



Guidance for Interpreting BESA HIU Test Results

Summary Document

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With over 50,000 Heat Interface Units (HIUs) being installed each year in the UK, setting performance standards has become increasingly important. The BESA UK Test Standard for Heat Interface Units is regarded as an important step towards improving the overall performance of existing and new build heat networks.

In 2023, BESA published a major update to the HIU Test Standard, moving to pass/fail standards that represent another step forward in improving HIU performance across the sector. In addition, the standard has been restructured to a modular approach, to allow testing of additional types of HIU. This has introduced new test variants for the different HIU types, including a Non-Keep Warm test, and new tests for space heating only HIUs. The 2023 test has also introduced a DHW load test and changes to the VWART calculation. This version also introduces minimum standards which need to be met in order to pass the Standard alongside reporting of whether Best Practice standards have been achieved.

The BESA HIU Test Regime provides a comprehensive assessment of HIU performance for UK residential heat networks. HIUs are tested under various usage scenarios, during space heating operation, domestic hot water draw-off and under zero demand. However, the test results can be difficult to interpret, often leading to a lack of understanding and an overreliance on simplified metrics alone, such as volume-weighted average return temperatures (VWARTs).

BESA Guidance document

A detailed guidance document has been developed to assist those interpreting the results from test reports of the BESA HIU Testing Regime (V3-Rev001). This covers guidance for interpreting the results from Modules 7 & 8 for instantaneous Domestic Hot Water (DHW) with Keep Warm, and Modules 1 & 2 for indirect Space Heating.

This summary document provides a brief overview of the structure of the guidance document and highlights key considerations to be made when interpreting results from the BESA HIU Test Regime. All information related to the BESA HIU Testing Regime, including the HIU Test Standard and supplementary documentation, are available on the BESA HIU website at:

<https://www.thebesa.com/heating-interface-units>

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Summary of pass/fail thresholds

Since the 2023 Test Standard (V3-Rev001) was published, the following monitored parameters generated through the tests now have pass/fail thresholds (for Modules 1, 2, 7 & 8):

- DHW maximum temperature
- DHW scaling temperature
- DHW temperature stability
- DHW minimum load capability during DHW load test
- DHW response time
- Keep Warm primary flow temperature
- Keep Warm losses thresholds
- Space heating, DHW, and Keep Warm VWARTs (all tests)

The parameters above indicate just how comprehensive the 2023 BESA HIU Test Regime is, and clearly demonstrate that HIU performance should not be evaluated based on VWART results alone.

HIUs that pass the test regime are then registered with BESA and published on the website. Every HIU of that model that is installed is then required to have a sticker or data plate identification on each unit indicating the registration details and a QR code linking to the test results for the delivered HIU.

Guidance document structure

An overview of the full guidance document structure is outlined below, with the focus of each section highlighted. The full guidance document is available on the BESA website at:
<https://www.thebesa.com/hiu/downloads>

1. Introduction – details a high-level background to the BESA HIU Test Regime and provides the scope for the guidance document
2. Prior Considerations – outlines key points to consider prior to reviewing test results
3. Domestic Hot Water: Modules 7 & 8 (Keep Warm) – contains a detailed review of all Module 7 & 8 tests, including the context behind each test, the pass/fail and best practice criteria, and a comparative assessment of performance using annotated graphics with accompanying technical explanations
4. Space Heating: Modules 1 & 2 (Indirect) – contains a detailed review of all Module 1 & 2 tests, including the context behind each test, the pass/fail and best practice criteria, and a comparative assessment of performance using annotated graphics with accompanying technical explanations
5. References – provides a list of external documents referenced within the guidance
6. Appendices – details other useful information to consider regarding VWARTs, Keep Warm and HIU procurement considerations

Key considerations when reviewing results

The following points should be considered prior to reviewing results from test reports or referring to the detailed analysis sections of the full guidance document.

Purpose and Scope of the HIU Test Regime

- The BESA HIU Test Regime is designed to assess HIU performance and enable comparisons between HIUs under controlled conditions, with test parameters based on real-world observations and calculations. These are only a representation of real heat networks and may not exactly reflect actual operational performance, especially if network parameters differ from those during testing. However, they should give a good indication of how an HIU is likely to perform and the behaviour it will exhibit in situ.
- The BESA HIU Test Regime focuses on the HIU itself, rather than the wider heat network, therefore network-specific factors (e.g. size, hydraulic arrangement, temperature and pressure requirements) will influence actual HIU performance.
- The BESA HIU Test Regime is intended solely for performance testing. However, several other factors should be considered during HIU procurement, which are not covered within the scope of the test regime (e.g. long-term performance, reliability, maintenance requirements, cost, metering solutions, technical support).

Limitations of the HIU Test Regime

- The test rig has been automated and standardised as far as possible, but practical limitations mean that replicability is difficult to establish with a high degree of accuracy, and parameters are given relatively wide margins of error (e.g., ± 2 °C for VWARD figures).
- The current BESA HIU Test Regime does not cover all commercially available HIUs and excludes certain types (e.g. cooling or those with storage, calorifiers or built-in high-performance functionality). However, the scope of the BESA HIU Test Regime may expand to cover additional HIU types in the future.
- Future iterations of the BESA HIU Test Regime are expected over time, so it is important to note the most recent version that a particular HIU is tested to.

Interpreting Test Results and VWARDS

What is VWARD?

The overall Volume Weighted Average Return Temperature (VWARD) of an HIU is a composite of estimates of the annual average return temperatures for domestic hot water, space heating and Keep Warm functions, but weighted by the volume of water passing through the HIU. This provides a reasonable proxy for the impact of the tested HIU on the aggregated performance of the heat network.

- While VWARDS provide an indication of expected HIU performance under typical heat network conditions, other factors will affect the overall operational cost and reliability of a HIU, which are not reflected in VWARD figures (e.g. electrical losses).
- VWARDS should **not** be used as standalone performance scores; a comprehensive and objective assessment of a HIU's tested performance should include all aspects of test results, especially for non-technical users of the test reports.

HIU Procurement

- A registered HIU (i.e. one that has passed the HIU Test Regime and has its results published on the BESA website) does not guarantee that it is suitable for a specific network. Procurement decisions should holistically consider both test results and other key attributes, including the design of the particular heat network being considered.
- To be BESA-registered, HIUs provided by manufacturers must exactly match the make, model, components, and operating modes of a tested HIU, as even minor differences can significantly affect performance and invalidate test results. HIUs that are BESA-registered must be supplied with a BESA sticker which should be clearly situated somewhere on each HIU installed. This sticker should have a QR code which takes you to the HIU's results and report on the BESA website.

Conclusion

With the rising demand for HIUs across the UK, the need for consistent and reliable performance standards has never been greater. The BESA HIU Test Standard plays a central role in driving improvements in overall heat network performance, offering a structured approach to evaluating HIU performance.

The 2023 update to the standard introduced significant updates to the BESA HIU Test Regime. To support readers in navigating these changes and interpreting test results with greater confidence, a detailed guidance document has been developed. This document aims to promote a deeper understanding of HIU performance and encourage more informed decision-making during design and procurement.

With the forthcoming introduction of the Heat Network Technical Assurance Scheme (HNTAS), it is anticipated that an HIU that is BESA tested and registered to the 2023 version 3 or later will link to certification for new and existing heat networks.

It is clear that the scheme has already had a major impact on reducing carbon emissions and improving services to consumers in residential heat networks. But even more importantly, it demonstrates the positive impact that consumer led initiatives can have on market development.

Our Mission Statement:

"To improve the performance of residential HIUs across the UK."