



Technical Note		TN-004	
Test: Space heating		Test no.: 1a-1f	
Assumption: No use of HIU pump		Assumption no: 94	
Rev: 1	Date: 6 Dec 2019	Author: Martin Crane	Checked: Gareth Jones

1. Introduction

The BESA HIU Standard space heating tests (1a-1f) do not currently utilise the HIU pump.

The Swedish Test from which the BESA test was developed does not use the HIU pump.

The SBRI funded HIU test did include a test with radiators, that were 'poorly commissioned' (the lock shield valves fully open and presettable valves not set) that utilised the HIU pump. This test produced a wide range of heat outputs and return temperatures between the HIUs tested. There was a second test which allowed the enabling of any facility the HIU had to improve performance when the HIU was supplying poorly commissioned radiators. Together these test gave an indication of the potential of the controls in some HIU to manage poorly set up radiator. The results were purely observational and it was not possible to robustly measure that one HIU was 'better' than another and ultimately the better solution to the circumstance these tests evaluated was to install presettable valves on the radiators and properly commission them.

The following sections review various considerations with respect to whether to include space heating tests that use the HIU pump, then set out a conclusion and recommendation.

2. Consideration 1

If the HIU pumps were used, it would not be possible to achieve consistent system flow rates on all HIUs tested as every HIU design has a different heat exchanger and control valves. As such, every HIU produces a different pressure drop for the test flowrate.

The adjustability of the pumps is insufficient to allow adjustment to the flow rate such to achieve the required flow rate. In order for tests to be comparable across HIUs, the flowrate needs to be the same for each HIU tested.

In a real heating system the flow is controlled by a combination of HIU and heating system settings, and the level of accuracy of control required is lower than that required for a test that compares HIUs.

3. Consideration 2

The Test rig *could* be used to set the required test flowrate, through the use of a commissioning set for example. This would utilise the HIU pump, but would not provide any more useful data than the current test setup.

The use of the HIU pump may lead to inconsistent results due to the electronic control of the pump. There may be problems setting a constant pump speed where the HIU electronics directly control the pump.

4. Consideration 3

The pump's role is to provide the required dP for the heating system. The dP required for a heating system is variable, depending on heating system design. As example, the following are all variables that impact on dP requirements: heating system selected – radiators / fan coils / direct underfloor / underfloor via a separate manifold with mixing circuit; the heating system pipework - 15mm copper or much smaller micro bore; the choice of control valve – e.g. presettable TRV and design dT which could range from 10C for underfloor to 30C for some radiator setups.

With so many potential system designs it is not clear which the HIU Test would replicate.

All pumps are now variable speed and most have more than 6 potential speed settings, which adds yet more potential variable between HIUs and their recommended setups

5. Consideration 4

It is not clear what the aim would be for a test that included the HIU pump. More importantly, it is not clear what aspect of HIU performance could be improved if the pump was tested.

Insufficient dP has not been an issue, so there would be no point in testing for this.

The pump power consumption could be measured, but:

- (i) Pump energy efficiency is set by EU regulations and is already tested.
- (ii) Pump energy costs do not appear to be a major issue: Properly setup for low dPs and low flow rate the pump energy use will be under 20 Watts; which, over the estimated 650 hours of space heating operation (as estimated in the VWART calculation) is less than £2 /yr of electricity cost.

As such it is not clear that there would be value in testing pump performance per se.

6. Consideration 5

Active speed control of the pump, by the HIU controls, could open up options to lower return temperatures during times when lower radiator outputs are required. Plus there could be other benefits of HIU control of pump speed.

However, this would significantly increase test complexity.

Given that the objective of the test is to raise the minimum bar in the market, the regime is explicitly not intended to test leading edge features, which would argue against adding a test for this reason.

7. Conclusions

The use of the HIU pump would make achieving identical test conditions for each HIU very difficult to achieve.

There is no clear benefit, in terms of data useful to the understanding and quantifying HIU performance, from using the HIU pump for the current HIU Tests.

Use of the pump, controlled by the HIU controls may allow improved HIU performance but the HIU Test Regime would need to be expanded with additional tests to be able assess such benefits and this is not in accordance with the objectives of the regime (with respect to testing additional features as against baseline performance).

8. Recommendation

Maintain the current Test basis of not using pump.

In the longer term, the Technical Committee should maintain a knowledge base of the benefits that active control of the pump speed by the HIU could provide and consider if the HIU Test scope should be expanded to include assessment of such capability at some future point (particularly if the Test scope is expanded to include additional features).