Enertek International

International Consultants in Product
Research, Design, Development
& Certification

BESA HIU TEST REPORT

IDEAL POD i705 HIU

Client: Groupe Atlantic

Project Number: E4522-1A Report Issue: 3

02 December 2021

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BESA SUMMARY SHEET

This test summary, downloaded from the BESA website, indicates that the HIU listed below has been tested against the criteria of the BESA HIU Test Regime.

Model: POD i705

Serial Number: 22524000000003

Year of manufacture: 2021

Test carried out by S.Broxham Enertek Int On: 8/30/21 Reference: E4522-1A

NOTE: The VWART accuracy is in the range +/-2°C	HIGH TEMP VWART °C	LOW TEMP VWART °C
DHW	21	22
Keep-warm	44	43
Space heating	45	36
Overall with keep warm	36	35

Pressure test		
No HIU damage	Pass	Pass

Dynamic DHW operation	2a	
DHW not exceed 65°C	Pass	Pass

Low flow test at BESA flow rate of 0.02l/s	3a	3b
DHW not exceed 65°C	Pass	Pass
DHW temperature at set point +/- 3°C	Fail	Fail

Low flow test at manufacturer declared flow rate	3c	3d
Declared minimum flow rate (l/sec)	0.037	0.037
Not exceed 65°C	Yes	Yes
DHW temperature at set point +/- 3°C	Yes	Yes

Keep-warm test	4a	4b
Standby heat consumption - average (Watts)	62	57
Standby electricity consumption - average (Watts)	2.56	2.49
Total HIU heat loss (DH + electrical input) (Watts)	65	59
Standby flow rate (the average flow rate) (l/hr)	5.6	7.3

DHW Response time test	5a	5b
DHW response time (Seconds)	11	11
Peak electrical heat during test (Watts)		
Output		
DHW temperature not exceed 65°C for more than 10 secs	Pass	Pass
DHW reaches 45°C with 15 secs	Pass	Pass

Scaling risk assessment as defined in 2.26	If any of the factors below occur then the risk of scaling of the DHW PHE in hard water areas increases		
HIU has a TMV or TRV on the DHW	No		
Test	2a	3a	3c
t32 above 60°C for more than 5 secs	Yes	Yes	Yes
t12 exceeds 55°C at any point of the test	No	No	No
Test	4a		4b
t12 exceeds 50°C at any time	Yes		Yes

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1 BRIEF

1.1.1 Enertek international Limited (EIL), were contracted to receive, install, and commission a production sample, of the IDEAL POD i705 70kW HIU.

1.1.2 To carry out the work involved to evaluate the performance of Domestic Hot Water (DHW) and Space Heating (SH) in accordance with the BESA UK HIU Test regime Technical Specification, Rev-009 October 2018, a publicly available online test regime. This is here-on referred to as the Test Regime throughout this document.

1.1.3 To provide a report detailing the tests carried out and generated results in accordance with the Test Regime criteria, including calculations for Volume Weighted Average Return Temperatures (VWART).

2 DEFINITIONS

2.1.1 The following definitions and abbreviations which have been used within this report can be found in table 2.1 below.

Table 2.1 – Definitions and Abbreviations

Symbol	Description	Unit
P_1	Power, Primary side	kW
P_2	Power, Space Heating side	kW
P_3	Power, Domestic Hot Water	kW
t_{11}	Temperature, Primary Side Supply Connection	°C
t_{12}	Temperature, Primary Side Return connection	°C
t_{21}	Temperature, Space Heating Side Return Connection	°C
t_{22}	Temperature, Space Heating System Supply Connection	°C
t_{31}	Temperature, Cold Water Supply	°C
t_{32}	Temperature, Domestic hot Water Output from HIU	°C
q_1	Volume Flow, Primary side	L/s
q_2	Volume Flow, Space heating side	L/s
q_3	Volume flow, Domestic hot water	L/s
Δp_1	Primary Pressure drop across entire HIU unit	kPa
Δp_2	Pressure Drop, Space heating system across HIU	kPa
Δp_3	Pressure Drop, Domestic Hot Water across HIU	kPa
$VWART_{DHW}$	DHW Volume Weighted Return Temperature	°C
$VWART_{SH}$	Space Heating Volume Weighted Return Temperature	°C
$VWART_{KWH}$	Keep Warm Volume Weighted Return Temperature	°C
$VWART_{HEAT}$	Annual Volume Weighted Return Temperature for Heating Period	°C
$VWART_{NONHEAT}$	Annual Volume Weighed Return Temperature for Non-Heating	°C
$VWART_{HIU}$	Total Annual Volume Weighted Return Temperature	°C
DHW	Domestic Hot Water	–
HIU	Heat Interface Unit	–
SH	Space Heating	–
TMV	Thermostatic mixing Valve	–

3 TEST OBJECT

3.1 Appliance Details

3.1.1 Details of the HIU IDEAL POD i705 appliance are given in Table 3.1. Photograph of the installed appliance is given in Figure 8.2, Appendix B.

Table 3.1 – Appliance Details

Item	Description
Manufacturer	Groupe Atlantic
Model	Ideal POD i705
Serial number	2252400000003
Year of manufacture	2021
DHW priority	Yes

3.2 Appliance Design Pressures

3.2.1 The maximum design pressures of the IDEAL POD i705 appliance for the primary side and the secondary side for both Space Heating and DHW are given in Table 3.2.

Table 3.2 – Appliance Design Pressures

Item	Value	Unit
Primary Side	16	Bar
Secondary Side space Heating	2.5	Bar
Secondary Side DHW	10	Bar

3.3 Appliance Design Temperatures

3.3.1 The maximum design temperatures of the IDEAL POD i705 appliance for the primary side and the secondary side for both Space Heating and DHW are given in Table 3.3.

Table 3.3 – Appliance Design Temperatures

Item	Value	Unit
Primary Side	90	°C
Secondary Side space Heating	80	°C
Secondary Side DHW	65	°C

4 TEST METHOD

4.1 Installation of Appliance

4.1.1 The appliance was installed and commissioned (as received) and as defined in the product literature provided. Testing was carried out without further adjustment other than disabling the internal space heating pump and adjusting the setting of the SH and DHW set points through the user interface on the HIU controller to suit the conditions of the HIU test rig. The HIU rig schematic is given in Figure 4.1.

4.2 Test Regime

4.2.1 The testing described in this report was carried out in accordance with the BESA test regime. The Test Regime outlines a series of static and dynamic tests to determine the performance of a HIU's DHW and SH functions. The Regime outlines the test method including the reporting of the results, the performance requirements and the VWART calculations.

4.2.2 The setup of the BESA tests is reproduced in Table 4.1. The basis of reporting the performance of the HIU from the BESA Test Regime is reproduced in Table 4.2.

4.2.3 The Test Regime specifies the testing of two different test temperature packages. The first is the high temperature package, with a district primary supply of 70 °C and the second is the 'low temperature' package, with a district primary supply temperature of 60 °C.

1.1.1 As the IDEAL POD i705 is suitable for both high and low temperature operation, both test packages were carried out and results recorded within this report.

4.3 Measurement & Uncertainties

4.3.1 All measurements and uncertainties adhere to the requirements stipulated in the BESA Test Regime. All measurements were sampled at a rate of 1 Hz for all tests.

4.3.2 The BESA uncertainties of measurement requirements are as follows: Differential Pressure, ± 1 kPa; Temperature, ± 0.1 °C; Volume Flow, ± 1.5 %. Note: the time constant for the temperature sensors is less than 1.5 s.

4.3.3 EIL's reported uncertainty is based on a standard uncertainty by a coverage factor K=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The EIL equipment list and uncertainties are given in Table 8.8, Appendix B.

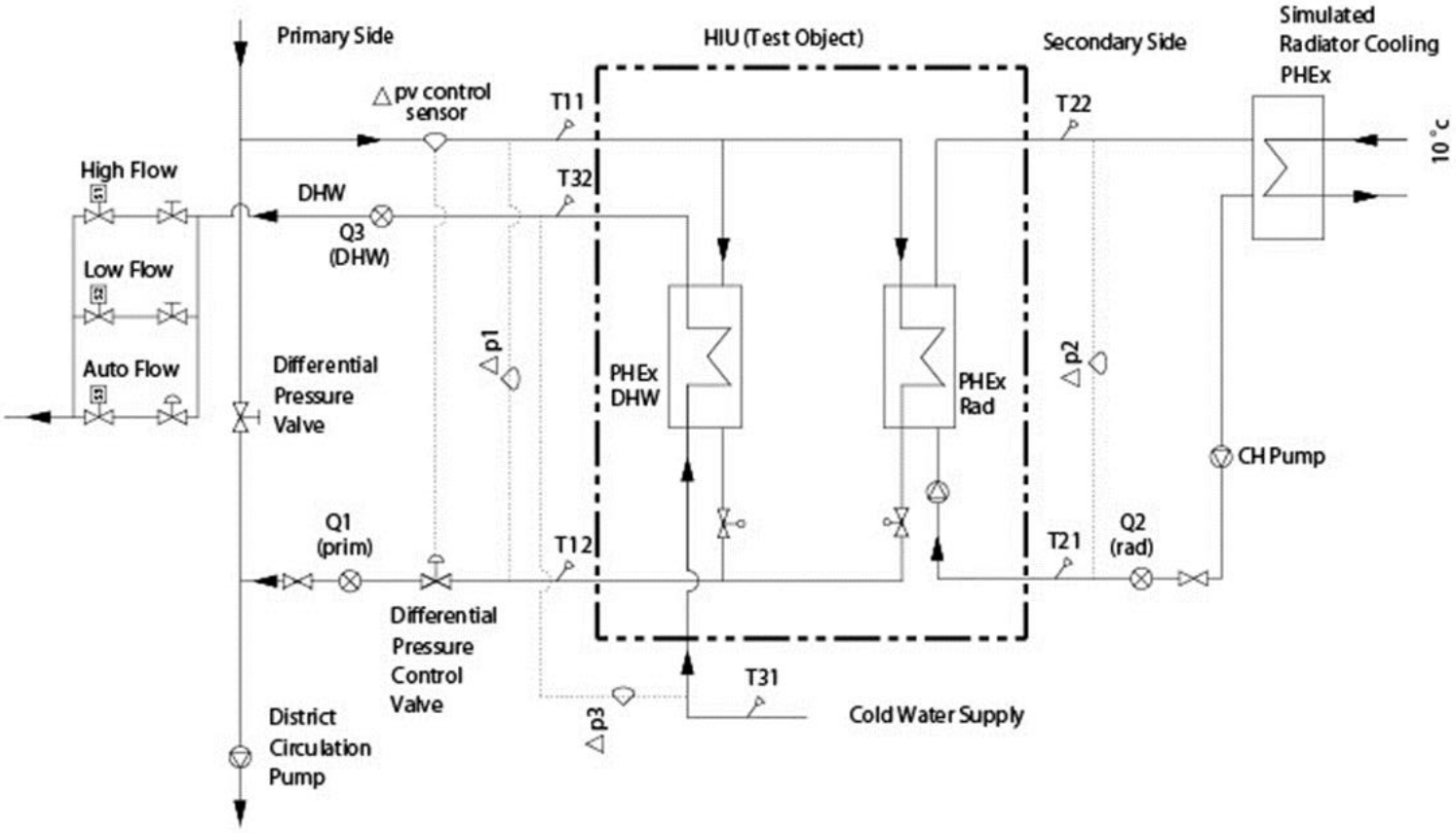


Figure 4.1 – EIL's HIU Test Rig Schematic

Table 4.1 – Setup of Tests (Based on BESA Test Regime, Table 1: Test Schedule)

		District Circuit			***Domestic Hot Water***			***Space Heating***		
		Static Pressure	Differential Pressure	Flow Temperature	Temperature Set Point	Flow Rate	Heat Load	Flow Temperature	Return Temperature	Heat Load
Symbol		*[p_1]*	*[Δp_1]*	*[t_{11}]*	*[t_{32}]*	*[q_3]*	*[P_3]*	*[t_{22}]*	*[t_{21}]*	*[P_2]*
Units		*[kPa]*	*[kPa]*	*[°C]*	*[°C]*	*[Ls^{-1}]*	*[kW]*	*[°C]*	*[°C]*	*[kW]*
Static Tests										
0a	District Pressure Test	1.43 X Claimed Value	-	-	-	-	-	-	-	-
1a	1kW Space Heating	3.0	0.5	70	-	-	-	60	40	1
1b	2kW Space Heating	3.0	0.5	70	-	-	-	60	40	2
1c	4kW Space Heating	3.0	0.5	70	-	-	-	60	40	4
1d	1kW Space Heating	3.0	0.5	60	-	-	-	45	35	1
1e	2kW Space Heating	3.0	0.5	60	-	-	-	45	35	2
1f	4kW Space Heating	3.0	0.5	60	-	-	-	45	35	4
Dynamic Tests										
2a	Dynamic Tapping	3.0	0.5	70	55	See Test Profile	See Test Profile	-	-	-
2b	Dynamic Tapping	3.0	0.5	60	50			-	-	-
3a	Low Flow	3.0	0.5	70	55	0.02	Record Value.	-	-	-
3b	Low Flow	3.0	0.5	60	50	0.02	Record Value.	-	-	-
4a	Keep-warm	3.0	0.5	70	55	0.00	0	-	-	-
4b	Keep-warm	3.0	0.5	60	50	0.00	0	-	-	-
5a	DHW Response	3.0	0.5	70	55	0.13	Record Value.	-	-	-
5b	DHW Response	3.0	0.5	60	50	0.13	Record Value.	-	-	-

Table 4.2 – Test Reporting, (Adapted from BESA Test Regime, Table 5)

Test Designation		Reporting
0	District Pressure Test.	Pass/Fail as to whether HIU manages pressure test without leaks or damage.
1a	Space heating 1 kW, 60/40 °C secondary.	t_{11} – Primary flow temperature. t_{12} – Primary return temperature. Plot of key metrics over duration of test. **Note**: Outputs used as input data to 'High Temperature' Space Heating Volume Weighted Average Return Temperature calculation.
1b	Space heating 2 kW, 60/40 °C secondary.	
1c	Space heating 4 kW, 60/40 °C secondary.	
1d	Space heating 1 kW, 45/35 °C secondary.	t_{11} – Primary flow temperature. t_{12} – Primary return temperature. Plot of key metrics over duration of test. **Note**: Outputs used as input data to 'Low Temperature' Space Heating Volume Weighted Average Return Temperature calculation.
1e	Space heating 2 kW, 45/35 °C secondary.	
1f	Space heating 4 kW, 45/35 °C secondary.	
2a	DHW only, DH 70 °C flow, 55 °C DHW.	Pass/Fail on DHW (at t_{32}) exceeding 65.0 °C (to 1 decimal point) for more than 10 consecutive seconds. State the maximum and minimum DHW temperatures over the period of the test when there is a DHW flow. Assessment of scaling risk as per the criteria detailed in 2.26. **Note:** Outputs used as input data to 'High Temperature' Space Heating Volume Weighted Average Return Temperature calculation. Plot t_{32}, t_{31}, q_3, t_{12}, q_1
2b	DHW only, DH 60 °C flow, 50 °C DHW.	State the maximum and minimum DHW temperatures over the period of the test when there is a DHW flow. **Note:** Outputs used as input data to 'Low Temperature' Domestic Hot Water Volume Weighted Average Return Temperature calculation. Plot q_1, q_3, dp_1, dp_3
3a	Low flow DHW, DH 70 °C flow, 55 °C DHW.	Pass/Fail on DHW (at t_{32}) exceeding 65.0 °C (1 decimal place) for more than 10 consecutive seconds. Comment on ability to deliver DHW at low flow based on DHW temperature reaching at least 45.0 °C (1 decimal place) at the end of the 180 second period of low flow DHW. Comment on the ability to deliver stable DHW flow temperature (at t_{32}), defined as ability to maintain 55.0 +/- 3.0 °C (1 decimal place) during the last 60 seconds of the test. Maximum temperature achieved and +/-°C variance around 55.0 °C (1 decimal place) to be stated. Plot of key metrics for 60 seconds of 0.13 l/s flow and the subsequent 180 seconds of 0.02 l/s DHW flow. Assessment of scaling risk as per criteria detailed in 2.26.
3b	Low flow DHW, DH 60 °C flow, 50 °C DHW.	Comment on the ability to deliver DHW at low flow rate based on DHW temperature reaching at least 45 °C (1 decimal place) at the end of the 180 second period of low flow DHW. Comment on the ability to deliver stable DHW flow temperature (at t_{32}), defined as ability to maintain 50.0 +/-3°C (1 decimal place) to be stated. Maximum temperature achieved and +/-°C variance around 50.0°C (1 decimal place) to be stated. Plot of key metrics for 60 seconds of 0.13 l/s flow and the subsequent 180 seconds of 0.02 l/s DHW flow.

Test Designation		Reporting
4a	Keep-warm, DH 70 °C flow, 55 °C DHW.	Assessment of whether valid keep-warm operation, based on 5a response time criteria: Pass/Fail. Comment on HIU keep-warm controls options. Assessment of scaling risk based on duration of temperatures in excess of 55.0 °C (1 decimal place). State average heat load for the duration of the test. State the average primary flow rate for the duration of the test. Note: Outputs used as input data to 'High Temperature' Keep-warm Volume Weighted Average Return Temperature calculation. Plot of key metrics over duration of test.
4b	Keep-warm, DH 60 °C flow, 50 °C DHW.	Assessment of whether valid keep-warm operation, based on 5a response time criteria: Pass/Fail. Observation on the operation of the HIU during keep-warm. Comment on HIU keep-warm controls options. Assessment of scaling risk based on extent and duration of temperatures in excess of 55.0 °C (1 decimal place). State average heat load for the duration of the test. State the average primary flowrate for the duration of the test. **Note:** Outputs used as input data to 'Low Temperature' Keep-warm Volume Weighted Average Return Temperature calculation. Plot of key metrics over duration of test.
5a	DHW response time, DH 70 °C flow, 55 °C DHW.	Pass/Fail on DHW (at t_{32}) exceeding 65.0 °C (1 decimal place) for more than 10 consecutive seconds. State time to achieve 45.0 °C (1 decimal place) and not subsequently drop below 42.0 °C (1 decimal place). Plot t_{32}, t_{31}, t_{12}, q_1 over duration of test.
5b	DHW response time, DH 60 °C flow, 50 °C DHW.	State time to achieve a DHW temperature 45.0 °C (1 decimal place) and not subsequently drop below 42.0 °C (1 decimal place). Comment on stability of DHW temperature. Plot t_{32}, t_{31}, t_{12}, q_1 over duration of test.

5 TEST RESULTS

5.1 Test 0 – Pressure Test

5.1.1 The appliance has passed the requirements of the static pressure test, Test 0 of the BESA Test Regime as:

5.1.2 There was No damage observed during the static pressure test, with the primary flow pressurised to 22.88 bar (1.43 times the rated value), and,

5.1.3 There were No leaks observed during the static pressure test, with the primary flow pressurised to 22.88 bar (1.43 times the rated value).

5.2 Test 1a to 1f – Space Heating 1-4 kW at 70 and 60°C

5.2.1 The plot of the key metrics of Tests 1a-1f for the space heating 1 - 4 kW at both 70 and 60 °C are displayed in Figure 7.1 to Figure 7.6 respectively. See Table 5.1 for summarised test results including the average primary return temperature, t_{12}.

Table 5.1 - Test Results for Space Heating Tests 1a to 1f

Test No & Description	Primary					Secondary				
	Flow Temperature $[t_{11}]$ [°C]	*Return Temperature* $[t_{12}]$ [°C]	*Flow Rate* $[q_1]$ $[Ls^{-1}]$	*Differential Pressure* $[\Delta p_1]$ [kPa]	*Heat Load* $[P_1]$ [W]	*Return Temperature* $[t_{21}]$ [°C]	*Flow Temperature* $[t_{22}]$ [°C]	*Flow Rate* $[q_2]$ $[Ls^{-}]$	*Differential Pressure* $[\Delta p_2]$ [kPa]	*Heat Load* $[P_2]$ [W]
1a - 1 kW Space Heating (DH 70 °C flow)	70.2	47.2	0.014	83.0	1280	40.3	60.2	0.015	0.6	1100
1b - 2 kW Space Heating (DH 70 °C flow)	70.3	43.5	0.020	80.0	2109	40.0	59.1	0.025	0.2	2026
1c - 4 kW Space Heating (DH 70 °C flow)	69.5	45.2	0.044	49.9	4458	39.7	60.1	0.050	3.2	4300
1d - Space Heating 1 kW (DH 60 °C flow)	60.0	36.5	0.010	79.0	1037	35.2	45.0	0.026	0.1	1001
1e - Space Heating 2 kW (DH 60 °C flow)	59.6	35.6	0.022	47.6	2237	34.9	44.7	0.052	3.2	2110
1f - Space Heating 4 kW (DH 60 °C flow)	59.9	36.3	0.042	50.1	4137	34.7	44.7	0.096	16.2	4031

5.3 Test 2a – DHW Dynamic Tapping at 70 °C

5.3.1 The appliance has passed the requirements of the DHW only at 70 °C, Test 2a of the BESA Test Regime as:

5.3.2 The domestic hot water output temperature, t_{32} did not exceed 65 °C for more than 10 seconds.

5.3.3 The maximum and minimum temperatures of t_{32} were 64.9 °C and 41.0 °C respectively.

5.3.4 The plot of the key metrics of the duration of Test 2a is displayed in Figure 7.7, Appendix.

5.4 Test 2b – DHW Dynamic Tapping at 60 °C

5.4.1 The maximum and minimum temperatures of t_{32} were 57.5 °C and 36.7 °C respectively.

5.4.2 The plot of the key metrics of the duration of Test 2b is displayed in Figure 7.8, Appendix.

5.5 Test 3a & 3c – Low Flow DHW at 70 °C

5.5.1 The appliance has passed the requirements of the Low Flow at 70 °C, Test 3a of the BESA Test Regime as:

5.5.2 The domestic hot water output temperature, t_{32} did not exceed 65 °C for more than 10 seconds, and,

5.5.3 The appliance did not maintain the DHW output temperature, t_{32} at 55 ± 3 °C during the last 60 seconds of the test.

5.5.4 The maximum and minimum temperatures of t_{32} were 64.52 °C and 49.8 °C respectively.

5.5.5 As the appliance did not maintain a stable flow temperature at 1.2 l/min, the appliance was retested as test 3c at the manufacturers declared low flow rate which was 2.2 l/min.

5.5.6 At the manufacturers low flow rate of 2.2l/min the appliance did maintain the DHW output temperature t_{32} at 55±3 °C during the last 60 seconds of the test.

5.5.7 The plot of the key metrics of the duration of Test 3a is displayed in Figure 7.9, Appendix.

5.5.8 The plot of the key metrics of the duration of Test 3c is displayed in Figure 7.11, Appendix.

5.6 Test 3b & 3d – Low Flow DHW at 60 °C

5.6.1 The appliance did not maintain stable flow temperatures during Low Flow at 60 °C, Test 3b of the BESA Test Regime.

5.6.2 The appliance was retested as test 3d at the manufacturers declared low flow rate which was 2.2 l/min, the appliance was then seen to maintain DHW output temperature t_{32} at 50 °C during the last 60 seconds of the test.

5.6.3 The plot of the key metrics of the duration of Test 3b is displayed in Figure 7.10, Appendix. Test 3d is displayed in Figure 7.12, Appendix.

5.7 Test 4a – Keep-warm at 70 °C

5.7.1 The appliance has passed the requirements of the Keep-warm at 70 °C, Test 4a of the BESA Test Regime as:

5.7.2 This is a valid keep warm operation based on 5a response time criteria, see 5.9.3.

5.7.3 The appliance is performing keep-warm cycling as the primary flow temperature, t_{11} varies by more than ± 3 °C during the final 3 hours of the test. Please see BESA HIU Standard technical note TN-018 Version 1 for a more detailed definition of cyclical data.

5.7.4 The average heat load on the primary side P_1 is 68 W.

5.7.5 The average electrical consumption was 2.54W.

5.7.6 The average primary flow q_1 over the 8 hours test was 6.1 l/hr.

5.7.7 The Keep-warm control was set to on.

5.7.8 The plot of the key metrics of the duration of Test 4a is displayed in Figure 7.13, Appendix.

5.8 Test 4b – Keep-Warm at 60 °C

5.8.1 The appliance has passed the requirements of the Keep-warm at 60 °C, Test 4b of the BESA Test Regime as:

5.8.2 This is a valid keep warm operation based on 5b response time criteria, see 5.10.1.

5.8.3 The appliance is performing keep-warm cycling as the primary flow temperature, t_{11} varies by more than ± 3 °C during the final 3 hours of the test. Please see BESA HIU Standard technical note TN-018 Version 1 for a more detailed definition of cyclical data.

5.8.4 The average heat load on the primary side P_1 is 66 W.

5.8.5 The average primary flow q_1 over the 8 hours test was 8.0 l/hr.

5.8.6 The average electrical consumption was 2.47 W.

5.8.7 The Keep-warm control was set to on.

5.8.8 The plot of the key metrics of the duration of Test 4b is displayed in Figure 7.14, Appendix.

5.9 Test 5a – DHW Response Time at 70 °C

5.9.1 The appliance has passed the requirements of DHW Response Time at 70°C, Test 5a of the BESA Test Regime as:

5.9.2 The domestic hot water output temperature, t_{32} did not exceed 65 °C for more than 10 seconds.

5.9.3 The DHW response time for t_{32} to reach 45 °C (and not subsequently drop below 42 °C) was 12 seconds; therefore this is a valid keep warm.

5.9.4 The plot of the key metrics of the duration of Test 5a is displayed in Figure 7.15, Appendix.

5.10 Test 5b – DHW Response Time at 60 °C

5.10.1 The DHW response time for t_{32} to reach 45 °C (and not subsequently drop below 42 °C) was 15 seconds; therefore this is a valid keep warm.

5.10.2 The plot of the key metrics of the duration of Test 5b is displayed in Figure 7.16, Appendix.

5.11 Overall Scaling Risk Assessment

5.11.1 If any of the below factors occur, then the risk of scaling of the DHW plate in hard water areas increases.

Table 5.2 - Overall Scaling Risk Assessment

HIU has a TMV or TRV on the output of the DHW plate heat exchanger.	No	
Test Designation	**2a**	**3a**
t_{32} above 60°C for more than 5 seconds	Yes	Yes
t_{12} exceeds 55°C at any point of the test	No	No
Test Designation	**4a**	**4b**
t_{12} exceeds 50°C at any time	Yes	Yes

5.12 VWART Calculations

5.12.1 The Volume Weighted Average Return Temperatures (VWART) have been calculated as stipulated in the BESA UK HIU Test Regime document. The calculated VWART values for both the high temperature and low temperature tests described in this report are given below in Table 5.3 and Table 5.4 respectively.

Table 5.3 – High Temperature VWART Calculations

Description	Symbol	Value	Unit
Annual Heating Period percentage	SH_{PROP}	6.9	%
Annual Non-Heating Period percentage	NSH_{PROP}	93.1	%
Space Heating Volume Weighted Return Temperature	$VWART_{SH}$	45	°C
DHW Volume Weighted Return Temperature	$VWART_{DHW}$	21	°C
Keep Warm Volume Weighed Return Temperature	$VWART_{KWM}$	43	°C
Annual Volume Weighted Return Temperature for Heating Period	$VWART_{HEAT}$	44	°C
Annual Volume Weighted Return Temperature for Non-Heating	$VWART_{NONHEAT}$	36	°C
Total Annual Volume Weighted Return Temperature	$VWART_{OVERALL}$	36	°C

Table 5.4 – Low Temperature VWART Calculations

Description	Symbol	Value	Unit
Annual Heating Period percentage	SH_{PROP}	7.0	%
Annual Non-Heating Period percentage	NSH_{PROP}	93.0	%
Space Heating Volume Weighted Return Temperature	$VWART_{SH}$	36	°C
DHW Volume Weighted Return Temperature	$VWART_{DHW}$	22	°C
Keep Warm Volume Weighed Return Temperature	$VWART_{KWM}$	42	°C
Annual Volume Weighted Return Temperature for Heating Period	$VWART_{HEAT}$	36	°C
Annual Volume Weighted Return Temperature for Non-Heating	$VWART_{NONHEAT}$	35	°C
Total Annual Volume Weighted Return Temperature	$VWART_{OVERALL}$	35	°C

6 CONCLUSIONS

6.1.1 The appliance has passed the performance requirements of the BESA HIU Test Regime.

7 APPENDIX A

7.1 Key Metric Plots

7.1.1 The graphical plots of the key metrics of the tests described in this report are given in this section.

GRAPHICAL PLOTS START ON NEXT PAGE

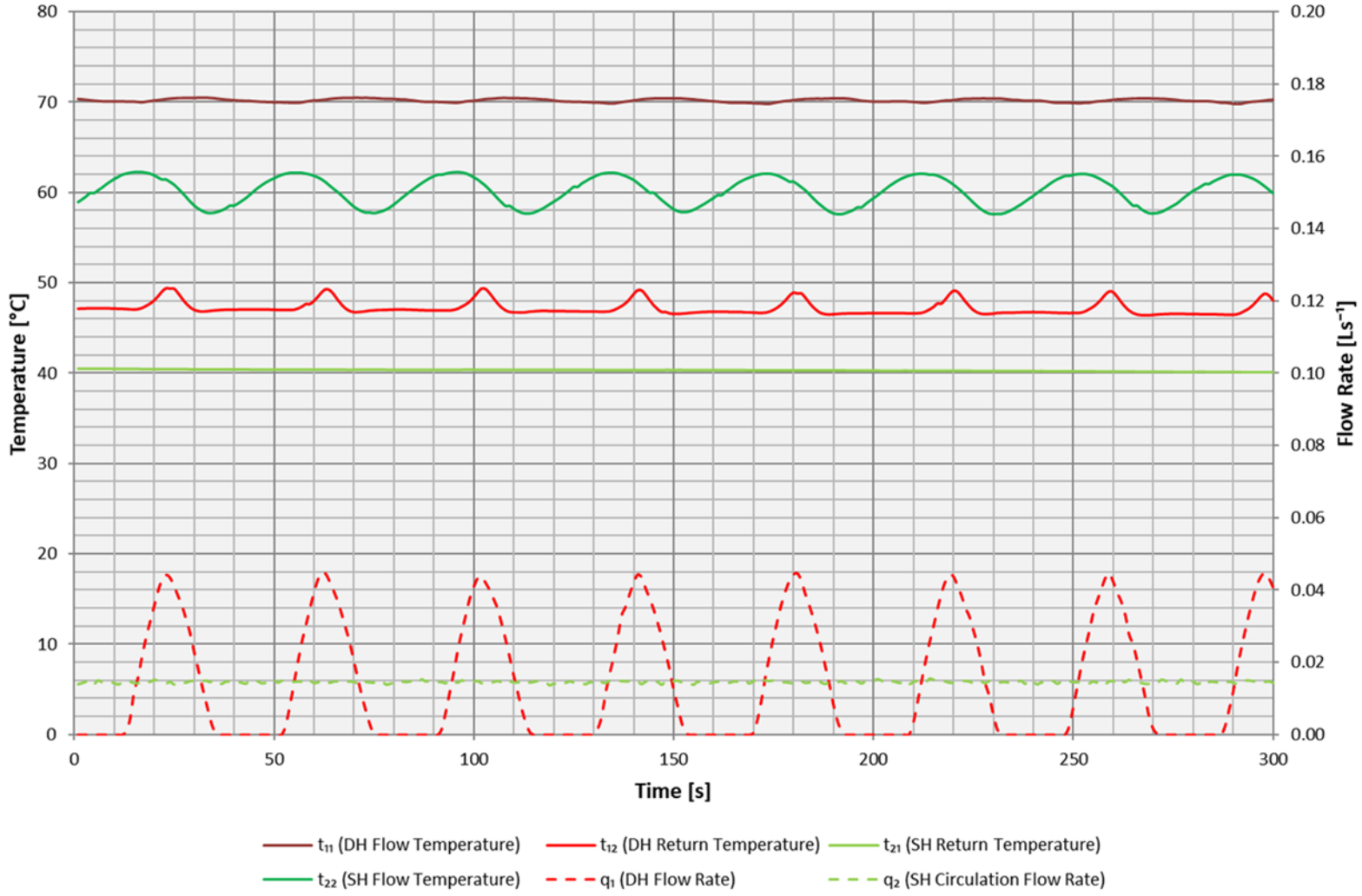


Figure 7.1 - Test 1a – Space Heating 1 kW at 70 °C

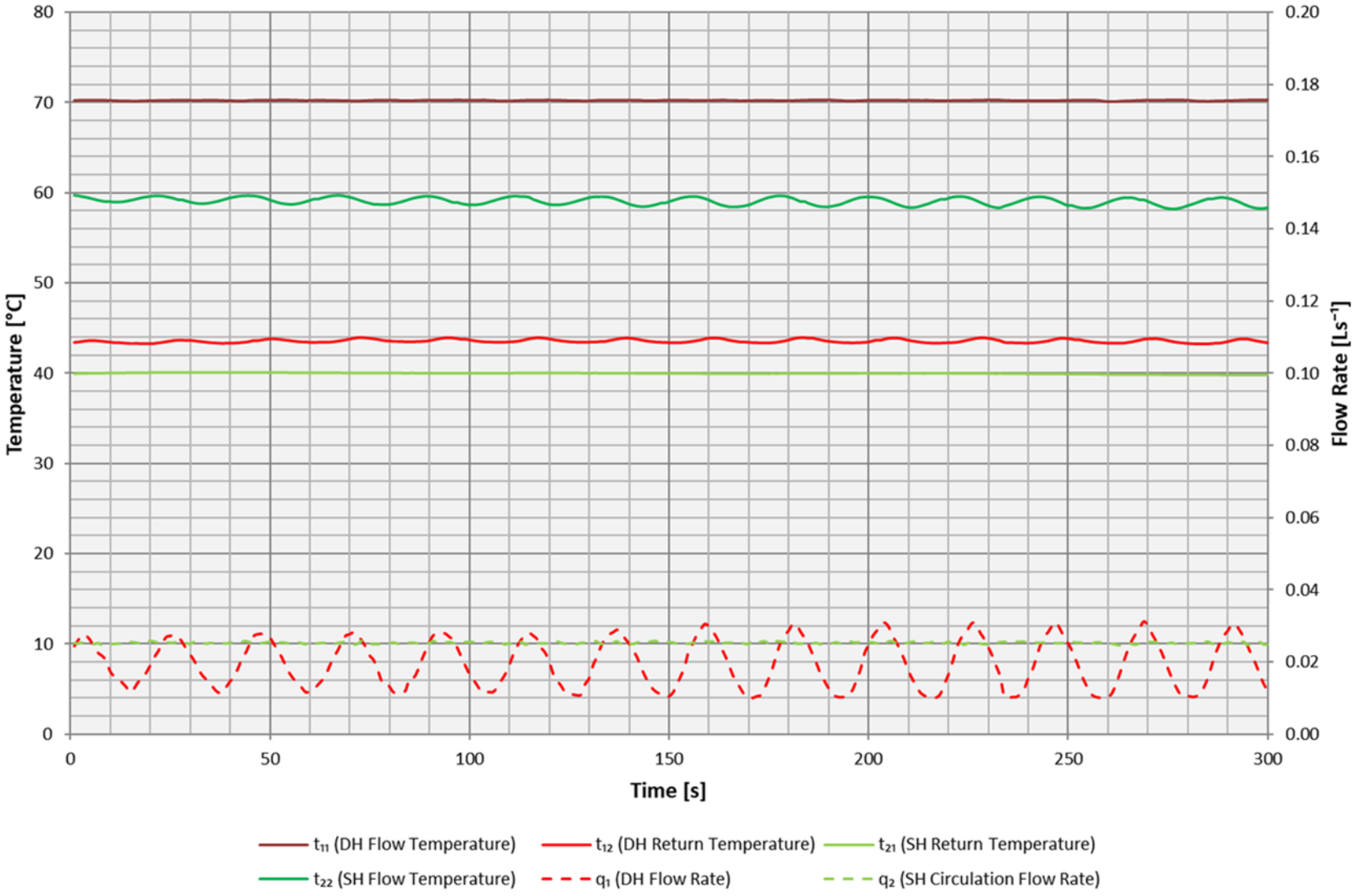


Figure 7.2 - Test 1b – Space Heating 2 kW at 70 °C

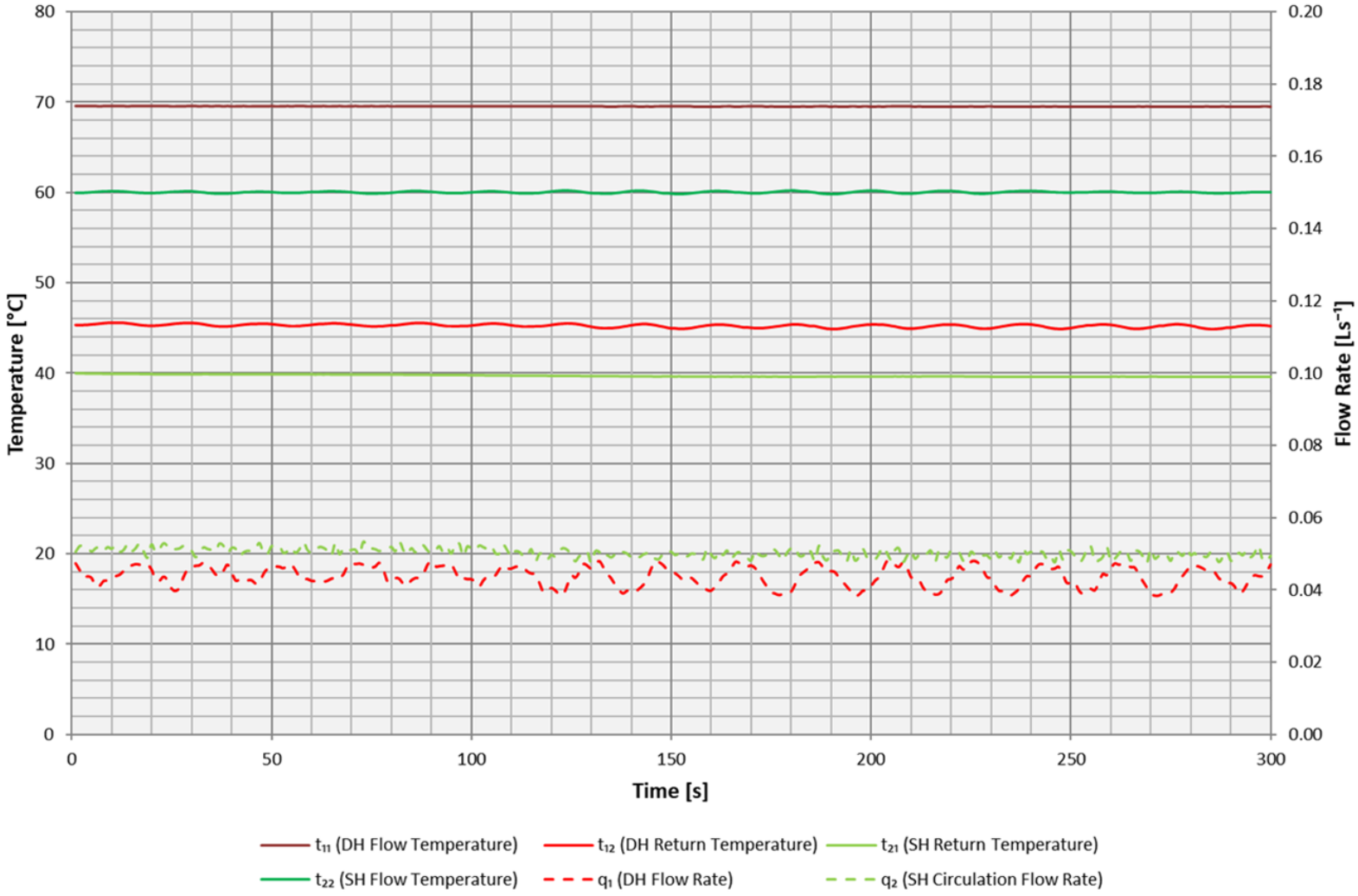


Figure 7.3 - Test 1c – Space Heating 4 kW at 70 °C

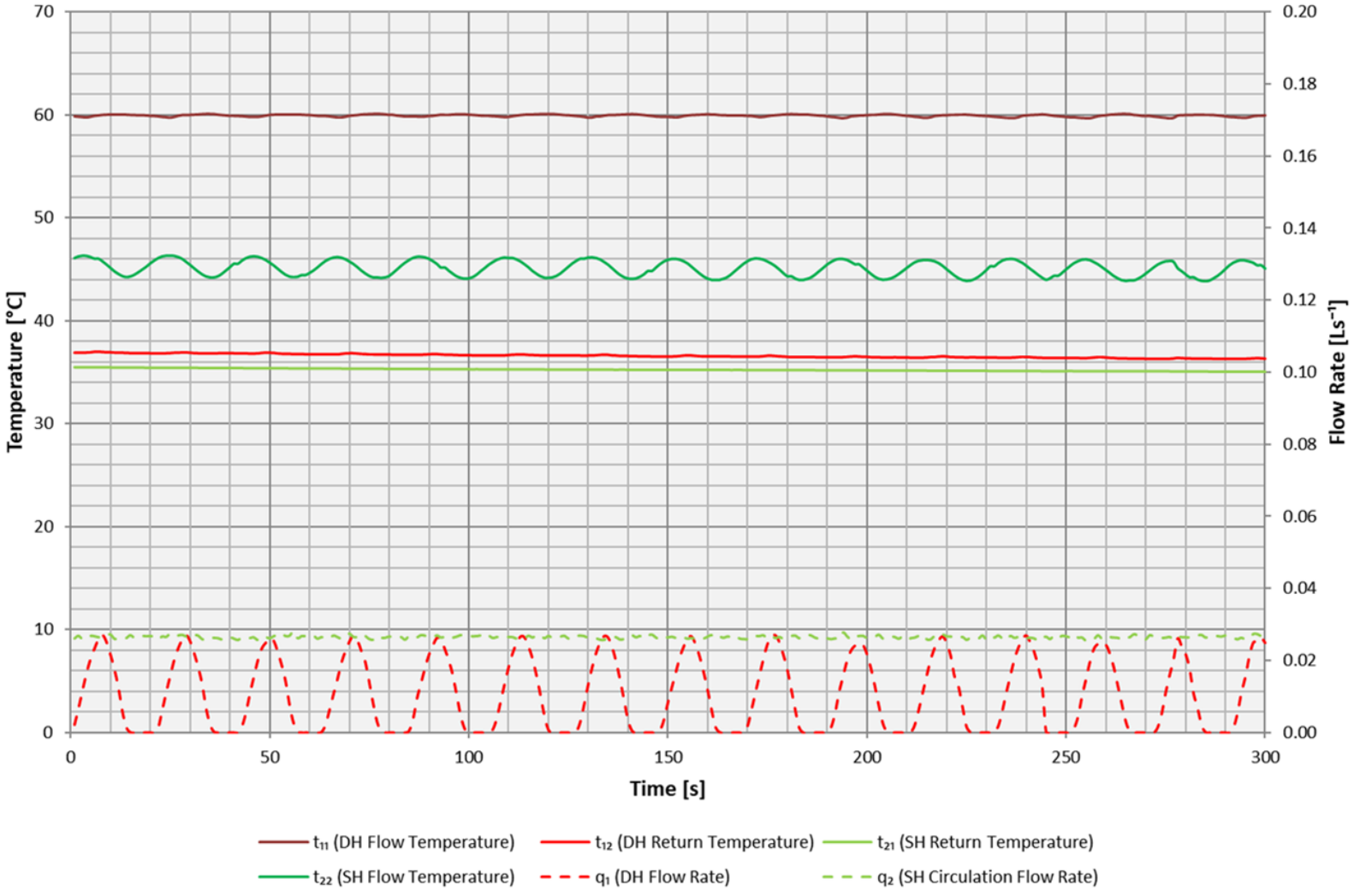


Figure 7.4 - Test 1d – Space Heating 1 kW at 60 °C

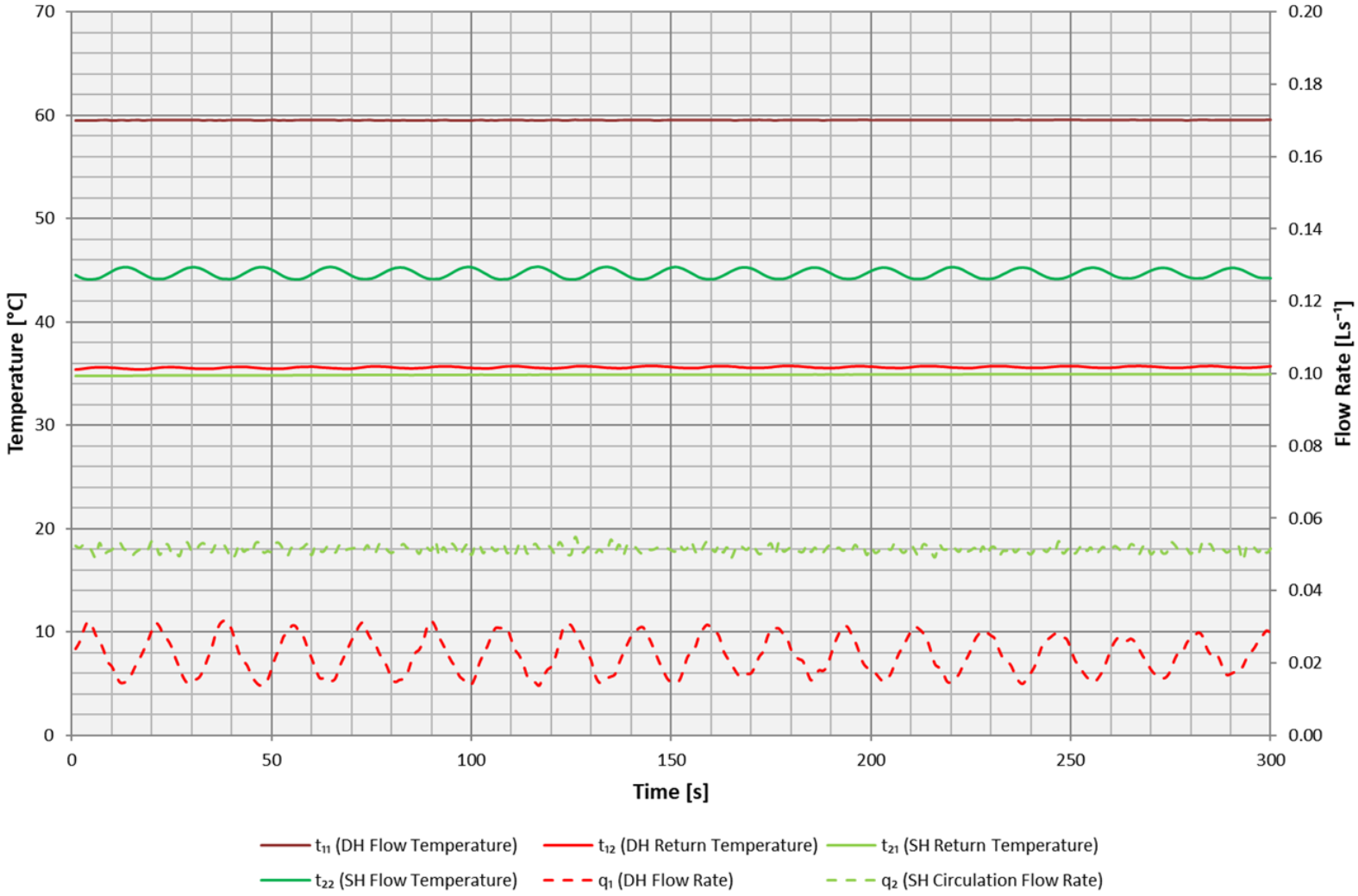


Figure 7.5 - Test 1e – Space Heating 2 kW at 60 °C

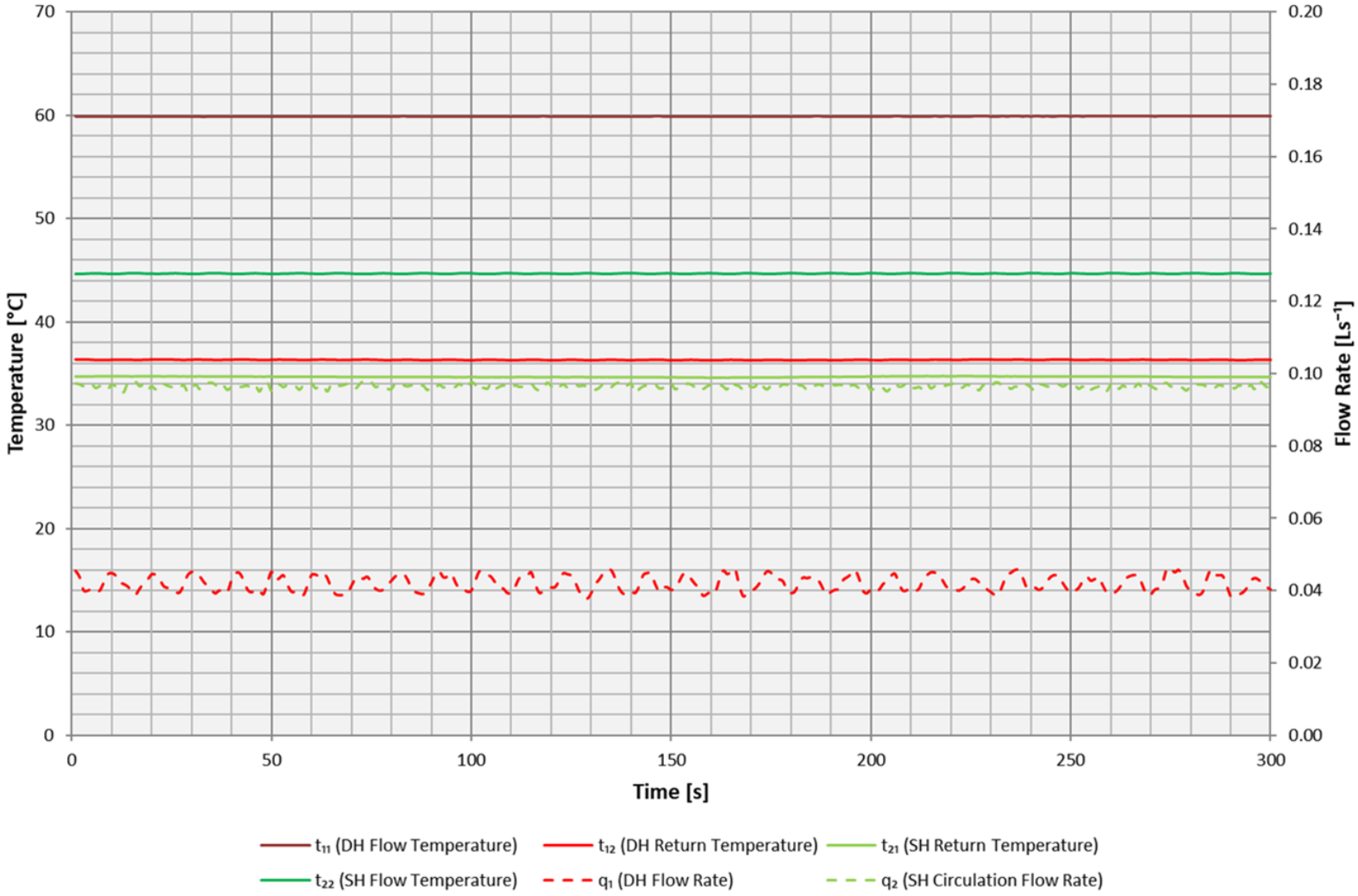


Figure 7.6 - Test 1f – Space Heating 4 kW at 60 °C

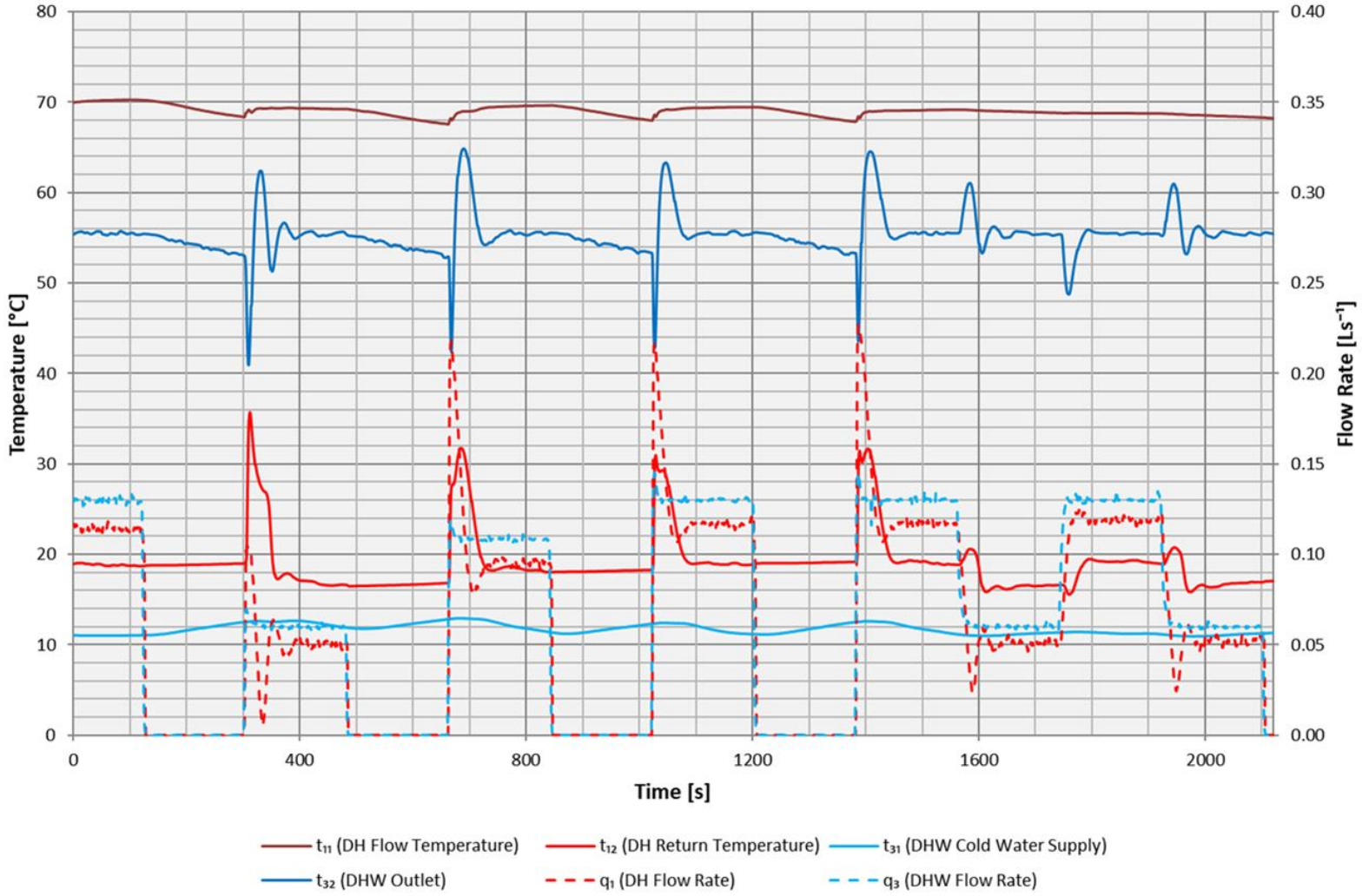


Figure 7.7 - Test 2a – DHW only at 70 °C

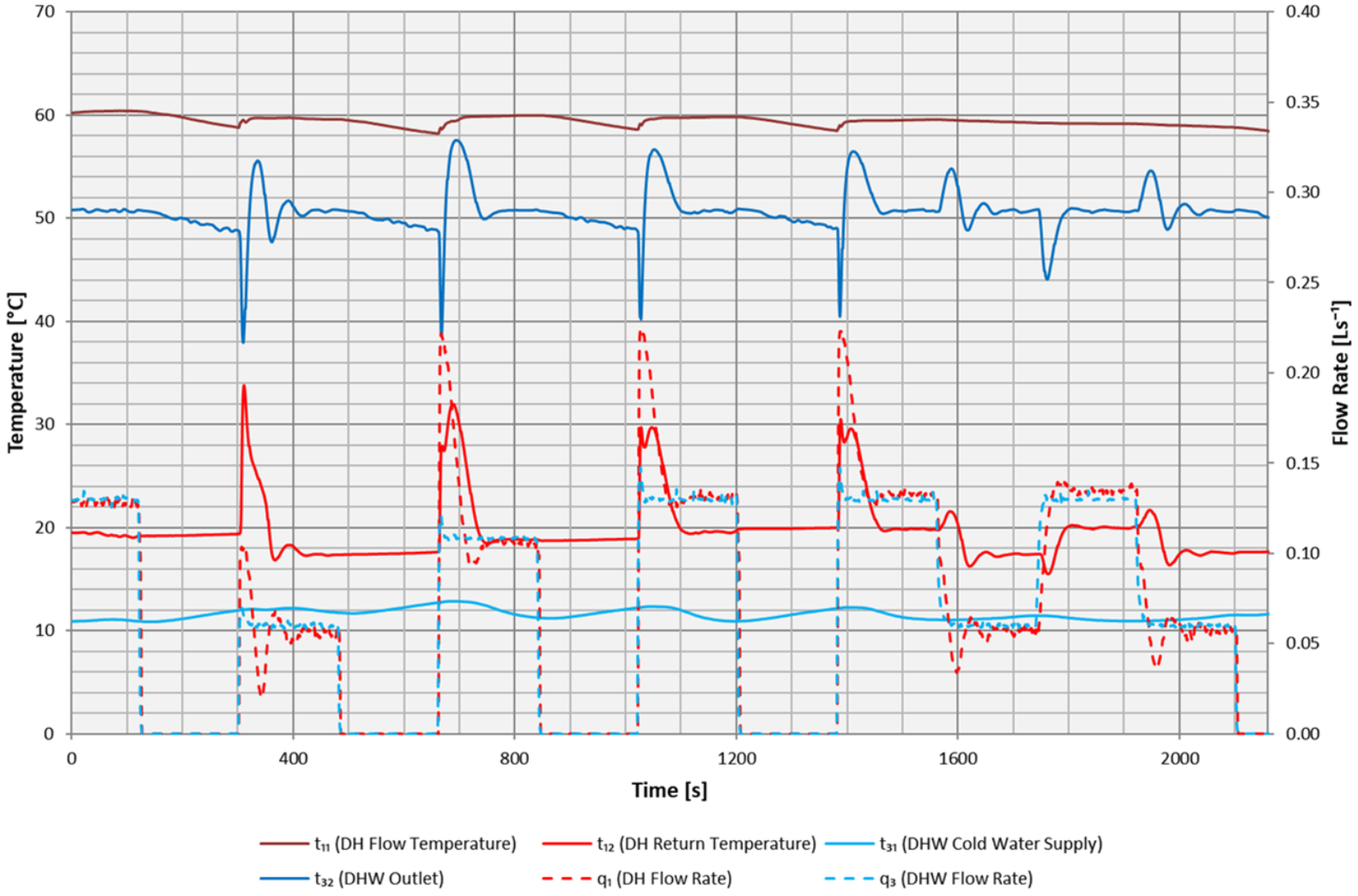


Figure 7.8 - Test 2b – DHW only at 60 °C

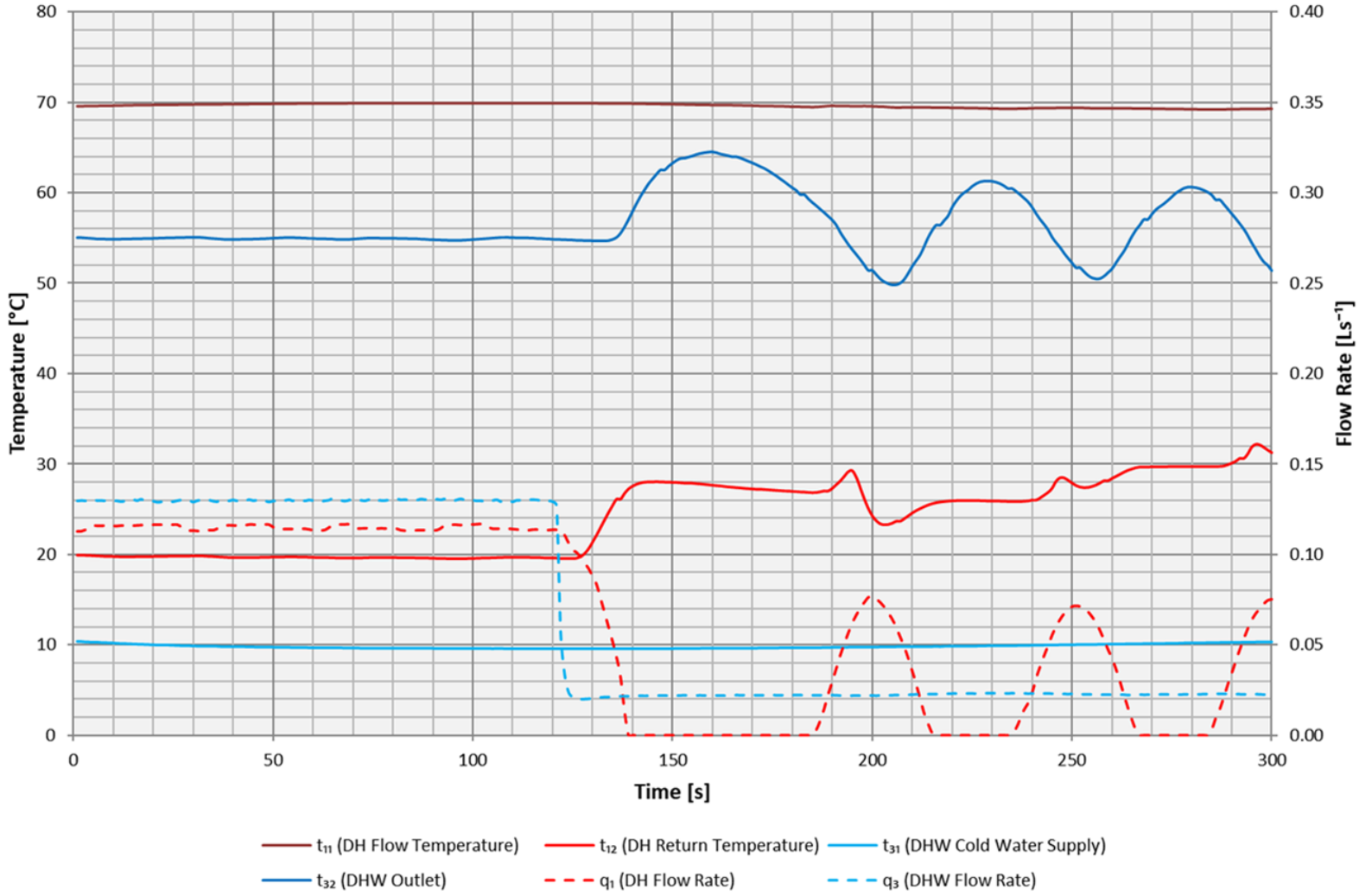


Figure 7.9 - Test 3a – Low Flow DHW at 70 °C

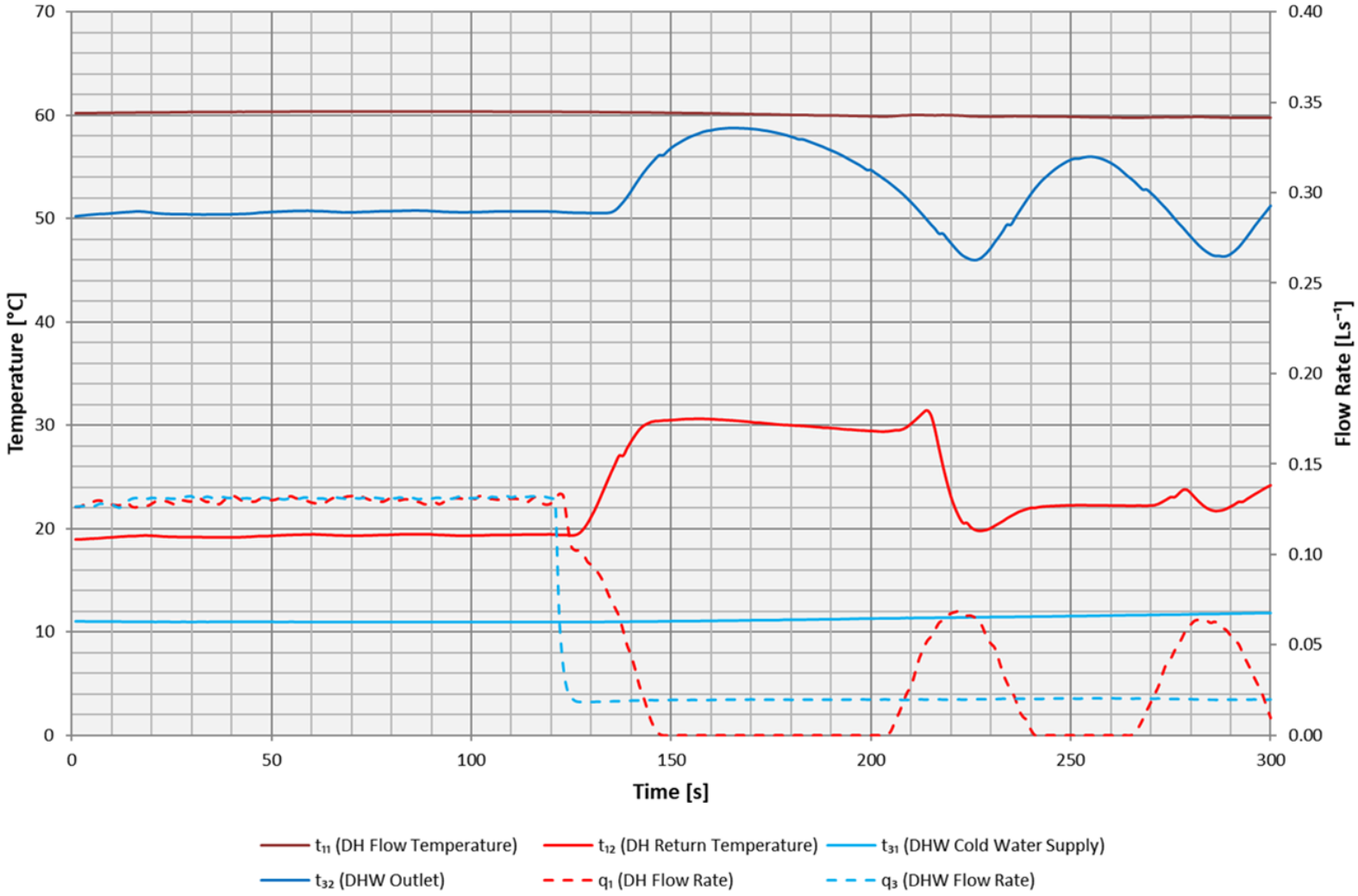


Figure 7.10 - Test 3b – Low Flow DHW at 60 °C

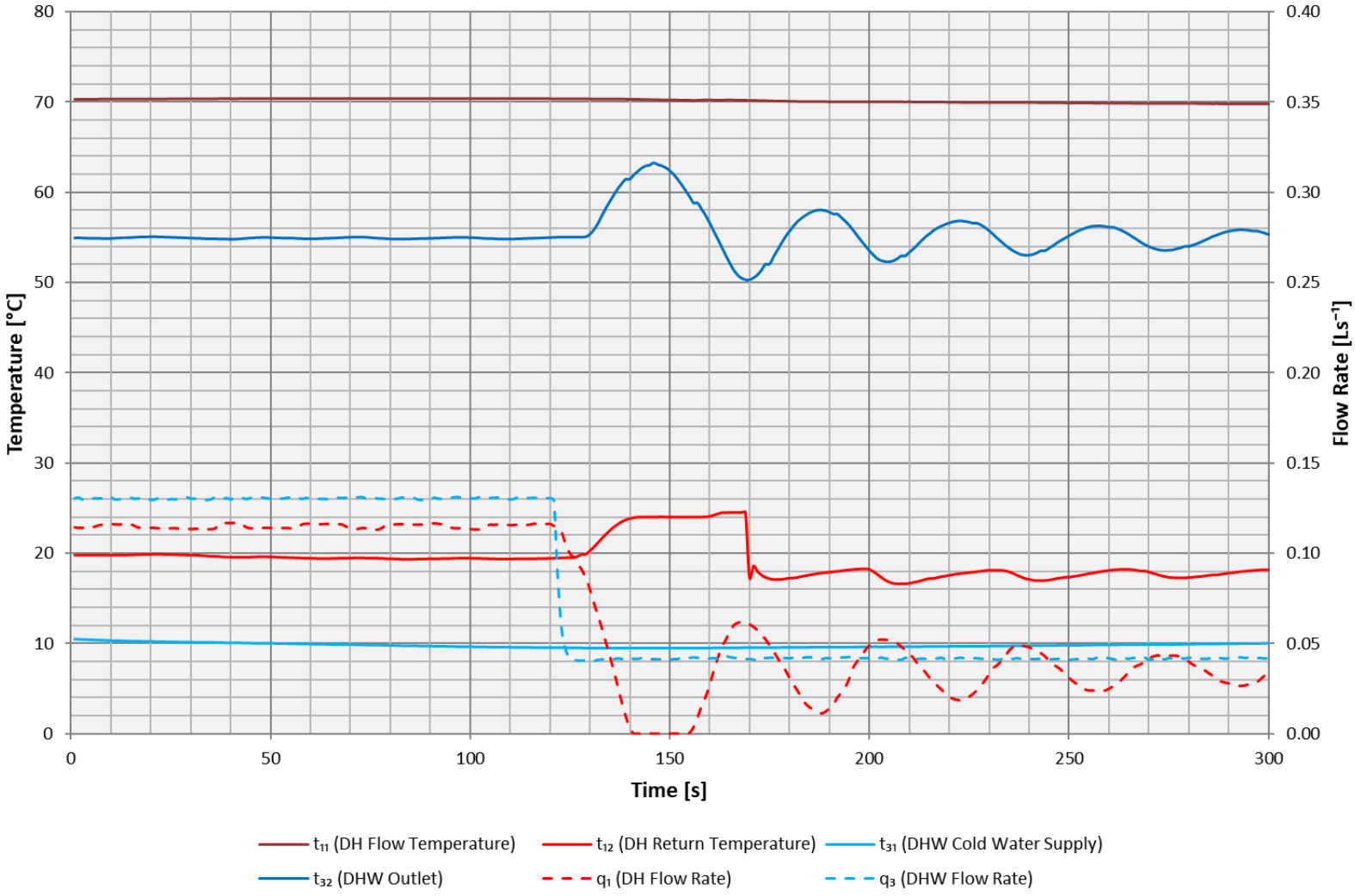


Figure 7.11 - Test 3c – Manufacturers Declared Low Flow DHW at 70 °C

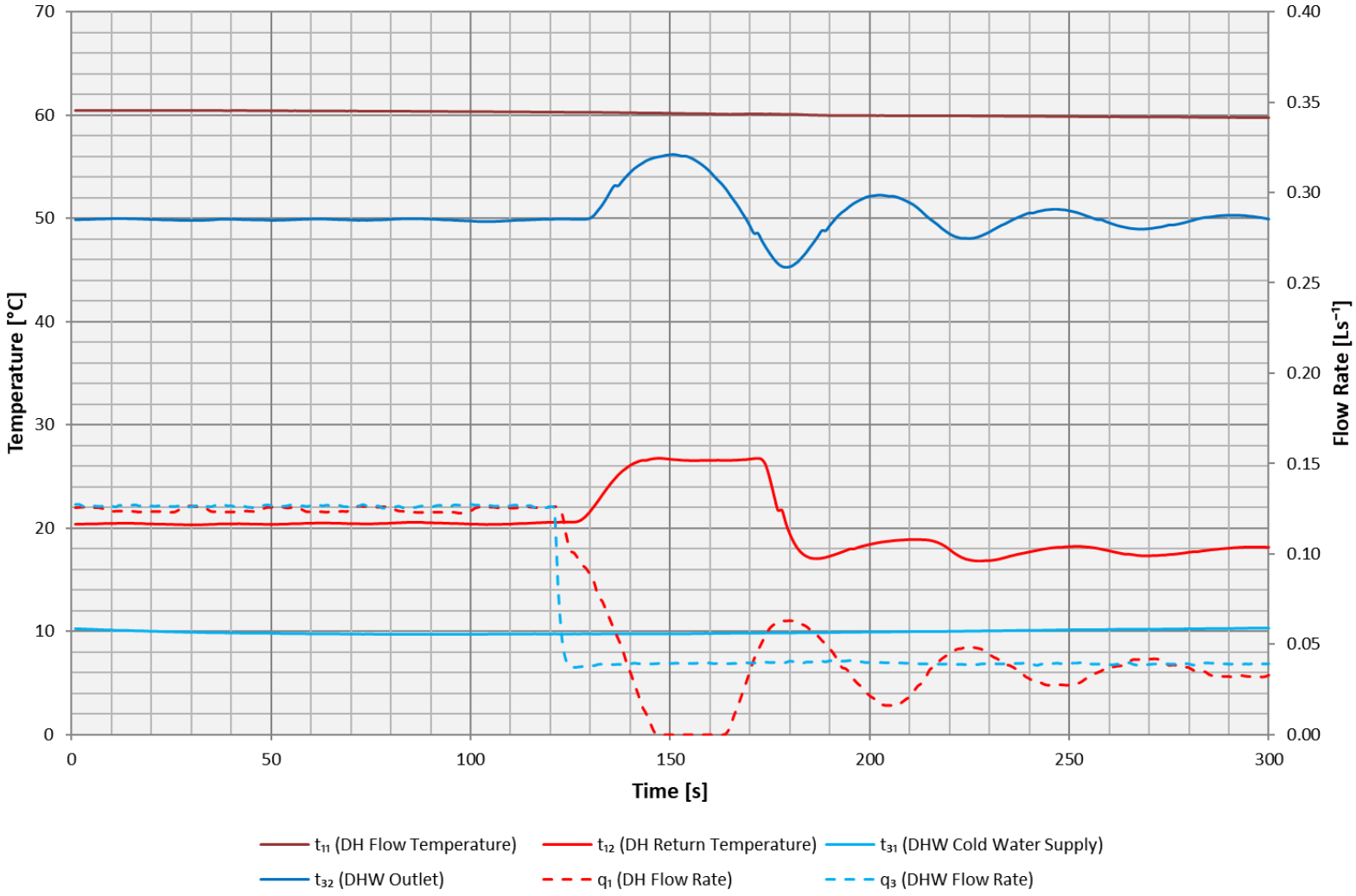


Figure 7.12 - Test 3d – Manufacturers Declared Low Flow DHW at 60 °C

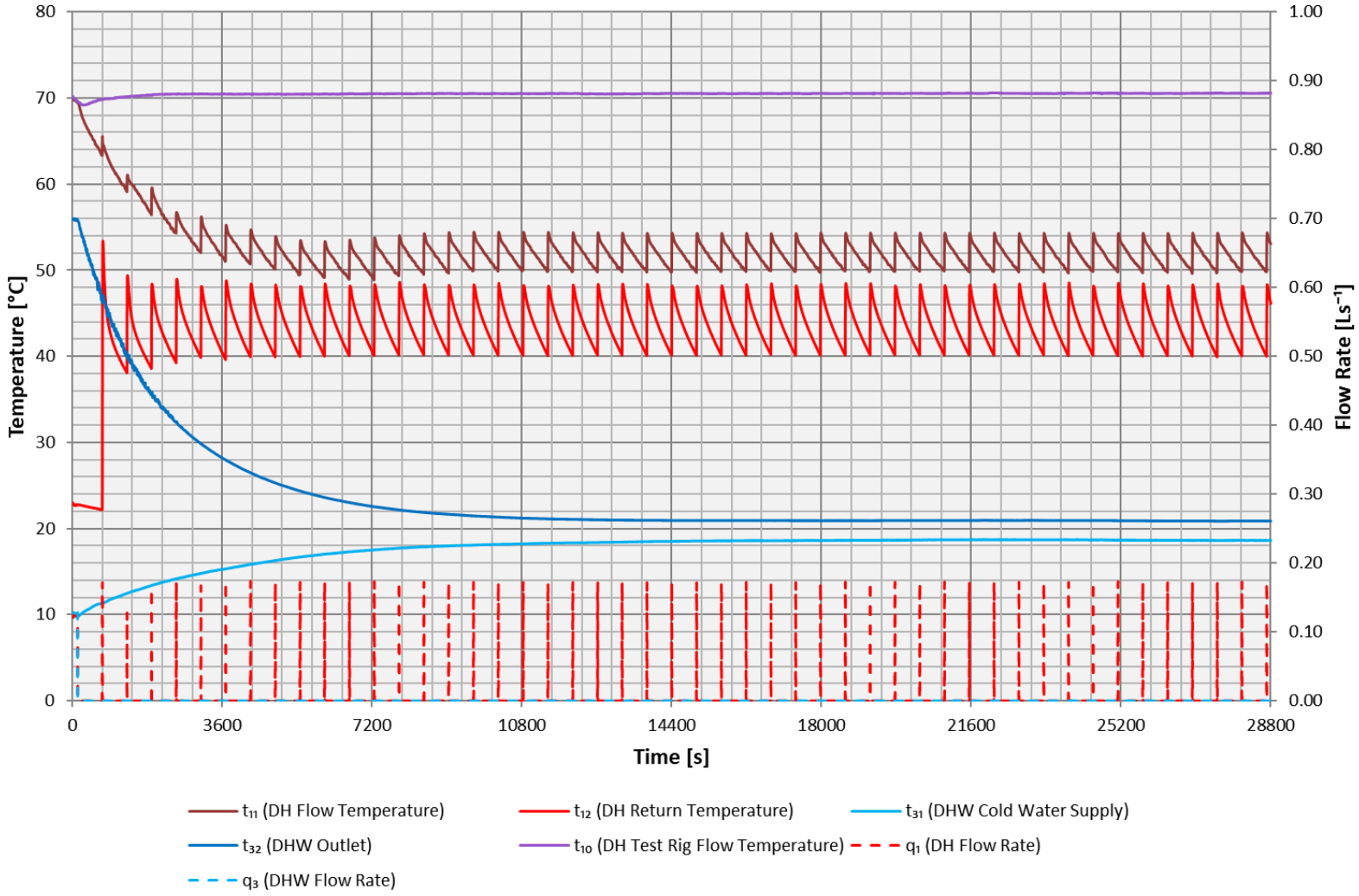


Figure 7.13 - Test 4a – Keep-warm at 70 °C

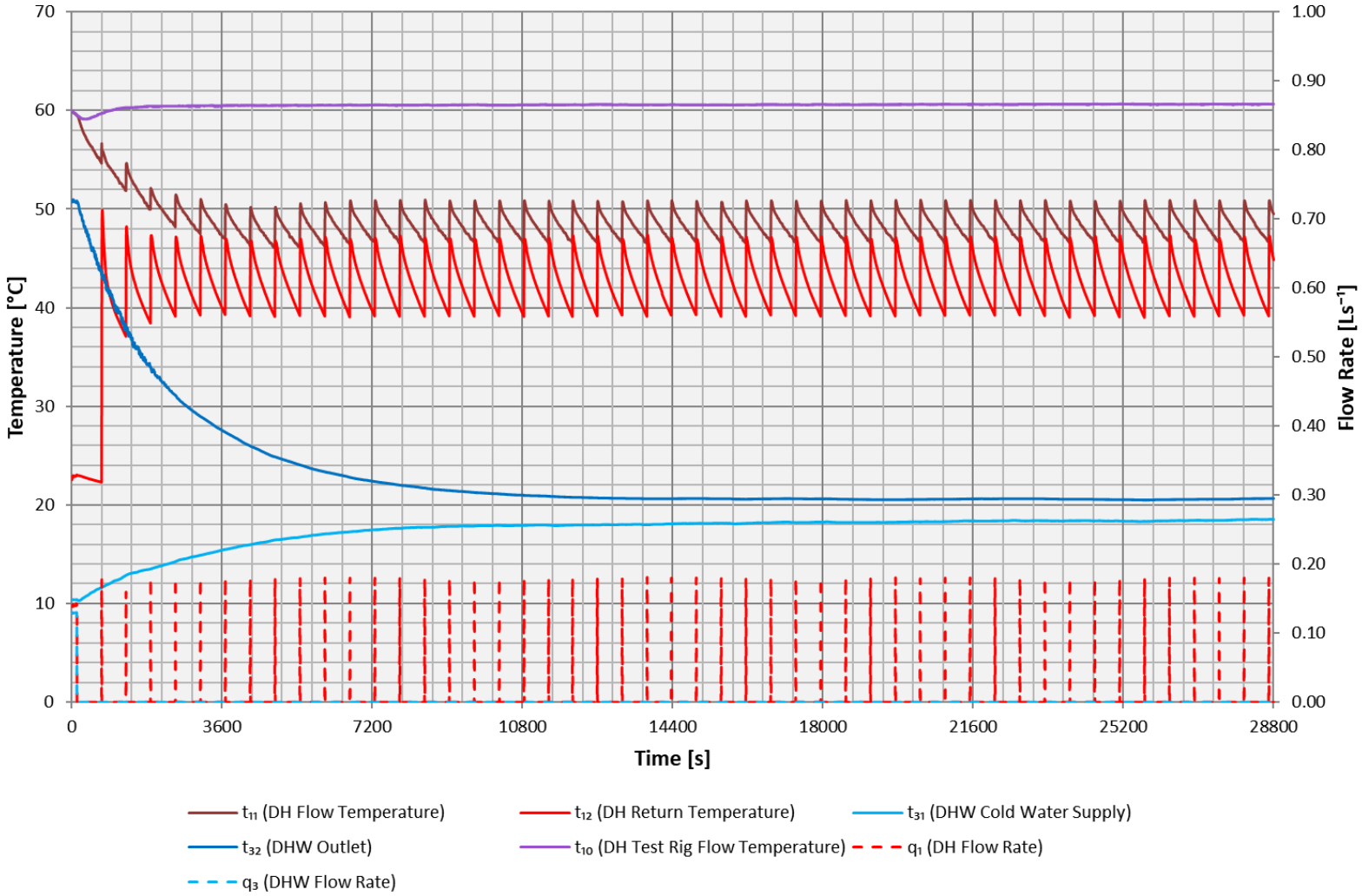


Figure 7.14 - Test 4b – Keep-warm at 60 °C

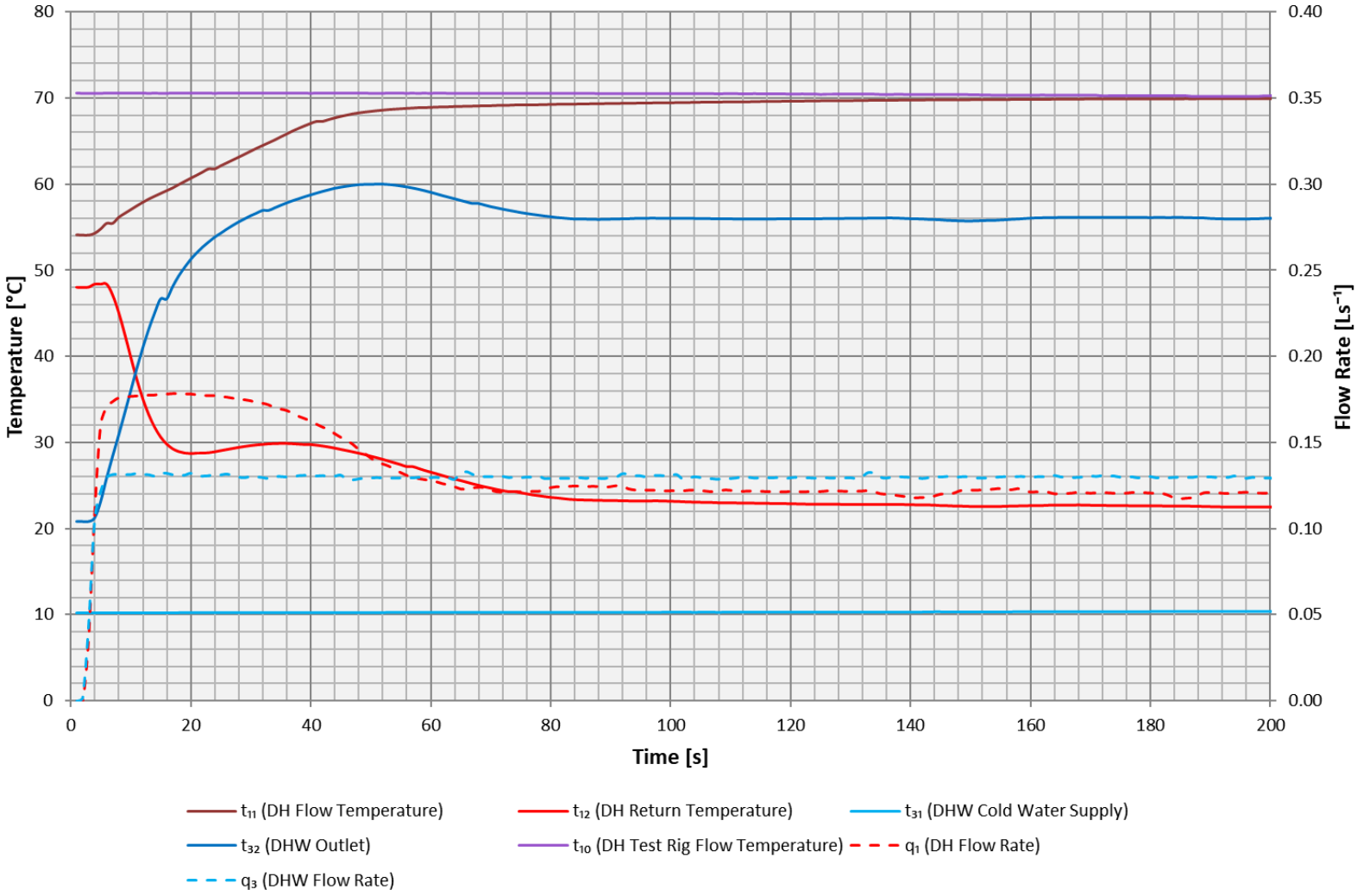


Figure 7.15 - Test 5a – DHW Response Time at 70 °C

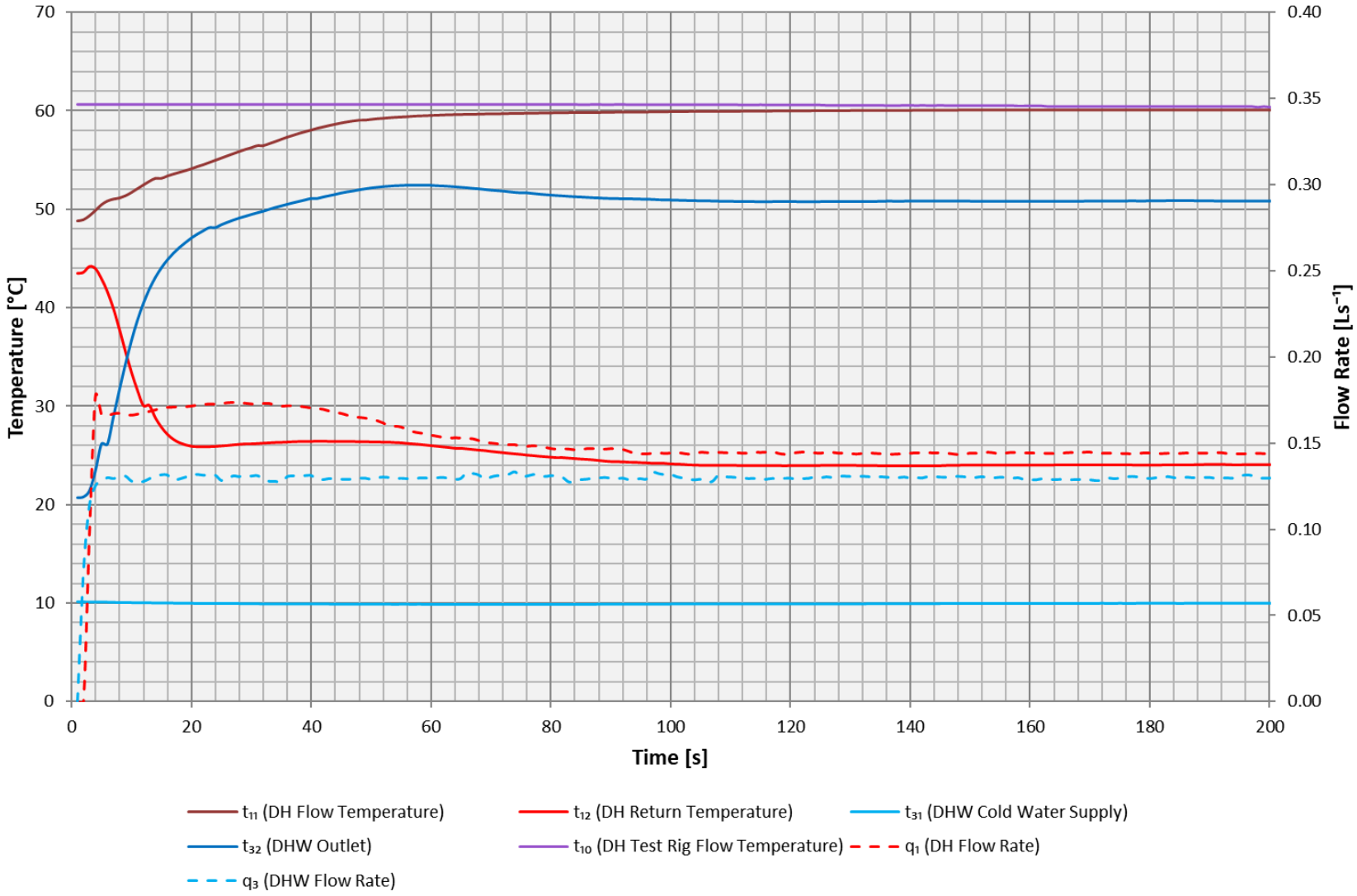


Figure 7.16 - Test 5b – DHW Response Time at 60 °C

7.2 Key Metric and VWART Summary

7.2.1 The summary tables of the key metrics and VWARTs of the tests described in this report are given in this section.

SUMMARY TABLES START ON NEXT PAGE

VWART Calculation with Keep Warm

Test carried out by Enertek International for High Temperature BESA Tests

Manufacturer:	Groupe Atlantic
Model:	70kW
Serial number:	225240000003
Calculation performed by S.Broxham of Enertek on:	02/12/2021

Primary Flow Temperature:	70°C
DHW Setpoint:	55°C
Space Heating Temperature:	60/40°C

	VWART (°C)	Volume (m3)
DHW	21	26.2
Standby	43	49.1
Space Heating	45	52.5

	VWART with keep warm active	
Period	**VWART (°C)**	**% Time**
No Heating	36	93%
Heating	44	7%
Overall	**36**	

		Test Results							
		Power [W]	Primary flow [m³/hr]	VWART [°C]	Energy Used [kWh]	Annual Operation [Hours]	Volume [m³]	Events [Per Year]	Average duration [Seconds]
1kW Space Heating	1a	1280	0.052	48	104	81.3	4.20	-	-
2kW Space Heating	1b	2109	0.071	44	820	388.5	27.55	-	-
4kW Space Heating	1c	4458	0.158	45	586	131.4	20.71	-	-
DHW Low Flow Rate	2a	10848	0.186	20	711	67.2	12.50	-	-
DHW Medium Flow Rate	2a	20053	0.377	22	307	14.8	5.58	-	-
DHW High Flow Rate	2a	24151	0.444	22	452	18.4	8.16	-	-
DHW Post Low Flow Rate	2a	-	0.000	0	-	-	0.00	10000	30
DHW Post Medium Flow Rate	2a	-	0.000	0	-	-	0.00	660	70
DHW Post High Flow Rate	2a	-	0.000	0	-	-	0.00	300	145
DHW Keep Warm Standby	4a	-	0.006	43	551	8058.4	49.05	-	-

Table 7.1 - Key Metrics of High Temperature Package

VWART Calculation with Keep Warm

Test carried out by Enertek International for Low Temperature BESA Tests

Manufacturer:	Groupe Atlantic
Model:	70kW
Serial number:	225240000003
Calculation performed by S.Broxham of Enertek on:	02/12/2021

Primary Flow Temperature:	60°C
DHW Setpoint:	50°C
Space Heating Temperature:	45/35°C

	VWART (°C)	Volume (m3)
DHW	22	33.8
Standby	42	64.6
Space Heating	36	54.7

	VWART with keep warm active	
Period	**VWART (°C)**	**% Time**
No Heating	35	93%
Heating	36	7%
Overall	**35**	

		Test Results							
		Power [W]	Primary flow [m³/hr]	VWART [°C]	Energy Used [kWh]	Annual Operation [Hours]	Volume [m³]	Events [Per Year]	Average duration [Seconds]
1kW Space Heating	1d	1037	0.038	37	102	97.9	3.68	-	-
2kW Space Heating	1e	2237	0.080	36	832	371.9	29.83	-	-
4kW Space Heating	1f	4137	0.151	36	580	140.2	21.17	-	-
DHW Low Flow Rate	2b	9660	0.210	20	722	75.5	15.87	-	-
DHW Medium Flow Rate	2b	17865	0.436	23	309	16.6	7.25	-	-
DHW High Flow Rate	2b	21617	0.518	23	457	20.5	10.64	-	-
DHW Post Low Flow Rate	2b	-	0.000	0	-	-	0.00	10000	30
DHW Post Medium Flow Rate	2b	-	0.000	0	-	-	0.00	660	70
DHW Post High Flow Rate	2b	-	0.000	0	-	-	0.00	300	145
DHW Keep Warm Standby	4b	-	0.008	42	530	8037.4	64.58	-	-

Table 7.2 - Key Metrics of Low Temperature Package

8 APPENDIX B

8.1 Appliance Documentation

8.1.1 The details of the appliance documentation are given in Table 8.1 below.

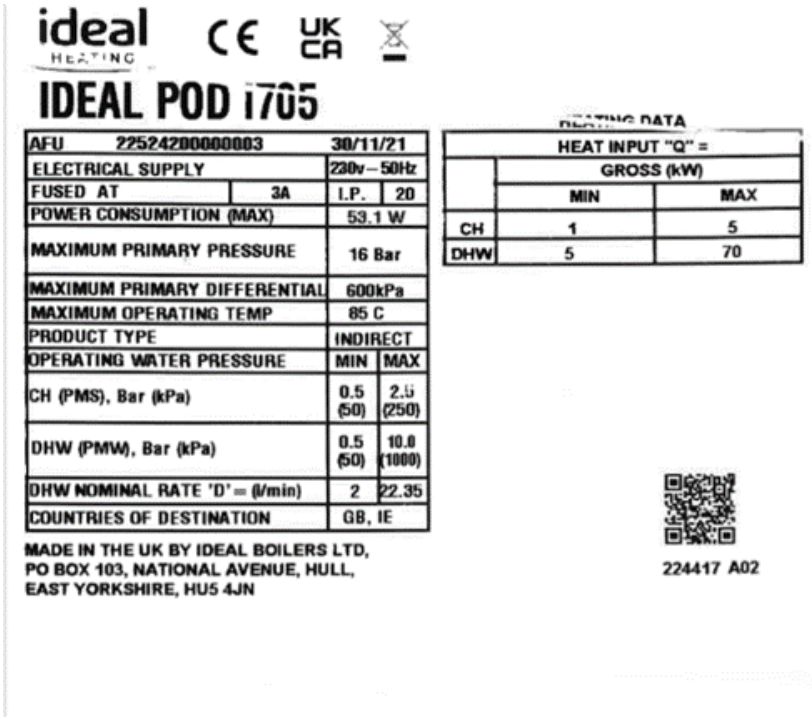
Table 8.1 – Documentation Supplied

	Component:	Document Submitted (Y/N):	Manufacturer and Type:
1	Space Heating Heat Exchanger	Y	Alfa Laval
2	Domestic Hot Water Heat Exchanger	Y	Alfa Laval
3	Controller for Space Heating	Y	Nordgas (PCB)
4	Control Valve and Actuator for Space Heating	Y	Frese (Optima PICV)
5	Space Heating Strainer	Y	Novasfer A13 R074CA
6	Controller for Domestic Hot Water	Y	Nordgas (PCB)
7	Control Valve and Actuator for Domestic Hot Water	Y	Frese (Optima PICV)
8	Temperature Sensors	Y	Tasseron (SNTC Thermistor)
9	Domestic Hot Water Isolating Valve	Y	Airaga Rubinetterie
10	Primary Side Strainer	N	N/A
11	Drain Valves	Y	CQI Drain Valve G 1/4
12	Vent Valves	Y	CQI Drain Valve G 1/4
13	Circulation Pump set with AAV & PRV	Y	Grundfos
14	Heat Meter	Y	Sycous
15	Domestic Hot Water Flow Sensor	Y	Sika Systemtechnik
16	Pipes	Y	Copper
17	Connections	Y	
18	Joints	Y	
19	Gaskets	Y	Reinz Dichtungs
20	Expansion Vessel	Y	Winkelman
21	Insulation	Y	Expanded Polypropylene
22	Pressure Sensors	N	N/A
A1	‘O’ Ring	Y	Superior Seals
A2	Commissioning Guide.	Y	User Instructions/ Installation guide
A3	Operation guides with a function description / description of operation and care instructions as suited to the intended user category.	Y	User Instructions/ Installation guide
A4	Declaration of Conformity for CE-marked HIUs.	Y	
A5	Full parameter list for electrically controlled HIUs.	Y	
A6	Maximum primary static operating differential pressure.	Y	
A7	Deactivation procedure of the internal SH pump.	Y	
	Software / Firmware	Y	V32_12
	Model Name and Type Number	Y	IDEAL POD i705
	Serial Number	Y	225238000000006

8.2 Appliance Photographs

Figure 8.1 – Photograph of Appliance [Case Fitted]

Figure 8.2 – Photograph of Appliance [Case Removed]



ideal HEATING

CE UK CA

IDEAL POD i705

AFU 22524200000003		30/11/21	
ELECTRICAL SUPPLY		230v – 50Hz	
FUSED AT	3A	I.P.	20
POWER CONSUMPTION (MAX)		53.1 W	
MAXIMUM PRIMARY PRESSURE		16 Bar	
MAXIMUM PRIMARY DIFFERENTIAL		600kPa	
MAXIMUM OPERATING TEMP		85 C	
PRODUCT TYPE		INDIRECT	
OPERATING WATER PRESSURE		MIN	MAX
CH (PMS), Bar (kPa)		0.5 (50)	2.5 (250)
DHW (PMW), Bar (kPa)		0.5 (50)	10.0 (1000)
DHW NOMINAL RATE 'D' = (l/min)		2	22.35
COUNTRIES OF DESTINATION		GB, IE	

MADE IN THE UK BY IDEAL BOILERS LTD,
PO BOX 103, NATIONAL AVENUE, HULL,
EAST YORKSHIRE, HU5 4JN

HEATING DATA

HEAT INPUT "Q" =		
	GROSS (kW)	
	MIN	MAX
CH	1	5
DHW	5	70

224417 A02

Figure 8.3 – Appliance Data Label

8.3 Calibrations and Uncertainties

1.1.3 A list of equipment, their calibrations and uncertainties are given in table 8.8 below.

Table 8.2 - EIL Equipment Calibration and Uncertainties

Equipment Name	ID Number	Calibration Certificate	Measurement Uncertainty K=2 $\frac{U}{\sqrt{20}}$	Units	Calibration Date	Calibration Due
Flow Meter [Primary Flow Rate]	FM 601	K48376FW1S2	±0.0004	l/s	07/07/2021	07/2022
Flow Meter [DHW Flow Rate]	FM 602	K48378FW	±0.00305	l/s	07/07/2021	07/2022
Flow Meter [SH Flow Rate]	FM 603	K48377FW	±0.04871	l/s	06/07/2021	07/2022
Flow Meter [DHW Flow Rate]	FM 605	K48375FW	±0.00576	l/s	05/07/2021	07/2022
Pressure Transducer [Primary Supply]	PT 086	K48379P	±6.91	kPa	05/07/2021	07/2022
Pressure Transducer [Primary Return]	PT 085	K48384P	±8.54	kPa	05/07/2021	07/2022
Pressure Transducer [DHW Output Pressure]	PT 083	K48380P	±21.27	kPa	05/07/2021	07/2022
Pressure Transducer [DHW Cold Water Supply]	PT 084	K48383P2	±9.21	kPa	20/07/2021	07/2022
Pressure Transducer [SH Flow]	PT 087	K48382P	±7.10	kPa	05/07/2021	07/2022
Pressure Transducer [SH Return]	PT 088	K48381P	±15.24	kPa	05/07/2021	07/2022
PRT Probe [Primary Supply Temp]	PRT 4709	443851	±0.6	°C	10/07/2021	07/2022
PRT Probe [Primary Return Temp]	PRT 4708	443851	±0.6	°C	10/07/2021	07/2022
PRT Probe [DHW Output Temp]	PRT 4711	443852	±0.6	°C	10/07/2021	07/2022
PRT Probe [Cold Water Supply Temp]	PRT 4710	443852	±1.91	°C	10/07/2021	07/2022
PRT Probe [SH Supply Temp]	PRT 4707	443851	±0.57	°C	10/07/2021	07/2022
PRT Probe [SH Return Temp]	PRT 4706	443851	±1.06	°C	10/07/2021	07/2022

Equipment Name	ID Number	Calibration Certificate	Measurement Uncertainty K=2 $\frac{U}{\sqrt{20}}$	Units	Calibration Date	Calibration Due
Pressure Transducer [Static Pressure Test]	PT 090	U100553-19	±50	kPa	21/11/2019	20/11/2021
Power Meter [Electrical Consumption]	PM1022	U103585-20	±1.03	W	28/07/2021	09/2021
Software	VERSION – LabVIEW, Version 5, Service pack 1					

Report Issue No	Reason for Report Update
1	Original Issue 14/10/2021
2	Data label amended. 01/12/2021
3	Cycling reference added and total energy used during keep warm added. 02/12/2021

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