Heat Emitter Guide for Domestic Heat Pumps

Heat pumps can provide high-efficiency, low-carbon heat for dwellings. Their performance is optimised if low-temperature heat emitters are used for heat distribution in the house, so this guide aims to help you select an emitter type and operating temperature which will result in high efficiency and low running costs.

The guide uses a Temperature Star Rating to indicate how efficient the proposed system is likely to be. More efficient systems are given a higher number of stars. The maximum is 6 stars. More stars are given when lower heat emitter temperatures are used because the heat pump is able to operate more efficiently.

Heat Emitter Guide
for Domestic Heat Pumps

Who produced this guide?
Trade Associations representing heat pumps and heat distribution technologies have worked together to produce this guide which is supported by DETE and EST. Participating members are

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Examples for existing radiator systems

Calculating the Temperature Star Rating of an existing radiator system

An example of a poorly insulated room has been adopted from CIBSE’s Domestic Heating Design Guide. The room is assumed to be in London (design outside air temperature = –10°C) and it has single glazing. The heating is assumed to be used continuously.

Room heat loss: 1938 W

Size of existing radiator: 1800 x 750 H x 750 W (60°C) Output power: 1671 W

Existing radiator rated output at MW+H = 0°C: 2349 W

Existing radiator rated output at MW-H = 0°C: 734.5 W x 0.825 = 1038 W

Calculate the Oversize Factor and look up the Temperature Star Rating on the chart.

Oversize factor: 1938/1038 = 1.9

Radiator flow temperature: 50°C

To operate at these temperatures, a specialist heat pump would be required. To operate at these temperatures, a specialist heat pump would be required.

You must therefore take action to ensure satisfactory operation.

The examples on this page demonstrate the impact of reducing heat losses and increasing radiator output. Use the Guidance Table over the page to redesign the emitter system.

Reducing fabric and ventilation heat losses

Reducing the fabric and ventilation heat loss is an efficient way to improve the temperature Star Rating because it reduces energy consumption and improves the system’s efficiency. It is often worthwhile reducing heat losses when making changes to a house.

The examples on this page demonstrate the impact of reducing heat losses and increasing radiator output. Use the Guidance Table over the page to redesign the emitter system.

Reducing fabric and ventilation heat losses and upgrading the existing radiators

This section shows how the two processes can be combined to produce a more efficient installation.

Reducing improved room heat loss: 1738 W

New radiator output: 2022 W

New temperature Star Rating: 5.3

New radiator flow temperature: 50°C

Likely GSHP heating SPF: 5.2

Likely ASHP heating SPF: 3.4

Notes and assumptions used to create this guide

Heat pump heat delivery. Performance factor (SPF) is calculated for spaces heating only and is based on the following assumptions:

- Heating system is sized to meet 100% of the space heating load and is the only heat source used in the dwelling.
- The house has effective draught-proofing and the windows are replaced with A-rated double glazing.
- The dwelling is not an extension. (a) The mean water to air temperature difference used in the calculation of the SCOP is 50°C, which is the average difference in a dwelling. (b) SCOP is a measure of the system’s energy efficiency which is calculated for a system (or by adding or replacing radiators; or by switching to a different emitter type.

The two previous examples can be combined to produce a more efficient installation.

Reducing improved room heat loss: 1738 W

New radiator output: 2022 W

New temperature Star Rating: 5.3

New radiator flow temperature: 50°C

Likely GSHP heating SPF: 5.2

Likely ASHP heating SPF: 3.4

Notes and assumptions used to create this guide

Heat pump heat delivery. Performance factor (SPF) is calculated for spaces heating only and is based on the following assumptions and calculations:

- The temperature Star Rating can be improved by reducing the fabric and ventilation heat loss and increasing radiator output. Use the Guidance Table over the page to redesign the emitter system.

The two previous examples can be combined to produce a more efficient installation.
These tables cover space heating only – domestic hot water the correct information is being provided within the heat Use manufacturers’ data.

Key for GUIDANCE TABLE

GUIDANCE TABLE

Examples of systems designed using the GUIDANCE TABLE

Benefits of reducing fabric and ventilation heat losses

The poorly-insulated example room introduced on the first page has the following heat loss and dimensions:

- **Room specific heat loss band:** 100 to 120 W/m²
- **Improved room heat loss:** 1671 W
- **Room floor area:** 31 m²
- **Temperature Star Rating:** 2

The Oversize Factor required to achieve the maximum recommended Temperature Star Rating is circled on the Guidance Table for a radiator system in the same room specific heat loss band.

The maximum pipe spacing required to achieve the highest recommended Temperature Star Rating is circled in the Guidance Table for a screed underfloor heat distribution system with a tile covering.

The oversize required to achieve the maximum recommended Temperature Star Rating is circled on the guidance table for a fan-assisted radiator system.

- **Room specific heat loss band:** 50 to 80 W/m²
- **Room floor area:** 31 m²
- **Temperature Star Rating:** 3

The Oversize Factor required to achieve the maximum recommended Temperature Star Rating is circled on the Guidance Table for a screed underfloor heat distribution system with a tile covering.

- **Room specific heat loss band:** 50 to 80 W/m²
- **Room floor area:** 31 m²
- **Temperature Star Rating:** 4

The Oversize Factor required to achieve the maximum recommended Temperature Star Rating is circled on the Guidance Table for a fan-assisted radiator system.

- **Room specific heat loss band:** 50 to 80 W/m²
- **Room floor area:** 31 m²
- **Temperature Star Rating:** 5

The Oversize Factor required to achieve the maximum recommended Temperature Star Rating is circled on the Guidance Table for a fan-assisted radiator system.

- **Room specific heat loss band:** 50 to 80 W/m²
- **Room floor area:** 31 m²
- **Temperature Star Rating:** 6

The Oversize Factor required to achieve the maximum recommended Temperature Star Rating is circled on the Guidance Table for a fan-assisted radiator system.