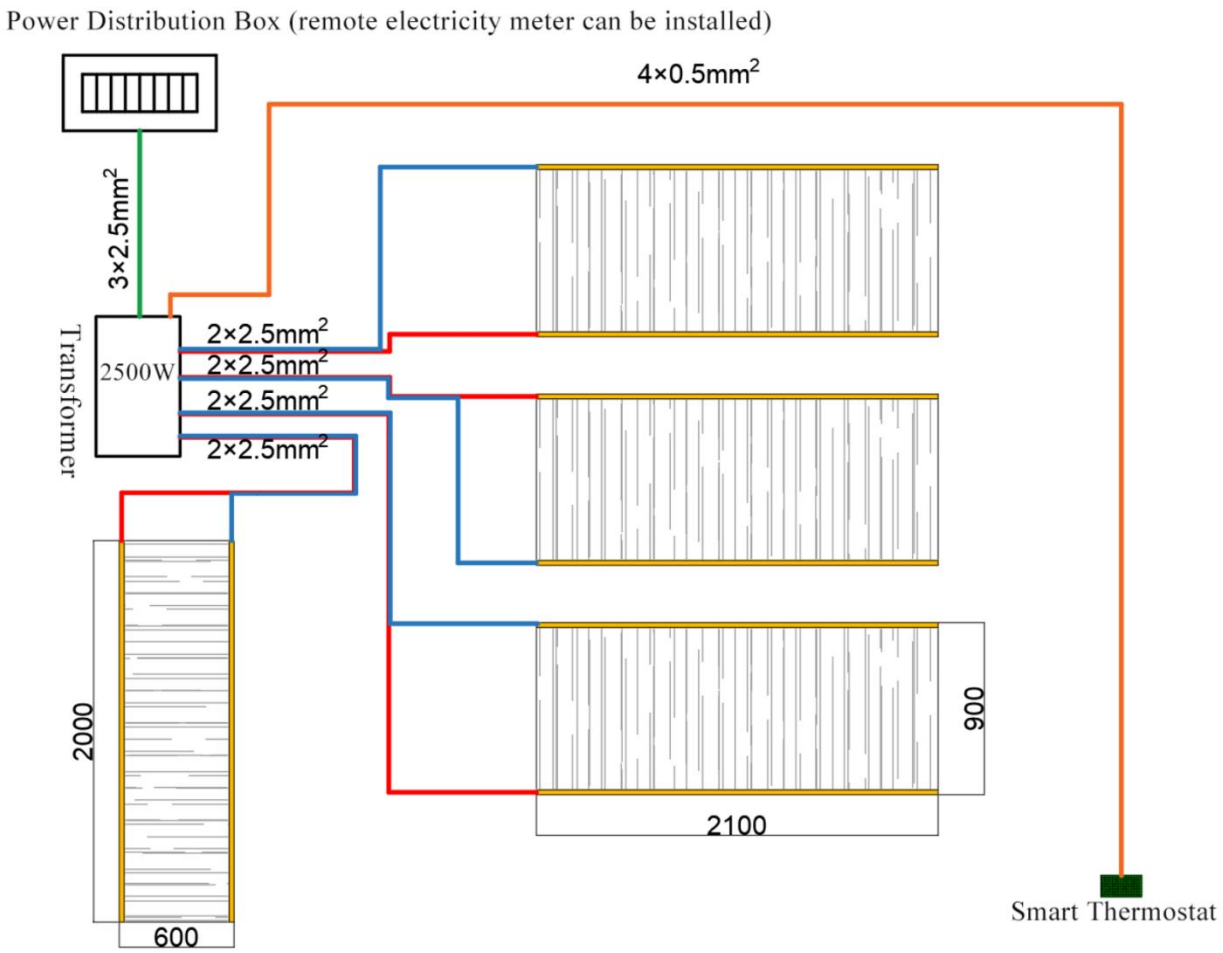



*Figure 9.1 — ComfortScrim Low-Voltage Radiant Heating System Schematic (Power Distribution Board → Control Power Supply / Transformer → ComfortScrim Panels → Smart Thermostat)*

## 9.2 Floor / Wall / Ceiling Layer Diagrams

The following cross-section diagrams illustrate the recommended layer build-up for each installation surface type.

### Ceiling Layer Build-Up

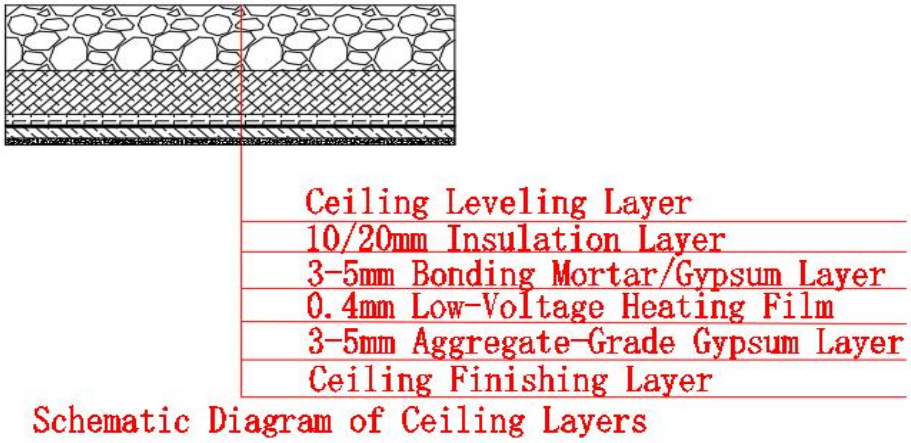



*Figure 9.2a — Ceiling layer diagram*

### Wall Layer Build-Up

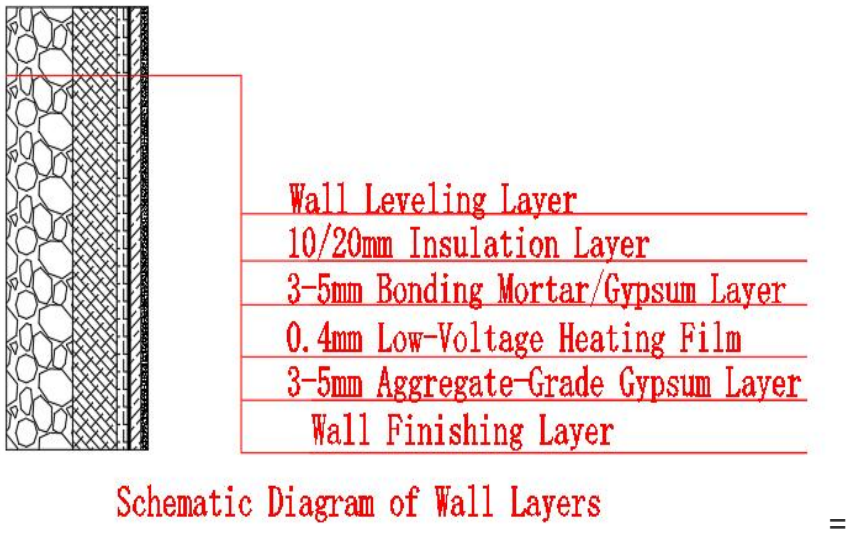



*Figure 9.2b — Wall layer diagram*

## Bathroom Floor Layer Build-Up

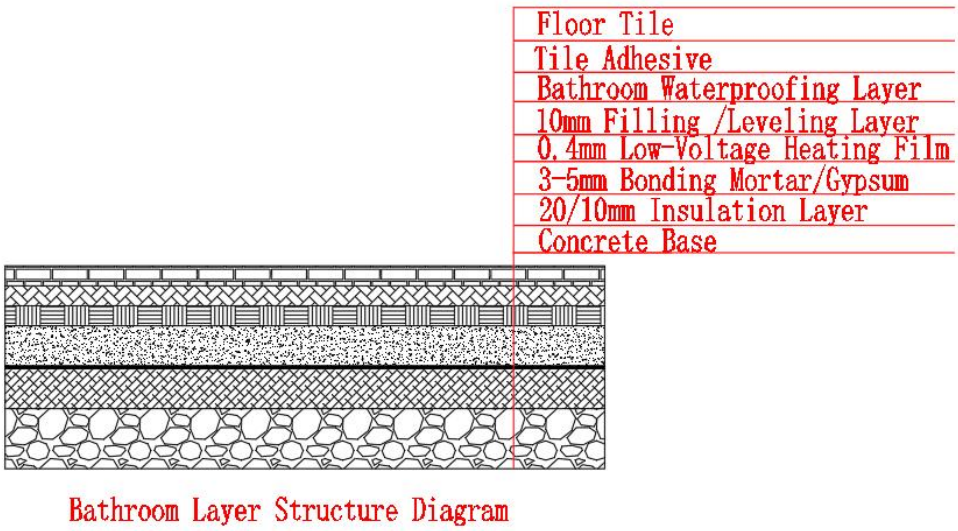



*Figure 9.2c — Bathroom floor layer diagram*

## Timber Floor Layer Build-Up

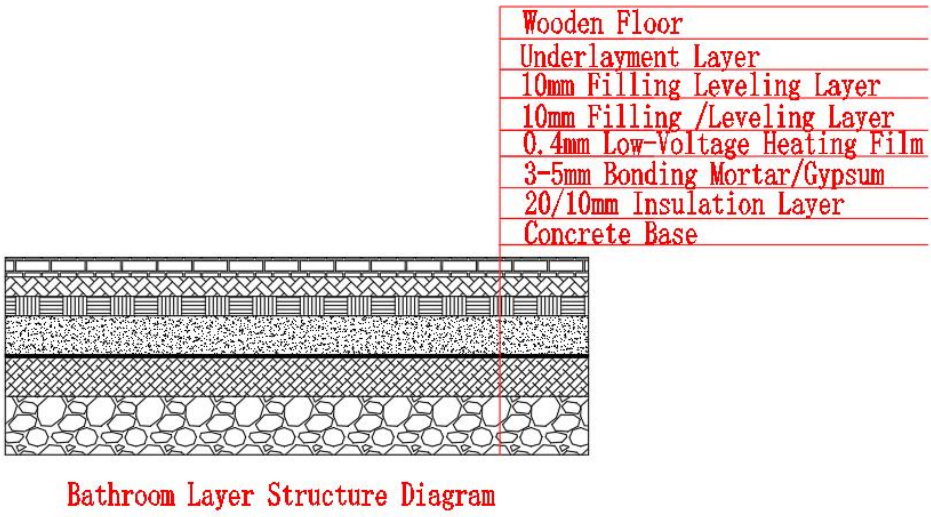



*Figure 9.2d — Timber floor layer diagram*

## Ceramic Tile Floor Layer Build-Up

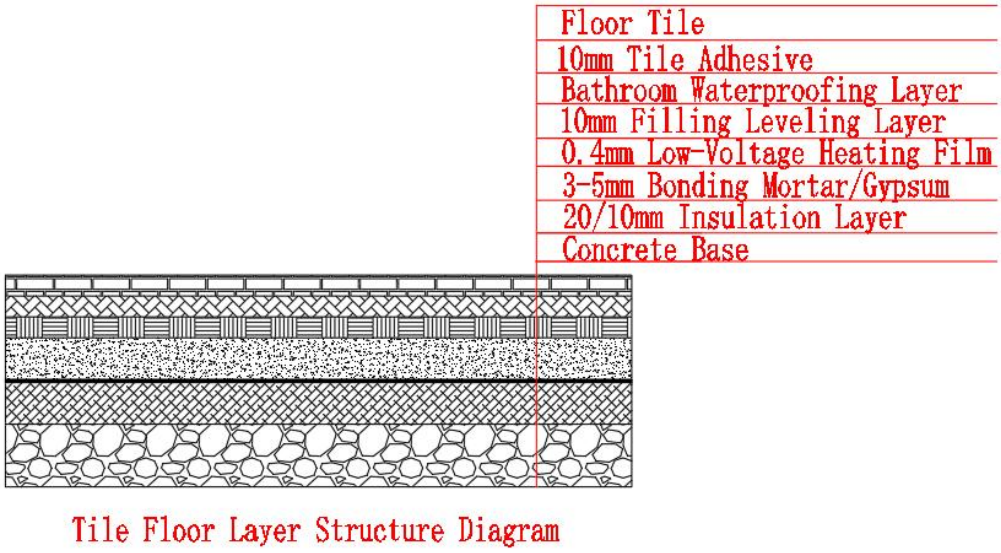



*Figure 9.2e — Ceramic tile floor layer diagram*

## 9.3 Acceptance Test Record Forms

The following forms must be completed during the inspection and commissioning stages and retained on file.

### 9.3.1 ComfortScrim Panel Test Record (per zone)

| **Room No.** | | **Design Total Power (W)** | | **Rated Grid Voltage (V)** | | |
|---|---|---|---|---|---|---|
| **Heating Film Model** | | **First Operation Time** | | **Measured Grid Voltage (V)** | | |
| Pre-Energization Test | | | Post-Energization Test | | | |
| Heating Film No. | Measured Resistance (Ω) | Measured Total Resistance (Ω) | Load Voltage (V) | Current of Heating Film (A) | Total Current (A) | Total Power (W) |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Remarks: | | | | | | |
| 1. Under rated conditions, the operating current of each carbon fiber heating film shall not exceed 20A. If it exceeds 20A, the cause shall be checked. | | | | | | |
| 2. The error between the measured resistance value and the resistance value in the planning drawing shall not exceed 5%. | | | | | | |
| 3. Under rated conditions, the error between the measured total power and the design total power shall not exceed 10%. | | | | | | |
| Test Conclusion | | | | | | |

*Figure 9.3a — ComfortScrim panel pre- and post-energisation test record*

### 9.3.2 Full System Acceptance Test Record

| Low-Voltage Electric Heating Film Heating System Acceptance Test Record Form | | |
|---|---|---|
| | | No.: |
| Project Name | | |
| Project Address | | |
| Construction Unit | | |
| Construction Person-in-Charge | | |
| Agent/Person-in-Charge | | |
| Inspection Item | Quality Requirement | Inspection Result |
| Temperature Control Switch | Wire correctly in accordance with the installation instructions | |
| | The temperature control switch shall be installed 1.4 meters above the ground, and the position shall reflect the average temperature of the room | |
| | The temperature control switch shall be installed horizontally and vertically, tightly attached to the wall | |
| | All temperature control switches shall be equipped with independent power cords; the power cord connections shall be tight, firm and free from loosening | |
| Electric Heating Film | Check the appearance for integrity before installation; the copper strip shall be free from damage, and the carbon cloth shall have no cracks | |
| | Measure and record the resistance value before installation | |
| | Install on the wall to ensure firmness and stability | |
| | Measure whether the resistance value is normal and record it after installation | |
| Wire Connection | When connecting a single-core wire with a multi-core flexible wire, the multi-core flexible wire shall be tinned | |
| | The wire core shall not be exposed after connection with the wire | |
| | When making wire joints by mechanical compression, special tools that ensure sufficient compression force shall be used | |
| | When wires are connected by winding and tinning, reliable insulation measures shall be taken for the connector after winding and tinning | |
| Transformer | Wall-mounted installation shall ensure stability, firmness and no falling off | |
| | Ensure the transformer has sufficient heat dissipation space | |
| | Measure the input voltage to match the transformer before installation | |
| | Ensure the inlet and outlet wire connections of the transformer are firm and stable | |
| | Ensure waterproof measures are in place for outdoor-installed transformers | |
| Commissioning | Turn on the power and measure whether the temperature is normal | |
| | Test whether the current is normal during operation | |
| | Measure whether the room temperature matches the design temperature after stable operation | |
| Acceptance Conclusion | | |
| Acceptor: | | |
| | Acceptance Date: Year Month Day | |

*Figure 9.3b — ComfortScrim Low-Voltage Radiant Heating System — Acceptance Test Record*

## 9.4 Transformer / Control Power Supply Specification Tables

Transformers are bespoke products. Total and branch output capacities may be customised to project requirements. The tables below list standard production models.

### 9.4.1 Standard Multi-Zone Transformer Units (3N series)

| No. | Model/ Specification | Capacity/ Output Voltage | Total Installed Film Power (W) | Unit | Cabinet Dimensions (L*W*H, mm) | Control Mode/ Solid State Relay | Usable Area with 80W/㎡ (㎡) | Usable Area with 100W/㎡ (㎡) | Usable Area with 120W/㎡ (㎡) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3N-1800-48L | 1800VA/48V | 1620 | Set | 320*500*130 | One-to-one:80A | 20.3 | 16.2 | 13.5 |
| 2 | 3N-2000-48L | 2000VA/48V | 1800 | Set | 320*500*130 | One-to-one: 80A | 22.5 | 18.0 | 15.0 |
| 3 | 3N-2400-48L | 2400VA/48V | 2200 | Set | 320*500*130 | One-to-one: 100A | 27.5 | 22.0 | 18.3 |
| 4 | 3N-2800-48L | 2800VA/48V | 2600 | Set | 320*500*130 | One-to-one: 100A | 32.5 | 26.0 | 21.7 |
| 5 | 3N-3200-48L | 3200VA/48V | 2900 | Set | 320*500*130 | One-to-two: 80A+100A | 36.3 | 29.0 | 24.2 |
| 6 | 3N-4000-48L | 4000VA/48V | 3600 | Set | 320*500*130 | One-to-two: 80A+100A | 45.0 | 36.0 | 30.0 |
| 7 | 3N-4500-48L | 4500VA/48V | 4100 | Set | 320*500*130 | One-to-two: 80A+100A | 51.3 | 41.0 | 34.2 |
| 8 | 3N-4800-48L | 4800VA/48V | 4350 | Set | 320*500*130 | One-to-two: 80A+100A | 54.4 | 43.5 | 36.3 |
| 9 | 3N-5300-48L | 5300VA/48V | 4800 | Set | 420*600*145 | One-to-three: 80A+100A+120A | 60.0 | 48.0 | 40.0 |
| 10 | 3N-5700-48L | 5700VA/48V | 5200 | Set | 420*600*145 | One-to-three: 80A+100A+120A | 65.0 | 52.0 | 43.3 |
| 11 | 3N-6200-48L | 6200VA/48V | 5500 | Set | 420*600*155 | One-to-four: 80A(2)+100A+120A | 68.8 | 55.0 | 45.8 |
| 12 | 3N-7000-48L | 7000VA/48V | 6300 | Set | 420*600*155 | One-to-four: 80A(2)+100A+120A | 78.8 | 63.0 | 52.5 |
| 13 | 3N-7500-48L | 7500VA/48V | 6700 | Set | 420*600*155 | One-to-four: 80A(2)+100A+120A | 83.8 | 67.0 | 55.8 |
| 14 | 3N-8000-48L | 8000VA/48V | 7200 | Set | 420*600*155 | One-to-four: 80A(2)+100A+120A(2) | 90 | 72 | 60 |

*Figure 9.4a — Standard 3N-series transformer specification table*

### 9.4.2 Compact Single-Zone Control Power Supplies (SLN series)

| No. | Product Model | Product Description | Dimensions (L*W*H) | Usable Area with 80W/㎡ (㎡) | Usable Area with 100W/㎡ (㎡) | Usable Area with 120W/㎡ (㎡) |
|---|---|---|---|---|---|---|
| 1 | SLN500L-48 | 500W power supply (single control)Input: 220VAC, Output: 48VACTransformer aluminum winding, wall-mounted, including cabinet, transformer soft start, control and protection module, indicator light | 340*218*85mm | 6.3 | 5 | 4.2 |
| 2 | SLN800L-48 | 800W power supply (single control)Input: 220VAC, Output: 48VACTransformer aluminum winding, wall-mounted, including cabinet, transformer soft start, control and protection module, indicator light | 340*218*85mm | 10 | 8 | 6.7 |
| 3 | SLN1000L-48 | 1000W power supply (single control)Input: 220VAC, Output: 48VACTransformer aluminum winding, wall-mounted, including cabinet, transformer soft start, control and protection module, indicator light | 340*218*85mm | 12.5 | 10 | 8.3 |
| 4 | SLN1200L-48 | 1200W power supply (single control)Input: 220VAC, Output: 48VACTransformer aluminum winding, wall-mounted, including cabinet, transformer soft start, control and protection module, indicator light | 440*280*95mm | 15 | 12 | 10 |
| 5 | SLN1500L-48 | 1500W power supply (single control)Input: 220VAC, Output: 48VACTransformer aluminum winding, wall-mounted, including cabinet, transformer soft start, control and protection module, indicator light | 440*280*95mm | 18.8 | 15 | 12.5 |

*Figure 9.4b — SLN-series compact single-zone control power supply specification table*

## 9.5 Transformer & Thermostat Wiring Instructions

The following operating instructions apply to the SLN-series control power supply units.

### 9.5.1 SLN Series — 1-to-1 (Single Zone) Wiring

*SLN-series transformer enclosure*


*Internal PCB — terminal connections*


*Cable identification: ① Input cable ② Thermostat cable ③ Load output cable*

Connection Scheme diagram (1-to-1 configuration):

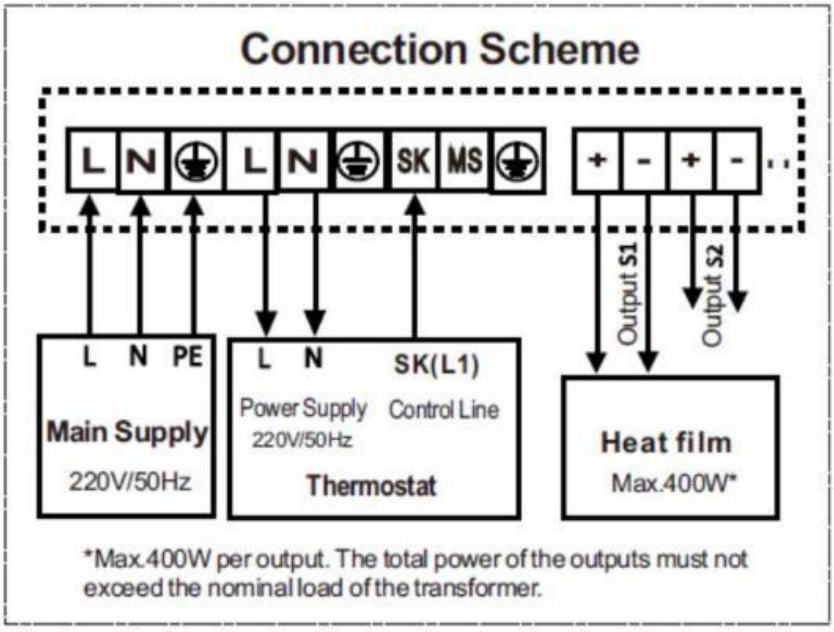


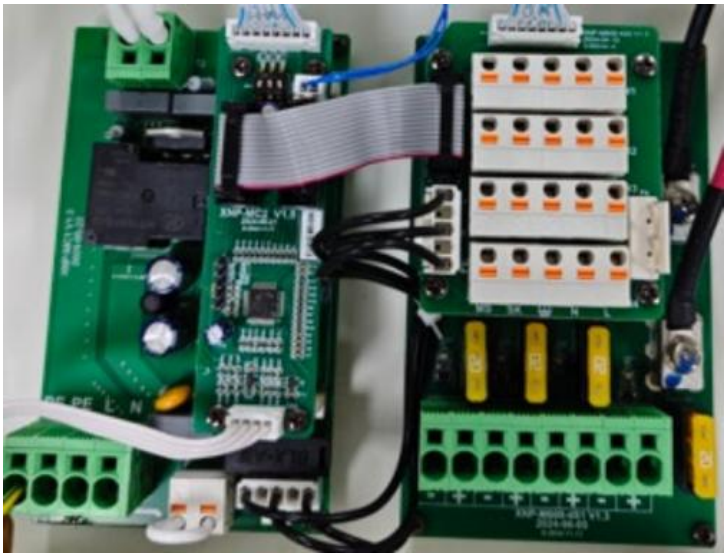

*Figure 9.5a — SLN 1-to-1 connection scheme*

Step-by-step connection procedure:

- **Step 1 — Wall mounting:** fix the unit vertically on the wall using bolts and nuts. The 0.2 m radius around the unit must be kept clear of obstructions.
- **Step 2 — Input wiring:** connect the mains input cable ① to the input terminals. Ensure all connections are complete and securely tightened.
- **Step 3 — Thermostat wiring:** connect the thermostat cable ② to the thermostat control module, connecting L, N, and L1(SK) only. Do NOT connect the N1 neutral output line of the thermostat.
- **Step 4 — Load output wiring:** connect the load output cable ③ to the output terminals.
- **Step 5 — Power on:** energise the main supply. The green indicator on the enclosure will illuminate steadily.
- **Step 6 — Heating test:** send a heating command via the thermostat. The yellow indicator will illuminate steadily. Verify output voltage and current are normal, and that thermostat on/off control is functioning correctly.

### 9.5.2 SLN Series — 1-to-Many (Multi-Zone) Wiring

*SLN multi-zone transformer enclosure*



*Internal PCB — multi-zone terminal layout*

Multi-zone connection scheme:

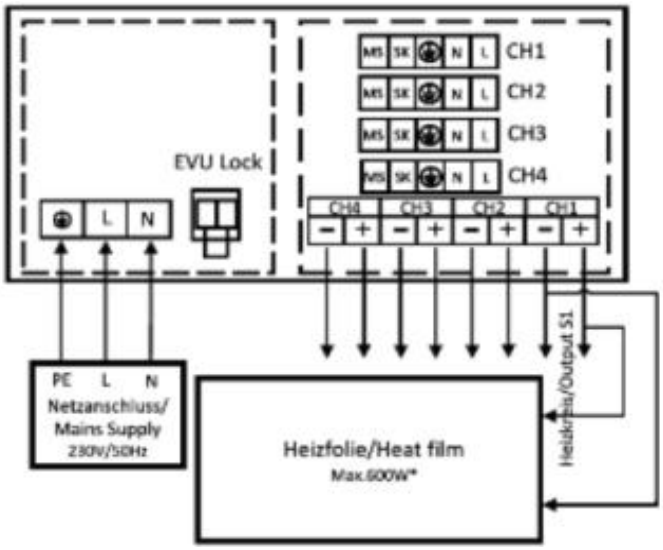



*Figure 9.5b — SLN multi-zone (1-to-many) connection scheme*

Thermostat channel wiring schematic (1-to-many):

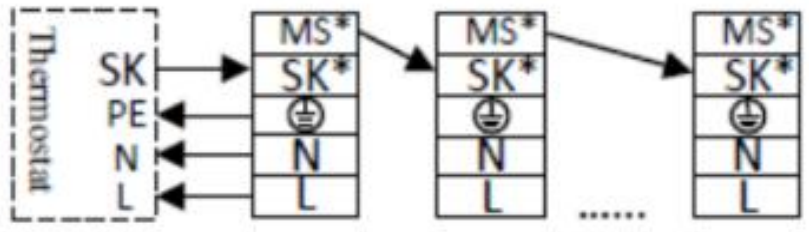



*Figure 9.5c — Thermostat channel connections for multi-zone configuration*

**SLN-Series-1-to-Many(Multi-Zone)Wiring Materials &Tools Reference**
**Product Data-SLN Multi-Zone Control Power Supply**

| Parameter | Value |
|---|---|
| Product name | Dedicated electric heating control power supply |
| Model | SLN1000L-48/4M V1.0 |
| Input voltage | 220 V AC |
| Output voltage | 48V AC |
| Rated load | 1000 W |
| Dimensions (L×W×D) | 460×270×90 mm |
| Weight | 12 kg |

**Materials&Tools Required**

| No. | Material | Specification | Qty | Cable Preparation | Terminal ID | Tool |
|---|---|---|---|---|---|---|
| ① | Input cable | 1.0-6.0 mm² | 1 set | Strip 15 mm,twist end | Input:L,N,PE | Smallflat-head screwdriver |
| ② | Thermostat cable | 0.5-2.0 mm² | 1 sett | Strip 10 mm,twist end | Control module:L,N,SK | Small flat-head screwdriver |
| ③ | Output cable | 2.5-6.0 mm² | 1 set | Strip 15 mm,twist end | '+'and'-'output terminals | Smallflat-head screwdriver |
| — | Bolts &nuts | M8×60 mm | 4 sets | N/A | Wallmounting | Rotary hammer drill |

**Cable Preparation Notes**

· Solid-core(single-strand)cables:strip the insulation and insert directly-no copper ferrule is required.

· Flexible(multi-strand)cables:it is recommended to crimp a copper ferrule onto the stripped end before insertion to prevent strand spreading.

*Figure 9.5d — Materials & tools table; SLN 1-to-many wiring*

| SLN-Series-1-to-Many(Multi-Zone)Wiring<br>Step-by-Step Connection Instructions<br>Important Wiring Notes | |
|---|---|
| Thermostat output channels CH1/CH2/CH3/CH4 must correspond exactly to transformer output load channels CH1/CH2/CH3/CH4—one-to-one correspondence is mandatory.Do NOT connect the N1(neutral output)wire from the thermostat. | |
| **Step-by-Step Installation** | |
| 1.Mount the enclosure vertically on a solid wall using M8×60 mm bolts and nuts.Maintain a clear radius of 0.2 m around the unit for ventilation.<br>2.Connect the mains input cable ①to the input terminals.Ensure all connections are complete and terminal screws are firmly tightened.<br>3.Connect the thermostat cable ②to the control module,connecting L,N,and SK(L1)only.Do NOT connect the thermostat N1 line. | |
| 4.Connect the output load cable ③to the output terminals.Ensure the 0V and 48 V conductors within each channel (e.g.CH1)are not cross-connected to a different channel (e.g.CH2 or CH3). | |
| 5. Energise the main supply.The green indicator on the enclosure will illuminate steadily. | |
| 6.Send a heating command via the thermostat.The yellow indicator will illuminate steadily.Verify output voltage and current are normal,and that thermostat on/off control functions correctly. | |
| **Post-Installation Checks** | |
| · Confirm all terminal screws have been tightened to the correct torque.<br>· Confirm there are no exposed bare conductors at any connection point.<br>· Confirm indicator light status corresponds to expected system operation. | |
| · Record all measured values in the Acceptance Test Record Form held within the control enclosure. | |

**Fault Indicators-Quick Reference**

| Indicator | Fault Condition | Required Action |
|---|---|---|
| Green —steady | Normal—input voltage within range | No action required |
| Green —flashing | Input voltage abnormal | Check mains supply;unit auto-restarts on recovery |
| Yellow—steady | Normal—heating load active | No action required |
| Red—steady | Overload /over-temp/short circuit | Disconnect;investigate and clear fault;restart manually |

*Figure 9.5e — Step-by-step wiring instructions; SLN 1-to-many configuration*

## 9.6 Thermostat Operating Manual — BHT-002

The following pages reproduce the BHT-002 thermostat operating manual in full.

LaminaHeat

# BHT-2000 Series Thermostat

User Guide


For Water Heating/Boiler/Electric Heating

WIFI Type

## Welcome

Thank you for your purchase.

Your new thermostat will provide uniform and comfortable temperature control throughout every room in your property. We bring together technology, craftsmanship and the highest quality materials to provide you with a safe, reliable product combined with sleek, contemporary design.

Please read this installation/programming manual for comprehensive instructions on installing and operating your thermostat. Please also ensure a suitably qualified person installs your thermostat and complies with all local regulations.

## In the box you will find

| | | | |
|---|---|---|---|
| Thermostat | 1pc | Screws | 2pc |
| User Guide | 1pc | Floor Sensor (2.5m) | 1pc |
| QC Passed | 1pc | (Floor sensor is Optional) | |

## ABOUT YOUR THERMOSTATS

The BHT-2000 range has been developed to control electric underfloor, water heating or water/gas boiler systems. These units are designed for use in commercial, industrial, civil and domestic properties

## MODEL DEFINITION

GA: Water heating, 3A
GB: Electric floor Heating, 16A
GC: Water/Gas Boiler, 3A
L: Backlight
P: Weekly Programmable
N: Modbus Communication
W: Wifi
S2: Both internal sensor and floor external sensor
***For example: BHT-2000 GCLP***

## FEATURES

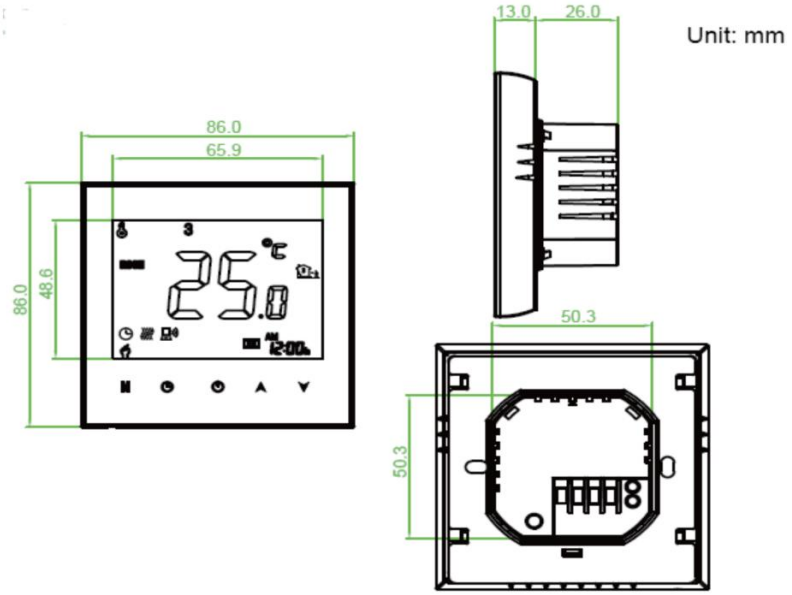
### On Appearance

1.Negative black screen will bring you a secret world.
2. 65.9*48.6 mm display area helps to protect your eyes.
3. Glass or Acrylic Lens is for your selection.
4. Touch buttons to make simple operation.
5. Amazing Silver Frame opens your modern life.
6. The visiable thickenss above the wall is only 13 mm.
7. Interlock to connect gives you easy installation.
8. 86mm hidden box and european 60mm round box is suitable.
9. White, black or gold housing creates your colorful life.

### On Functionality

1. Powerful functions are available such as Modbus/WIFI etc,
2. 0.5°C Accuracy keeps temperature within the level you set.
3. Data memory when power is off.
4. 5+2 six periods programmable maximize comfort and economy.
5. Creat thermostat group to Centralized control
6. Interated with Amazon Echo ,Google Home , Tmall Genie
7. All setting languages synchronize your time zone, address and language.
8. No limit to add rooms and support Smart Scene.

## DIMENSION




## TECHNICAL DATA

Power Supply: 95 ~ 240 VAC, 50 ~ 60HZ
Current Load: 3A (water heating/water boiler/gas boiler)
16A (electric heating)

Sensor: NTC3950, 10K
Accuracy: ±0.5℃ or ±1℉
Set Temp. Range: 5 -35℃
Dispaly Temp. Range: 5 ~ 99℃
Ambient Temp.: 0 ~ 45 ℃
Ambient Humidity: 5 ~ 95 % RH (Non Condensing)
Storage Temp.: -5 ~ 45 ℃
Power Consumption: <1.5W
Timing Error: < 1%
Shell Material: PC +ABS ( Fireproof)
Installation Box: 86 * 86mm Square or European 60mm Round Box
Wire Terminals: Wire 2 x 1.5 mm2 or 1 x 2.5 mm2
Protection Class: IP20
Buttons: Capactive Touch Buttons

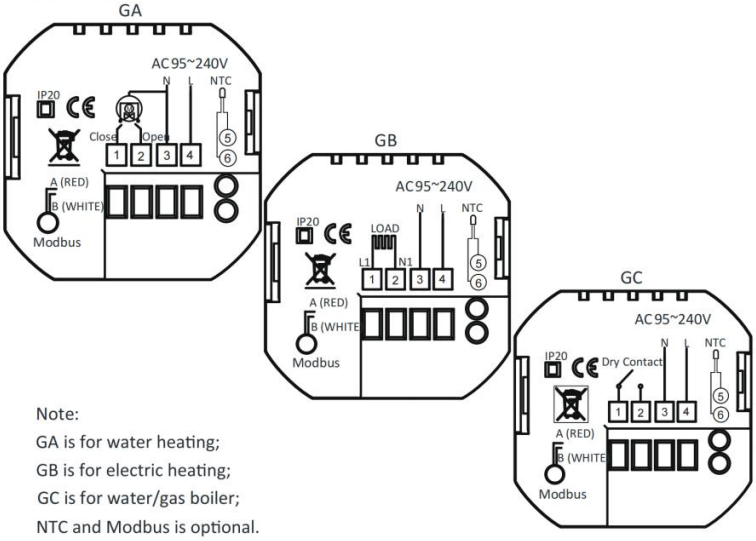
## BEFORE WIRING AND INSTALLING

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

### CAUTION

**Electrical Shock or Equipment Damage Hazard. Can shock individuals or short equipment circuitry.**
**Disconnect power supply before installation.**

## WIRING



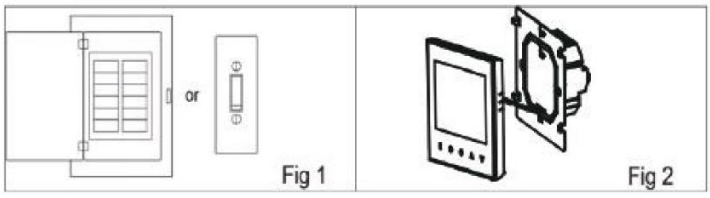

Note:
GA is for water heating;
GB is for electric heating;
GC is for water/gas boiler;
NTC and Modbus is optional.

## INSTALLATION

Your thermostat is suitable for installation within a standard 86mm pattress box or European 60mm pattress box.

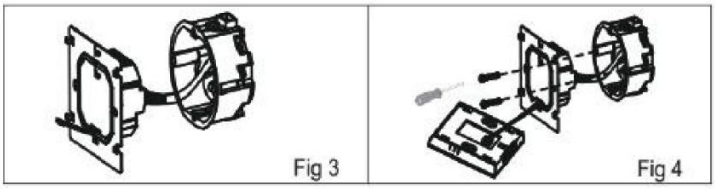
Step 1. Keep power off. See Fig 1.

Step 2. Slide the LCD assembly down to remove the mounting plate. Fig 2.



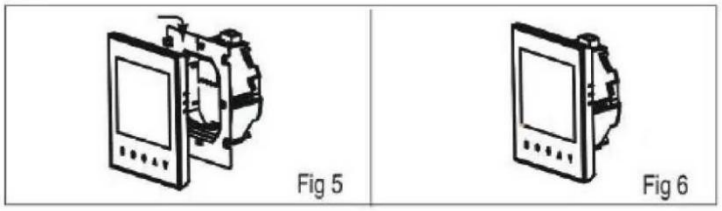

Step 3. Connect power supply, load into the appropriate terminals. (see “Wiring your thermostat” for details and Fig 3).

Step 4. Fix the mounting plate into the wall with screws in the box. See Fig 4.

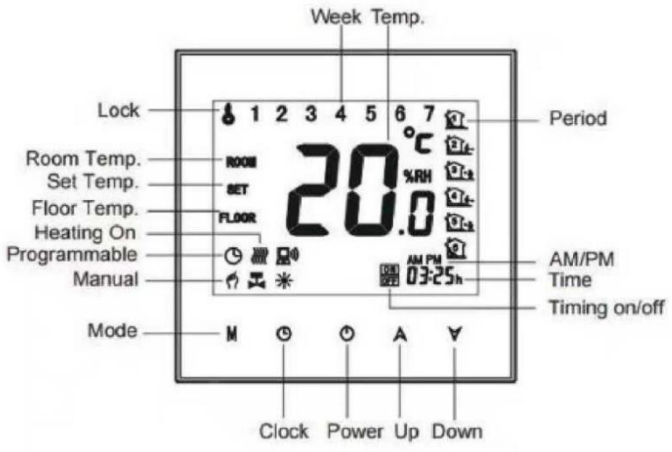



Step 5. Fasten body of thermostat and the mounting plate through rotating. See Fig 5.

Step 6. Installation complete. See Fig 6.




## HOME SCREEN QUICK REFERENCE




## OPERATION

### During Power On

**1. Power On/off:** Press ⏻ to turn the thermostat on/off.

**2. Manual & Programmable**

Touch **M** (mode) to change between manual mode and programme mode. In manual mode, ✋ will show in the bottom left of the screen In programmable mode, the period icon will show in the right side.

**3. Setting Temperature**

In the mode of programmable, set temperature, time could not be adjusted. If the user want to change, please go to manual mode or programmable mode.

In the mode of manual, press ∧ ∨ to set the desired temperature.

**4. Adjusting/Setting the Clock**

Touch the icon 🕒 to set minute, hour and weekday (1 = Monday, 2 = Tuesday etc.) by using the ∧ ∨ arrows. Press 🕒 once more to confirm and exit.

**5. Locking your Thermostat**

Press and hold the ∧ ∨ for 5 seconds to lock/unlock your thermostat In item 3 of high senior options, you can select full lock or half lock.

**6. Adjusting/setting the Program Schedules**

When Wi-Fi connection is made, your thermostat will automatically accept the program schedule made via the APP on your device (see below for detailed instructions) To set the program schedules through your thermostat (NOT via your smartphone/tablet) simply follow the instructions as below:

**Please note: Setting the programme schedule through your thermostat can only be carried out if there is no Wi-Fi connection between your thermostat and smartphone/tablet.**

Touch M to change between manual mode and programme mode. In manual mode, ✋ will show in the bottom left of the screen. In programme mode, touch and hold the icon 🕒 until the weekday

schedule settings appear (1 2 3 4 5 will show along the top of the screen).
Use the ∧ and ∨ arrows to adjust the on time.
Press the icon ◷ and use the ∧ and ∨ arrows to set the off time (2nd period).
Press the icon ◷ and use the ∧ and ∨ arrows to set the temp.
Repeat this process for periods 3 4and 5 6.
Press the icon ◷ once more to enter the Saturday schedule settings (6 will show along the top of the screen).
Repeat the above process to set the period and temp. and Sunday schedule.
Press ◷ once more to confirm and exit.

**Default settings for program schedule**

| Time display | WEEKDAY (MONDAY – FRIDAY) (1 2 3 4 5 shows on screen) | | WEEKEND (SATURDAY) (6 shows on screen) | | WEEKEND (SUNDAY) (7 shows on screen) | |
|---|---|---|---|---|---|---|
| | TIME | TEMPERATURE | TIME | TEMPERATURE | TIME | TEMPERATURE |
| Period 1 | 06:00 | 20°C | 06:00 | 20°C | 06:00 | 20°C |
| Period 2 | 08:00 | 15°C | 08:00 | 20°C | 08:00 | 20°C |
| Period 3 | 11:30 | 15°C | 11:30 | 20°C | 11:30 | 20°C |
| Period 4 | 13:30 | 15°C | 13:30 | 20°C | 13:30 | 20°C |
| Period 5(1+2) | 17:00 | 22°C | 17:00 | 20°C | 17:00 | 20°C |
| Period 6(3+4) | 22:00 | 15°C | 22:00 | 15°C | 22:00 | 15°C |

A separate schedule may be set for weekdays (Mon – Fri) and for weekends (Sat or Sun).

## 7. Checking the Temperature of Floor Sensor

Press and hold the ∨ arrow for 5 seconds to display the temp. of floor sensor.

## 8. Return To Factory Default

Press the Reatore Manufacturer Defaults, you can reset thermostat.
Steps:Open your app -go into your room - click menu on the top right corner - move to the end - Press Restore Manufacturer Defaults.

During Power Off

## Setting the Functions and Options

When power is off, press and hold **M** and ◷ at the same time for 5 sec. in order to reach system function. Then press M to scroll through the available functions, and use the ∧ and ∨ arrows to change the available options. All settings are confirmed automatically.

| Code | Function | Setting and options | Default |
|---|---|---|---|
| 1 | Temperature compensation | -9 to + 9 ℃ (for internal sensor) | -1 |
| 2 | Deadzone Temperature | 1 ~ 5 ℃ | 1 |
| 3 | Button locking | 00: All buttons are locked except power button.<br>01: All buttons are locked. | 01 |
| 4 | Sensor types | In: Internal Sensor （to control the temp.）<br>Ou: External Sensor （to control the temp.）<br>AL: Internal/ External Sensor （Internal sensor to control the temp., external sensor to limit the temp.） | AL |
| 5 | Min. Set Temp. | 5-15 ℃ | 05 |
| 6 | Max. Set Temp. | 15-45 ℃ | 35 |
| 7 | Display Mode | 00： Display both set temp. and room temp.<br>01： Display set temp. only | 00 |
| 8 | Low temperature protection setting. | 0-10 ℃ | 00 |
| 9 | High temperature protection setting. | 25-70 ℃ | 45 |
| A | Economy Mode | 00: Non-energy saving Mode<br>01: Energy saving mode | 0 |
| B | Economy Temp. | 0-30 ℃ | 20 |
| C | Standby Brightness | 3-99 | 04 |

# ABOUT WIFI

## WI-FI CONNECTION

Before using your Wi-Fi thermostat for the first time,you must configure the Wi-Fi signal and settings through your smartphone or tablet ,This will allow communication between your connecteddevices

### Step 1 Download your APP (Fig1-1)

Fig 1-1

Fig 1-2 IOS

Fig 1-3 Android

Search for "Smartlife" in Apple Store or Google Play or use a browser to scan the QR code above (Figure 1-2), and complete account registration and installation according to the guidance of the APP.

### Step 2. Connect the thermostat

Check the tutorial below to complete the connection and setup.

Method 1: Scan the QR code to configure the network guide (Fig 2.1-Fig 2.3)

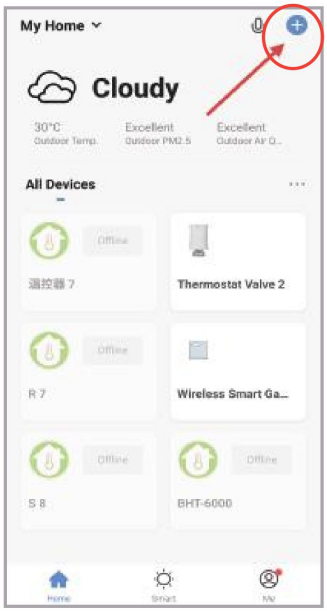



Fig2.1

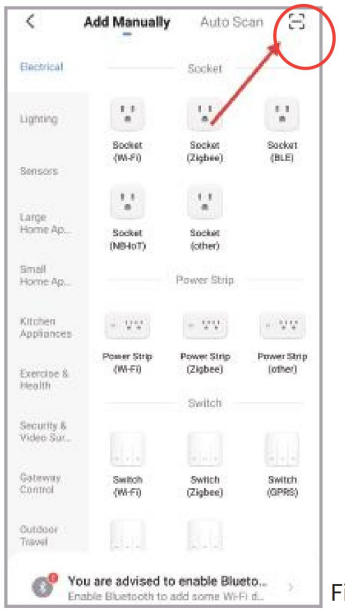



Fig2.2

Scan this QR code


Fig2.3

Method 2: Ordinary distribution network guidance
(Fig. 2. 1&Fig. 2.3.1)

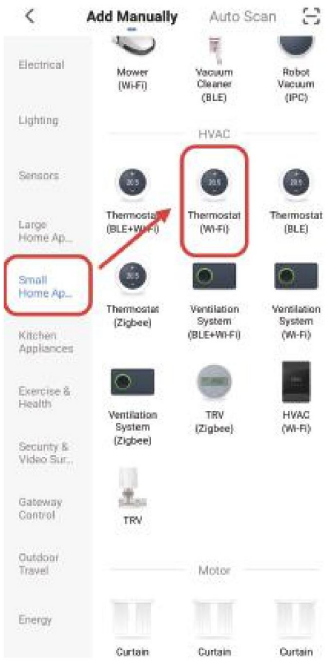



Fig2.3.1

## Network distribution mode:

1、 EZ Mode
When the thermostat is off, press and hold the " ⩛ "until the thermostat screen flashes quickly and displays the " ᯤ " icon, and then operate according to the following figure (Fig 2.4-Fig 2.7).

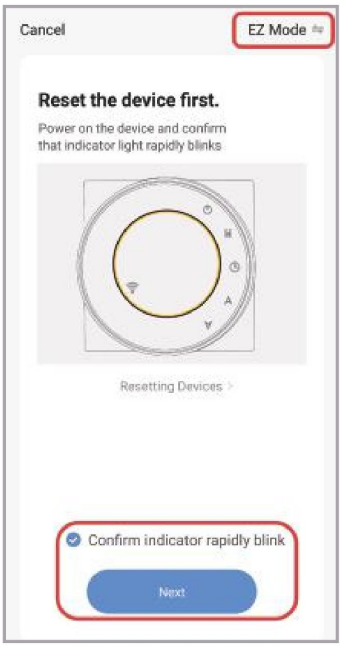



Fig2.4


Fig2.5


Fig2.6

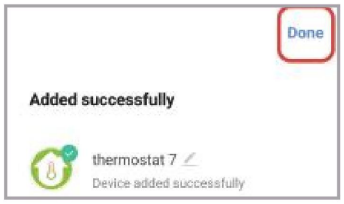



Fig2.7

2、AP Mode

When the thermostat is off, press and hold the " ▽ " until the thermostat screen flashes slowly and the " ◔ " icon is displayed (if the " ᯤ " icon appears, continue to press the " ▽ " until the thermostat screen Flashes slowly and displays the " ◔ " icon), and then operate according to the following figure (Fig 2.8-Fig 2.14)

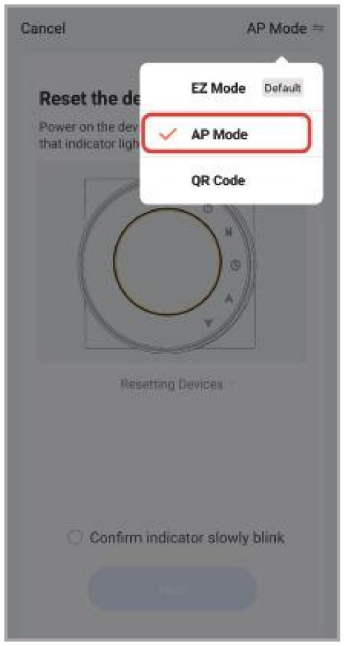



Fig2.8

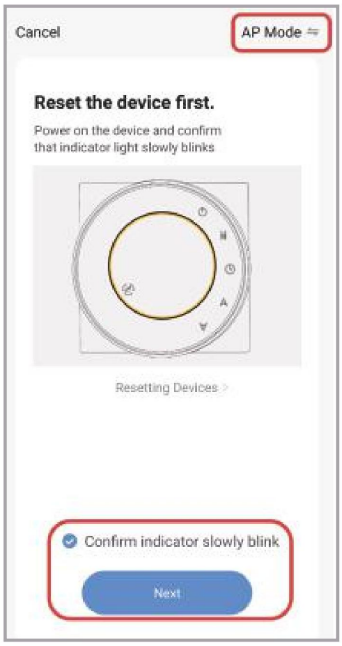



Fig2.9

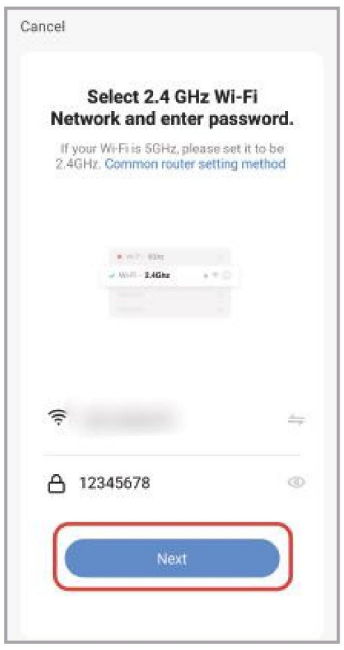



Fig2.10

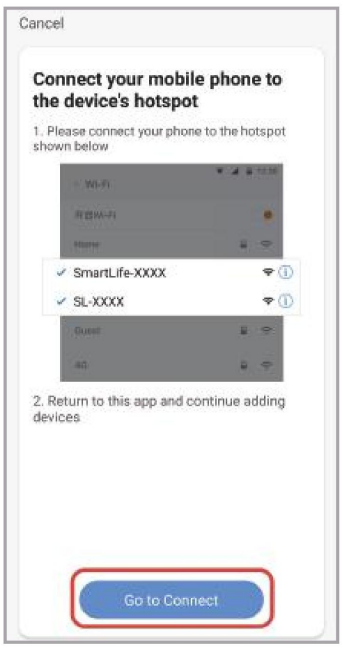



Fig2.11

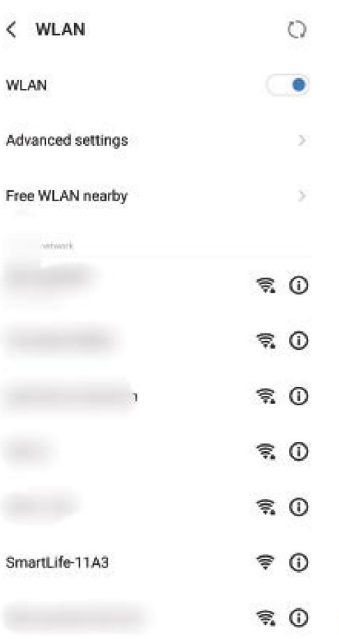



Fig2.12


Fig2.

After connecting to this hotspot, return to the "smartlife" APP

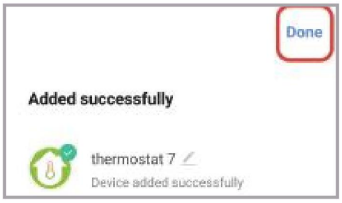
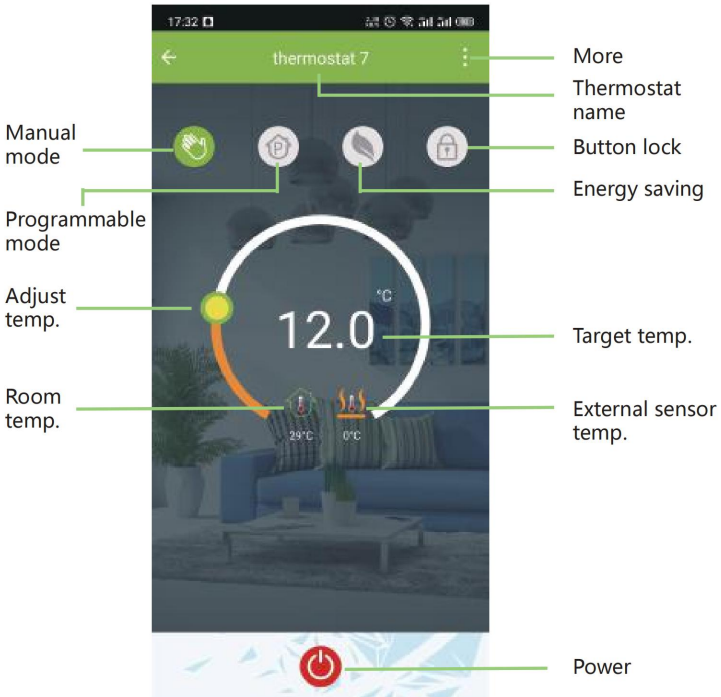
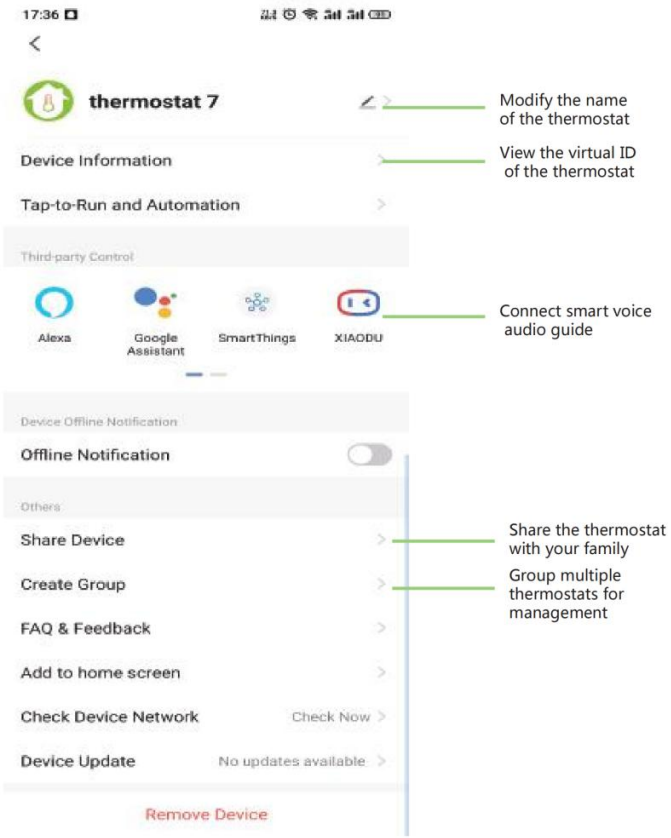



Fig2.14

## APP operation interface description (heating thermostat) )



# More settings






## SIMPLE EXCEPTION HANDLING

| No. | Phenomenons | Handling |
|---|---|---|
| 1 | Power is on but without display. | * Check if the terminals between LCD panel and Power Unit Box is loosen. |
| 2 | Without output but display works. | * Use a new LCD panel or new Power Unit Box to replace the old one. |
| 3 | Room Temp. Is a little different from the actual. | * Do temperature calibration in item 1 of high senior options |

## SERVICE

**Your thermostat carries an 24 months warranty from date of purchase. Service outwith the warranty period may incur a charge. More detail please contact with us directly.**