

Test Module 1

Space Heating, High Temperature, Indirect HEATING MODULE 1-DH70 Indirect

HMI-DH70C

Our Mission Statement: *"To improve the performance of residential HIUs across the UK."*

Revision History

Revision number	Comments	Author	Approver	Date
VI-Rev001	Final version of test module for publication alongside the third edition of the Technical Standard for UK HIU Test Regime	Technical Committee	Steering Group	01/09/2023

1. INTRODUCTION

This document forms part of the UK Test Standard for Heat Interface Units that has been developed to assess the role and performance of HIUs in UK heat networks.

BESA Technical Standard for UK HIU Test Regime (2023) sets out the overall Test Standard requirements. In order to avoid having to repeat successful tests, the tests have been bundled into 'modules'. This sub document covers MODULE 1 that comprises a series of tests, as set out below. Readers should refer to the main test document to understand how the tests and modules fit together within the overall Test Standard.

2. SCOPE

This document covers the tests required for registration under
MODULE 1, covering HIUs supplying Space Heating at High Temperature, Indirectly.

The module code is:

HMI-DH70C - HEATING MODULE 1-DH70 Indirect.

This module only applies to HIUs:

TYPE 1 HI / HWI

TYPE 5 HI

Pass/fail and best practice thresholds for these HIUs are shown below.

This module can be combined with DHW modules M7 or M9 for TYPE 1 HIUs.

3. TESTS TO BE CARRIED OUT

The following tests shall be carried out in this module.

MI.3.1 **Objective:** Perform static/steady state testing in order to investigate the performance characteristics of the HIU when meeting a specified space heating load.

Note: The static tests data shall be recorded for a minimum of 300 seconds once HIU and test rig operation has stabilised. The results shall then be presented in table form derived from the mean average over the test period, as well as a plot of the key metrics for the same time period.

M1.3.2 The primary differential pressure shall be dictated by the tests to be undertaken. This shall be set to either at 50 kPa or 200 kPa dependent on the test. The test rig shall control primary differential pressure to the set point $\pm 4\%$.

Note that in all plotting of graphs when reporting, dP will be converted into MPa to ensure that dP has a similar magnitude to flow rate values (in l/s) and can therefore share the same axis, with temperature on a separate axis.

All tests shall include the following:

M1.3.3 **Parameter recording** – there are several sensors across the test rig as well as instantaneous power values that shall be calculated from these sensor recordings. Only some of these will be required to be reported and plotted in graphs (see Reporting box at the end of the test module sections). However all sensors and calculated values shall be recorded for the duration of all tests and made available to the Technical Lead for analysis.

M1.3.4 **Electrical consumption** – the maximum and average electrical consumption shall be measured throughout the test (in Watts $\pm 1\%$) along with the derived electrical losses. Electrical elements and other components not within the standard definition of a HIU shall be recorded in the HIU list of components and recorded as an extra line item of measured electrical consumption. The electrical consumption values will not be reported on but will be made available to the Technical Lead for analysis.

Tests 01a, 01b & 01c – Indirect heating HIU, space heating circuit capacity (High Primary Temperature)

01a	DH/70C, Space Heating Indirect 0.5 kW, 55/35°C tertiary, 50 kPa
01b	DH/70C, Space Heating Indirect 1 kW, 55/35°C tertiary, 200 kPa
01c	DH/70C, Space Heating Indirect 4 kW, 55/35°C tertiary, 50 kPa

M1.3.5 **Objective** – Perform static testing in order to investigate the performance characteristics of the HIU when **indirectly** meeting a space-heating load given a 55°C/35°C tertiary heating circuit and 70°C primary flow temperature. It should be noted that the 55°C/35°C tertiary heating temperatures have been selected as representative of temperatures utilised on new build developments where radiators are installed and are within the operating parameters outlined in the CIBSE/ADE Heat Networks Code of Practice CPI (2020), Objective 3.4 (Table 6).

The static heating tests shall be carried out under different primary differential pressure conditions to simulate HIUs on differing points on a network. Tests 01a and 01c shall be carried out at a primary differential pressure of 50 kPa ± 2 kPa and test 01b shall be carried out at 200 kPa ± 8 kPa.

M1.3.6 The return temperatures recorded from these tests are used as the inputs for calculating the High Temperature Space Heating Volume Weighted Average Return Temperature figure for the HIU – see Appendix C in the main test document.

M1.3.7 In these tests the space heating load shall be simulated by the heat exchanger on the test rig, with 55°C tertiary flow temperature and 35°C tertiary return temperatures. The HIU pump shall be deactivated, with flow rates adjusted within the test rig to deliver the required space-heating load.

M1.3.8 In all three tests the primary flow temperature t_{p1} shall be 70°C $\pm 0.5^\circ\text{C}$.

M1.3.9 The average space heating flow temperature t_{22} shall not deviate more than $+0.5^{\circ}\text{C}$ from the stipulated temperature during the test. The average space heating return temperature t_{21} shall not deviate more than $\pm 0.5^{\circ}\text{C}$ from the stipulated temperature during the test. The average space heating heat output shall not deviate more than $\pm 10\%$ or 0.25 kW , whichever is the smallest, from the stipulated heat load during the test. For the 0.5 kW and 1 kW tests, the HIU and test rig settings shall not be changed other than adjusting the flow rates on the test rig space heating circuit, such that the heat output is within test tolerance and t_{21} is $35^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$.

M1.3.10 If temperatures are outside the permitted tolerances, no volume weighted average return temperature shall be calculated.

Test 01a: 0.5 kW heat output.

Test 01b: 1.0 kW heat output.

Test 01c: 4.0 kW heat output.

The HIU outer case shall be in place for these tests.

No DHW shall be drawn off during these tests.

M1.3.11 Results shall be presented in two forms:

- A table including mean average values of t_{11} , t_{12} , q_1 , dP_1 , H_1 , t_{21} , t_{22} , q_2 , dP_2 , H_2 over the duration of each test. The overall space heating VWART shall also be stated.
- A graph over the duration of each test showing t_{11} , t_{12} , q_1 , t_{21} , t_{22} , q_2 .

Pass/Fail Criteria

TEST 01 – Indirect HIU static testing of space heating circuit capacity

Fail if the VWART is above 40°C (to one decimal point).

Best Practice Criteria

TEST 01 – Indirect HIU static testing of space heating circuit capacity

Best practice if the VWART is below 37°C (to one decimal point)

These values do not constitute part of the formal test registration process. However, they do provide targets for manufacturers and purchasers seeking to achieve the highest possible performance in the sector.

4. TEST OUTPUTS

M1.4.1 A test report shall be prepared using the standardised BESA output template shown in the main test document. The test will provide the following outputs:

Reporting

TEST 01 – Indirect heating HIU static testing of space heating circuit capacity **Report on the following values for each test:**

A table including mean average values of t_{11} , t_{12} , q_1 , dP_1 , H_1 , t_{21} , t_{22} , q_2 , dP_2 , H_2 over the duration of each test.

Overall space heating VWART.

Plot graph of following key metrics for each test:

t_{11} , t_{12} , q_1 , t_{21} , t_{22} , q_2 over the duration of each test.

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