WORK PACKAGE 7

Safety Assessment:
Experimental Testing – Cupboard Level
Leakage and Accumulation
The Hy4Heat Safety Assessment has focused on assessing the safe use of hydrogen gas in certain types of domestic properties and buildings. The evidence collected is presented in the reports listed below, all of which have been reviewed by the HSE.

The summary reports (the Precis and the Safety Assessment Conclusions Report) bring together all the findings of the work and should be looked to for context by all readers. The technical reports should be read in conjunction with the summary reports. While the summary reports are made as accessible as possible for general readers, the technical reports may be most accessible for readers with a degree of technical subject matter understanding.

**Safety Assessment:**
**Precis**
An overview of the Safety Assessment work undertaken as part of the Hy4Heat programme.

**Safety Assessment:**
**Conclusions Report**  
*(incorporating Quantitative Risk Assessment)*
A comparative risk assessment of natural gas versus hydrogen gas, including a quantitative risk assessment; and identification of control measures to reduce risk and manage hydrogen gas safety for a community demonstration.

**Safety Assessment:**
**Consequence Modelling Assessment**
A comparative modelling assessment of the consequences in the event of a gas leak and ignition event for natural gas and hydrogen gas.

**Safety Assessment:**
**Gas Ignition and Explosion Data Analysis**
A review of experimental data focusing on natural gas and hydrogen gas ignition behaviour and a comparison of observed methane and hydrogen deflagrations.

**Safety Assessment:**
**Gas Dispersion Modelling Assessment**
A modelling assessment of how natural gas and hydrogen gas disperses and accumulates within an enclosure (e.g. in the event of a gas leak in a building).

**Safety Assessment:**
**Gas Dispersion Data Analysis**
A review of experimental data focusing on how natural gas and hydrogen gas disperses and accumulates within an enclosure (e.g. in the event of a gas leak in a building).

**Safety Assessment:**
**Gas Escape Frequency and Magnitude Assessment**
An assessment of the different causes of existing natural gas leaks and the frequency of such events; and a review of the relevance of this to a hydrogen gas network.

**Safety Assessment:**
**Experimental Testing - Domestic Pipework Leakage**
Comparison of leak rates for hydrogen and methane gas from various domestic gas joints and fittings seen in typical domestic gas installations.
Safety Assessment:
Experimental Testing – Commercial Pipework Leakage
Comparison of hydrogen and methane leak rates on a commercial gas pipework system, specifically the gas meter and equipment contained within the Plant Room of a MOD site.

Safety Assessment:
Experimental Testing - Cupboard Level Leakage and Accumulation
Comparison of the movement and accumulation of leaked hydrogen vs. methane gas within cupboard spaces in a typical domestic property.

Safety Assessment:
Experimental Testing - Property Level Leakage and Accumulation
Comparison of the movement and accumulation of leaked hydrogen vs. methane gas within a typical domestic property.

Safety Assessment:
Experimental Testing - Ignition Potential
Investigation of the ignition potential of hydrogen-air mixtures by household electrical items and a comparison with the ignition potential of methane-air mixtures.
Project name: Hy4Heat WP7 Lot2: Phase 1 and 2  
Report title: Cupboard Level Leakage and Accumulation Data Report  
Customer: Department for Business, Energy & Industrial Strategy, 1 Victoria Street, SW1H 0ET, London, United Kingdom  
Customer contact: c/o Sophie Brown, Arup  
Date of issue: 2020-08-03  
Project No.: 10158498  
Organisation unit: Project Delivery  
Report No.: 630650, Rev. 3 FINAL  
Document No.: 630650  
Applicable contract(s) governing the provision of this Report: 1819/02/2019 Hy4Heat – WP7 – Safety assessments for the suitability of hydrogen in existing buildings: Lot 2

Objective:
Convey experimental configuration and results from experiments in Hy4Heat WP7 Lot2.

Prepared by: Gemma Simpson  
Verified by: Dan Allason  
Approved by: Mike Johnson  

Copyright © DNV GL 2020. All rights reserved. Unless otherwise agreed in writing: (i) This publication or parts thereof may not be copied, reproduced or transmitted in any form, or by any means, whether digitally or otherwise; (ii) The content of this publication shall be kept confidential by the customer; (iii) No third party may rely on its contents; and (iv) DNV GL undertakes no duty of care toward any third party. Reference to part of this publication which may lead to misinterpretation is prohibited. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.

DNV GL Distribution:  
☐ OPEN. Unrestricted distribution, internal and external.  
☐ INTERNAL use only. Internal DNV GL document.  
☒ CONFIDENTIAL. Distribution within DNV GL according to applicable contract.*  
☐ SECRET. Authorized access only.  
*Specify distribution: BEIS, ARUP+

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>Reason for Issue</th>
<th>Prepared by</th>
<th>Verified by</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2020-01-21</td>
<td>DRAFT for comment only</td>
<td>Gemma Simpson</td>
<td>Dan Allason</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2020-02-10</td>
<td>DRAFT for comment only, including results</td>
<td>Gemma Simpson</td>
<td>Dan Allason</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2020-06-17</td>
<td>FINAL after comments</td>
<td>Gemma Simpson</td>
<td>Dan Allason</td>
<td>Mike Johnson</td>
</tr>
<tr>
<td>3</td>
<td>2020-08-03</td>
<td>FINAL inc. Phase 2 experiments</td>
<td>Gemma Simpson</td>
<td>Dan Allason</td>
<td>Mike Johnson</td>
</tr>
</tbody>
</table>
# Table of contents

**EXECUTIVE SUMMARY** ............................................................................................................. 3

1 **INTRODUCTION** ....................................................................................................................... 5

2 **EXPERIMENTAL ARRANGEMENT** .......................................................................................... 5
   2.1 Gas supply ................................................................................................................................. 6
   2.2 Instrumentation arrangement
      2.2.1 Pressure measurement ....................................................................................................... 6
      2.2.2 Temperature measurement ............................................................................................... 7
      2.2.3 Flow measurement ........................................................................................................... 7
      2.2.4 Gas sampling
         2.2.4.1 Sample point locations ............................................................................................. 8
      2.2.5 Wind Measurements ......................................................................................................... 8
   2.3 Control and Data Acquisition ................................................................................................. 8

3 **MASTER TEST PLAN (MTP)** .................................................................................................... 9

4 **EXPERIMENTAL PROCEDURE** ............................................................................................... 9

5 **RESULTS** .................................................................................................................................. 10
   5.1 Data Processing / Quality Check ............................................................................................ 11
   5.2 Volumetric Sensor Non-Linearity ........................................................................................... 12

6 **DISCUSSION** ............................................................................................................................ 12

7 **FIGURES** .................................................................................................................................. 14

8 **TABLES** .................................................................................................................................. 5

**APPENDIX A: PHASE 1 RESULTS** ............................................................................................ 14

**APPENDIX B: PHASE 2 RESULTS** ............................................................................................ 89

**APPENDIX C: AIR TIGHTNESS TESTING REPORT** ..................................................................... 101
EXECUTIVE SUMMARY

DNV GL were commissioned by BEIS to conduct three programmes of experimental studies (Lots 2-4) within WP7 of the Hy4Heat project. WP7 of the Hy4Heat programme is concerned with determining the relative safety of hydrogen within a domestic property (i.e. downstream of the gas distribution network’s final valve) compared to natural gas.

This report provides the results from two distinct phases in Lot 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. Methane was used as a surrogate for natural gas for simplicity of both supply and gas analysis. The second phase of experiments was commissioned after completion of the first phase and involved iterations of different vent arrangements applied to the cupboard and the kitchen.

In the first phase (Phase 1); a programme of 73 experiments was conducted involving 39 releases of hydrogen and 34 of methane into kitchen cupboards and an inset meter box. Releases were from holes ranging from 0.6 mm to 7.2 mm diameter with a pressure of 0.020 bar at the release point. This pressure is typical of the pressure downstream of the meter in a domestic property. Releases through 0.3mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low hydrogen concentrations observed.

The second phase, Phase 2, consisted of an additional set of 11 experiments (10 hydrogen and 1 methane) involving some higher release rates and variations in combinations of vent openings in the cupboard and the kitchen wall.

Experiments were carried out in a purpose-built row of houses, ‘Hy Street’, at DNV GL Spadeadam.

Some general observations are given below:

- Both hydrogen and methane formed layers of nominally uniform concentration above the point of the release.
- As a check on data consistency, the concentration in these layers could be explained in general terms by comparison with a simple accumulation model. Although no detailed analysis of the air ingress rates in the rooms was carried out, the air change rates required to reproduce the observed steady state concentrations in the simple model were reasonable for a domestic kitchen.
- In all releases of hydrogen and methane into the meter box, flammable concentrations were only observed in the wall and floor cavities. No flammable concentrations of either gas were observed in the rooms of the house.
- Releases of both methane and hydrogen generally formed high level layers in the kitchen with relatively homogeneous concentration. The layers generally extended from the tops of the cupboards to the kitchen ceiling.
- The highest release rates considered with methane in Phase 1 (6.4 m$^3$.hr$^{-1}$ through a 7.2 mm hole) resulted in steady state concentrations in a high level layer in the kitchen that was above the upper flammability limit for methane, albeit passing through the flammable range in the early parts of the release.
- For all release positions, the release with methane giving the concentration closest to stoichiometric in the kitchen layer was the 3.6 mm, 1.6 m$^3$.hr$^{-1}$ case.
- With hydrogen, the highest release rate in Phase 1 (7.2 mm, 18.6 m$^3$.hr$^{-1}$) produced highly reactive concentrations above 30%vol within a high level layer in the kitchen.
• 20 %vol hydrogen concentrations exhibit laminar burning velocities\(^1\) similar to that of ethylene and a factor of 2 higher than the worst case for methane. Concentrations of 30 %vol have a burning velocity about a factor of 5 higher than the worst case for methane. This can have significant effect on the severity of any subsequent explosion, even where some venting is available through weak parts of the structure such as windows.

• Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the largest hydrogen release rate case had the effect of reducing the concentration in the kitchen layer by about one third from \(~30\ %\)vol to \(~20\ %\)vol with only small increases observed in other areas of the house.

• Addition of 4 x 100 mm vent holes in the bottom and 4 x 100 mm vent holes in the side of the kitchen base cupboard in the largest release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 40 %vol to approximately 25-30 %vol. There was no significant effect on the concentrations in the bulk volume of the kitchen.

• Combining results from Phase 1 and Phase 2, it is possible to compare similar release rates with hydrogen and the effects of the various vent combinations:
  - All vent combinations involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
  - At the highest flow rate in Phase 2 (78.6 m\(^3\).hr\(^{-1}\)), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (\(~60\ %\)vol) to that of a more reactive fuel : air ratio (\(~40\ %\)vol, around the maximum burning velocity for hydrogen mixtures).
  - Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.

It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments in making these comparisons. It is considered that this would not materially affect the conclusions.

---

\(^1\) HySafe Website: [http://www.hysafe.net/wiki/BRHS/DependenceOfBurningVelocityOnHydrogenConcentrationPressureAndTemperature](http://www.hysafe.net/wiki/BRHS/DependenceOfBurningVelocityOnHydrogenConcentrationPressureAndTemperature)
1 INTRODUCTION

DNV GL were commissioned by BEIS to conduct three programmes of experimental studies (Lots 2-4) within WP7 of the Hy4Heat project. WP7 of the Hy4Heat programme is concerned with determining the relative safety of hydrogen within a domestic property (i.e. downstream of the gas distribution network’s final valve) compared to natural gas.

This report provides the results from Lot 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. This report provides the results from two distinct phases in Lot 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. The second phase of experiments was commissioned after completion of the first phase and involved iterations of different vent arrangements applied to the cupboard and the kitchen. Methane was used as a surrogate for natural gas for simplicity of both supply and gas analysis.

In the first phase (Phase 1) a programme of 73 experiments was conducted involving 39 releases of hydrogen and 34 of methane into kitchen cupboards and an inset meter box. Releases were from holes ranging from 0.6 mm to 7.2 mm diameter with a pressure of 0.020 bar at the release point. This pressure is typical of the pressure downstream of the meter in a domestic property. Releases through 0.3mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low hydrogen concentrations observed.

The second phase (Phase 2) consisted of an additional set of 11 experiments (10 hydrogen and 1 methane) involving some higher release rates and variations in combinations of vents in the cupboard and the kitchen wall.

Experiments were carried out in a purpose-built row of houses, ‘Hy Street’, at DNV GL Spadeadam.

2 EXPERIMENTAL ARRANGEMENT

Hy Street consists of 3 houses of varying layout and construction. This test program was carried out in the eastern house of the block (left hand house in Figure 1). Hy Street’s location on test site west (TSW) at DNV GL Spadeadam allows the required exclusion zones for testing to be enforced enabling the test program to be carried out safely. The house consists of a basement made up of a single room with stair access to the ground floor through a door into the hall. The ground floor has a hallway, living room with chimney breast, kitchen and utility room. Open stairs from the hall lead to the first floor which is a single room with open stairs to the converted loft, which was also a single room. Pictures of the internal layout and identification of the kitchen cupboards are included in Figure 2 - Figure 12. In some of the later experiments, a 100 mm diameter vent opening was introduced above the kitchen door into the hallway. This vent could be opened or sealed depending on the requirement of the experiment and a photograph is included as Figure 4. Similarly, 8 x 100 mm diameter vent openings were introduced into the kitchen base cupboard late in the programme (4 low and 4 high as indicated in Figure 5).

In Phase 2, ceiling vents were installed to provide some variation in ventilation to the kitchen. The vents were made from off-the-shelf cooker hood duct arrangements allowing the ceiling to be vented horizontally outside through the ceiling space (i.e. between the ceiling plaster board and the floorboards of the first floor). Two ducted vents were installed of equivalent cross-sectional areas of 78 cm² and 141 cm² such that it was possible to achieve three distinct vent arrangements of 0 cm², 78 cm², 141 cm²
or 219 cm² by isolation of both, one or none of the two vents. Photographs and a set of measurements showing the position of the installed vents are given in Figure 6.

The construction of the house was block and brick with an external cavity wall and internal stud walls on the ground floor. The external wall cavities in the east house were not filled with any insulation. The floors on each level are constructed with timber joists and floorboards. Pneumatic rams where fitted to remotely control the windows (Figure 13) allowing ventilation of the houses following a test. For the purpose of Lot 2 tests, the door to the basement of the house was wedged closed and sealed with tape.

On completion of construction and prior to testing, air leakage rate tests were carried out on the house by an independent company. The air leakage tests were carried out with the fireplace in the living room sealed and with this arrangement, the results confirmed that the houses meet current building regulations for air tightness. Test results are included in Appendix C.

2.1 Gas supply

Up to four hydrogen or methane packs were manifolded together to supply gas for the experiments. This was routed to the house through the arrangement shown in Figure 14 and in the photograph in Figure 15. Actuated valves V33 and V34 allowed gas to be supplied to or vented from the rig remotely, allowing control from outside the 200 m exclusion zone. Flow control valve V35 was remotely controlled either manually by the test engineer or through an automatic control system to maintain a required outlet pressure or flow rate. This was connected to a PE service pipe which feeds into the house. Internally, 22 mm copper pipe was used to route the gas to the cupboard into which the release was to be conducted. Gas was then released though a 0.6 mm, 0.9 mm, 1.8 mm, 2.5 mm, 3.6 mm, 5.1 mm or 7.2 mm diameter holes at the required location. In Phase 2, 3 releases were conducted through a 15 mm diameter hole.

2.2 Instrumentation arrangement

The gas supply system was instrumented to record pressure, temperature and flow of gas into the house. A sampling system was used to monitor the gas accumulation within the building. Data on wind speed and direction has also been collected for the duration of the tests. Details of the instruments are given in the following sections.

2.2.1 Pressure measurement

Pressure in the gas supply system was measured at three locations:

- the outlet of the manifold the gas packs were connected to (range: 0 – 10 bar)
- the outlet of the flow control valve (range: 0 – 4 bar)
- the release point inside the house. (range 0 – 1 bar)

To keep all electrical equipment outside the house, the pressure transducer at the release point was located outside the building and connected to the release location by a 1/8” stainless steel tube. The pressure transducers used in this programme were Druck UNIK5000 type transducers of the ranges specified above. All pressure transducers were calibrated prior to commencement of the programme against an onsite standard which, in turn, had been calibrated by a third party and traceable to national standards. The calibration was repeated periodically throughout the test programme.

The release point pressure transducer was used as the setpoint for the flow control valve. The flow control valve would therefore automatically adjust to maintain the release pressure at 0.020 bar. In Phase 2, the flow meter was used to maintain a specific mass flow rate.
2.2.2 Temperature measurement

The gas temperature was measured at the outlet of the flowmeter using a mineral insulated, stainless steel sheathed, Type T thermocouple connected to a thermocouple transmitter. The thermocouple was purchased together with a certificate of conformance and its transmitter calibrated for thermocouple conditioning using a thermocouple simulator, itself third-party calibrated and traceable to national standards.

2.2.3 Flow measurement

The flowrate was measured using a calibrated Bronkhorst thermal conductivity type flowmeter (model: F-206AI). The flowmeter had a range of 0 – 2.5 g/s hydrogen and was supplied with a factory calibration certificate. In the case of the 0.6 mm diameter release sizes, the flow rate was generally below that measurable within the resolution of the flowmeter and SCADA system. In these cases, the flow can be said to have been below 0.1 SLPM. The same flowmeter was used for both hydrogen and methane with the application of a correction factor provided by the manufacturer for methane. The performance of the flow meter for both methane and hydrogen was checked against simple orifice gaseous outflow theory through the release holes used in the programme and found to perform well for both gases.

2.2.4 Gas sampling

Gas samples were taken from 23 locations in the house for the duration of each test. Sample lines were run from each sample location to a panel on the first floor (Figure 16) and then onward to one of three analysers. Analyser one and two both handled eight sample points each and analyser three handled seven. A stream selection system was used to cycle through the sample points by operation of 2-way solenoids. (Figure 17) Each of the three analysers was equipped with an internal suction pump to pull samples at a rate of nominally 5 litres per minute through the analyser. The dwell time on each sample position could be altered depending on the test requirements but was typically 60 s resulting in a sample being taken from each location approximately every 8 minutes. Between sample periods, the sample lines had no flow, meaning that when next sampled, there was the remnants of the previous sample in the line. The 60 s dwell time was determined in the commissioning of the system to give approximate 15-20 seconds of steady state ‘live’ sample after the clearing of the line from the previous sample.

Each analyser has three sensors to cover the full range of concentrations. The PPM (part per million) sensor detected levels up to 0.2 % hydrogen (disabled for methane tests) and was a City Technology 4-HYT type sensor. The LEL (lower explosive limit) sensors detected up to the LEL and were NCP-180 Pellistors fitted to a bridge conditioning board. This bridge conditioning board allowed the sensors to be balanced manually prior to each experiment in air. Balancing of the sensor was also possible using the SCADA system used to monitor and control the experiments.

The volumetric sensors, which were capable of measuring up to 100 % hydrogen / methane, were SGX Sensortech VQ6 series thermal conductivity bridge type sensors, connected to a similar bridge conditioning board as the LEL type sensors. The thermal conductivity of gas : air mixtures is non-linear, particularly at higher concentrations. The non-linearity of this sensor is discussed further in Section 5.2.

In addition to the sensors through which the samples were being analysed, each analyser enclosure also has an internal sensor which visibly alarmed on the control system and shut down the analyser if gas was detected inside the enclosure. A scripted control system was used to isolate each sensor in turn when its range had been exceeded to prevent poisoning of the cells.

Calibration of each sensor on an analyser was carried out before each test with certified span gas of hydrogen or methane depending on the test. Calibration gases with concentrations below the lower
flammability limit used air as diluent and above the flammability limit, nitrogen. The calibration standards were as follows:

- **PPM Range:** 1000 ppm Hydrogen in Air
- **LEL Range:** 2 %vol Hydrogen (or Methane) in Air
- **Volumetric Range:** 50 %vol Hydrogen (or 10 % Methane) in Nitrogen

### 2.2.4.1 Sample point locations

Approximately 40 sample point locations were installed in the house and a maximum of 23 of these could be sampled during any test, therefore a judgement was made regarding which sample points would be of most benefit for accumulating useful data and for the safe operation of the test rig. Sample points in each room were located at high, mid-point and/or low-level. High level sample points were at ceiling level, mid-point at 1.2 m from floor level and low-level sample points were at floor level. The sample point locations recorded were consistent across tests depending on the location of the release.

Releases were carried out in a range of kitchen cupboards. The concentration within the cupboards was measured with four moveable sample points (SP 3- SP 6). The locations of these are shown in Table 4 and the following figures:

- Under sink cupboard, Figure 18 and Figure 19.
- Kitchen wall cupboard, Figure 20 and Figure 21.
- Kitchen base cupboard, Figure 22.
- Behind kitchen base cupboard, Figure 23.

Releases were also carried out into an inset meter cupboard on the external wall of the property. Sample point locations for these tests are shown in Figure 24, Figure 25 and Table 4. Two sample points were located within the meter box and two were drilled into the cavity wall from inside the house, one on the ground floor and one on the first floor. (Figure 26)

The remaining sample points in the house stayed constant for all kitchen cupboard releases and are detailed in Figure 27 - Figure 29 and Table 3.

### 2.2.5 Wind Measurements

The wind speed and direction were measured nominally 50 m from the eastern edge of the house in each experiment. The instrument used was a Gill Windsonic ultrasonic anemometer providing wind speed and direction measurements at a height of 6 m above the local ground level.

### 2.3 Control and Data Acquisition

The tests were controlled from a remote control room using a SCADA control system. This allowed operation of valves as well as monitoring of the instrumentation on the rig. Figure 30 shows the on-screen layout of the system. This screen allows control of the inlet, vent and flow control valves as well as monitoring of the pressures and temperatures. The pneumatic rams on the windows for each house could be operated to allow remote venting of the houses following a test. The flowrate through each analyser and its alarm status could also be monitored.

Analyser set up was carried out using the SCADA system, which also allowed remote recalibration if required mid-test. Figure 31 shows the control screen. This arrangement allowed all calibration gases to be routed to the analysers and the flowrate to the analysers to be monitored. Individual sensors could be isolated for calibration and the auto-function reinstated when a test was started. The auto-
function used a script to automatically isolate sensors depending on the concentration of the gas being detected and protect them from high concentrations. This control screen also allowed the zeroing of all LKV’s (last know values) at the end of a test.

Figure 32 shows the sample point monitoring system which indicates which sample point each analyser is sampling from at a given time. The graphs in the lower part of this figure show the live output from the analyser and display a percentage of the total range of the sensor the sample is passing through. The sensor being used is indicated by the colour of the line and the indicators below which show which sensors have been isolated. When the sample scrolling system is activated the analyser will sample from a location for the specified dwell time and then cycle onto the next location. The last live concentration recorded before the sample point switches is then recorded as the LKV at the location, this value remains constant until the next time the sample position is used.

3 MASTER TEST PLAN (MTP)

The MTP (Table 1) details the 73 experiments carried out in Phase 1 with Table 2 providing details of the 11 experiments carried out in Phase 2. The following notes confirm the test arrangements and amendments which were made to the program:

- For all tests in Lot 2, the basement was excluded from the test volume by wedging closed the door to the basement and sealing it with tape.
- The door to the utility room and living room remained open for all tests.
- The fireplace in the living room was sealed closed for all tests.
- The external airbricks were sealed for all tests but the internal airbricks in the basement were open to the wall cavity.
- For all tests the kitchen door was wedged closed but not sealed with tape. Later in the Phase 1 test programme a 100 mm diameter circular vent was added above the kitchen door. This is indicated in the MTP.
- For all tests the cupboard door where the release was located remained closed. Later in the test programme, the door of an adjacent cupboard was left open and a set of 4 x 100 mm diameter circular holes were created at high level and low level to mimic ventilation. This is indicated in the MTP and these vents were also used in some of the experiments in Phase 2.
- Releases through 0.3 mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low concentrations observed

4 EXPERIMENTAL PROCEDURE

The experiments in the test program were carried out in accordance with DNV GL Spadeadam Testing and Research Procedure STN0058 ‘Hydrogen and natural gas release into TSW houses – Hy Street’.

The same procedure was followed for both hydrogen and methane tests. When switching from one to the other, the control system was adjusted to allow the correct factor to be applied to the flowmeter readings and the PPM sensor to be isolated when testing with methane. Calibration gas bottles were changed as required and the analysers recalibrated.
To conduct a test, the appropriate release nozzle was connected to the pipework in the cupboard being used along with the pipework required to monitor the release point pressure. The internal door arrangements were set, and all doors were wedged into position. Isolation of power to the houses and operation of the window rams was confirmed. Gas bottle packs were connected to the manifold and the inlet pressure set as required depending on the test flowrate. Closure of the flow control valve and actuated gas inlet valve was confirmed and all manual valves to the rig were then opened.

An exclusion zone was enforced over an area extending 200 m from the house. This would ensure any personnel would be outside the area that could be affected by thrown debris in the event of an accidental ignition. CCTV cameras routed to the control room were used to monitor the area during a test.

Following remote calibration of the analysers, the auto protect function was set to prevent poisoning of the analyser cells and sample scrolling was started. The actuated inlet valve (V33) was opened and the flow control valve was manually stepped open until the required release pressure was achieved.

The control system logged all instrument readings continuously for the duration of the test. The release was then monitored from the control room until the required conditions were achieved. For releases into any kitchen cupboard with no vent above the kitchen door this criterion was steady state within the kitchen. When the vent above the kitchen door was included the criterion became steady state in the whole house. Experiments involving releases into the inset meter box, the release was continued until nominally steady state conditions were reached in the cavity and the general house.

A steady state concentration was considered to be reached where the concentration increase in the previous hour was less than 10%. Where tests had run for a period of greater than 3.5 hours, the discretion to stop the test was left with the test engineer based on the ‘steady-state’ criteria, gas availability and practicality of continued operation.

On completion of the experiment, the gas flow to the house was stopped by closing the actuated valve and the windows were opened remotely to allow ventilation of the building. The 200 m exclusion zone could be removed once the concentration in all locations within the house were below the lower flammable limit (LEL), but access to the inside of the house was not permitted until the gas concentration was less than 10% LEL. Entry was then first carried out by the Project Engineer with a hand-held gas meter to confirm that the building could now be accessed by checking of all voids and cavities.

5 RESULTS

Results from all the experiments in Lot 2 are presented in Appendix A, with the results from Phase 2 experiments being presented in Appendix B. For each experiment, there is a visualisation of the final or ‘maximum’ concentration profile throughout the house along with tabulated and trended values. The tabulated values show mean, maximum, minimum and standard deviation values for each measurement during the period selected. The selected period was manually chosen to encompass at least 2 measurements from every sample position in the property (i.e. a minimum of 10 minutes). In cases of changing wind conditions through an experiment, it may be that the latest period in a release does not necessarily correspond to the highest concentrations. The visualisations have been constructed from the raw data taken from the SCADA control system controlling the Hy Street facility. This raw data has been supplied in Excel Workbook form separately to this report. The raw data is kept within a ‘Raw Data’ worksheet in the workbook with any processing being performed in the ‘Plot Data’ worksheet.
One experiment, L2-053 was reconstructed from the log-book notes pertaining to the experiment. This was due to a failure of the acquisition system immediately after the experiment and subsequent loss of data.

5.1 Data Processing / Quality Check

Raw data in engineering units as well as measured units is provided within the results workbook for each experiment. The signals from all three ranges of gas sensor are provided in the workbook and the appropriate range selected by the user in the ‘Plot Data’ worksheet. Any offset in the baseline for each instrument / range is also applied in the ‘Plot Data’ worksheet, leaving the raw data intact and available for audit.

For each experiment the outflow of gas was checked for consistency against a simple outflow calculation, using the hole size and supply pressure as inputs – this provided a cross check on the orifice size, confirming that the correct fitting had been installed for an experiment. The evolution of concentration of gas within the room was checked for consistency against a simple gas accumulation model (Equation 1) using the outflow rate and an estimate for the air change rate within the room.

**Equation 1: Simple Accumulation Model**

\[
C = \left( \frac{100Q_g}{Q_a + Q_g} \right) \left[ 1 - \exp \left( -\frac{(Q_a + Q_g)t}{V} \right) \right]
\]

Where C is the concentration in %vol, \(Q_g\) is gas flow rate (m\(^3\).hr\(^{-1}\)), \(Q_a\) is air flow rate (m\(^3\).hr\(^{-1}\)), t is time (hr) and V is the volume into which the flows are mixing / accumulating (m\(^3\) – this can be a layer or full room volume).

These consistency checks provided a verification of the test setup and results, i.e. that the installed hole size was correct and that the accumulation appeared consistent given the expected range of air change rates. The results of the checks can be seen in the ‘Concentration’ worksheet of the experiment workbook which also shows the raw and processed instrument trends.

The visualisation provided in this report is contained within the ‘Concentration Visualisation’ worksheet of the results workbook for each experiment. The visualisation indicates relative concentrations at each sample location on a simple layout of the house, not drawn to scale. The colours in the visualisation are chosen by Excel and are a function of the concentrations in the experiment with the highest concentration indicated by a red colour, lowest by a green colouring. The colouring is therefore not consistent quantitatively between experiments.

The tabulated data and the visualisation are generated using data taken between the times indicated in the header table of the visualisation and the dashed red line on the trends. The visualisation is generated using the average reading across the time period specified. Different averaging periods can be chosen in the Excel workbook.

Within the visualisations and in some cases, the measurements recorded at certain sample positions, have been removed. This is because the reading was determined not to be credible during the quality process. The readings associated with some of the sample lines were sometimes (although rarely) found to be spurious and it was discovered that some of the lines were able to vapour lock with condensed water (or ice in the colder weeks of the experiment programme). Partial or complete blocking of these lines would explain spurious measurements on the lines with blockage but would not affect the measurements made on other lines to the same analyser.
5.2 Volumetric Sensor Non-Linearity

Three volumetric range sensors used in these experiments measured by principle of thermal conductivity of the mixture. Hydrogen and methane both have higher thermal conductivity than that of air and consequently mixtures of either with air have higher thermal conductivity. Methane : air mixtures exhibit a near-linear relationship in thermal conductivity with proportion of methane in the mixture. A two-point calibration of the sensor (in air and then subsequently in 10 % calibration standard) is sufficient to give errors in the measurement in the low single-digit percentage region when interpreted linearly (approximately 1-3 % of full scale range, better around the calibration points).

Hydrogen does not exhibit the same linearity, particularly at higher hydrogen concentrations. During the hydrogen experiments, the sensor was calibrated using the same two-point calibration method, understanding that the linearity was good up to approximately 60 %vol in measurement. Figure 33 shows the results of a four-point calibration of two different volumetric analysers using the following calibration standards: 0 % (atmospheric air), 9.0 %vol, 50.58 %vol and 100 %vol (hydrogen from cylinder pack).

The response of the analysers is shown when the two-point calibration is applied as used in the experiments (i.e. error at 0 %vol and 50.58 %vol is zero). Similarity in results when repeated across two analysers showed the response is notably repeatable using the same calibration method as was used in the experiments (i.e. the non-linearity was the same). The chart in Figure 33 illustrates that the sensor responds as a quadratic with a small 2nd order term; the difference between the quadratic fit and the 1:1 line giving the error associated with the non-linearity of the sensor at the measured concentration. Below the 50.58 %vol calibration point, the quadratic fit indicates that the sensor over responds by a maximum of 2.6 %vol, corresponding to an error of 2.6 % of full-scale range. The maximum error due to non-linearity of the sensor is tabulated for each 10 %vol of the sensor range in Table 5 and the sensor performance is noted to become more non-linear above 60 %vol. At the upper flammable limit of hydrogen (75 %vol), the error due to non-linearity is ~5.0 % to 8.8% of the full scale range..

6 DISCUSSION

Whilst not within the scope of the project to perform detailed analysis of the data, some general observations are given below:

- Both hydrogen and methane formed layers of nominally uniform concentration above the point of the release.
- As a check on data consistency, the concentration in these layers could be explained in general terms by comparison with a simple accumulation model. Although no detailed analysis of the air ingress rates in the rooms was carried out, the air change rates required to reproduce the observed steady state concentrations in the simple model were reasonable for a domestic kitchen.
- In all releases of hydrogen and methane into the meter box, flammable concentrations were only observed in the wall and floor cavities. No flammable concentrations of either gas were observed in the rooms of the house.
- Releases of both methane and hydrogen generally formed high level layers in the kitchen with relatively homogeneous concentration. The layers generally extended from the tops of the cupboards to the kitchen ceiling.
- The highest release rates considered with methane in Phase 1 (6.4 m³.hr⁻¹ through a 7.2 mm hole) resulted in steady state concentrations in a high level layer in the kitchen that was above the upper
flammability limit for methane, albeit passing through the flammable range in the early parts of the release.

- For all release positions, the release with methane giving the concentration closest to stoichiometric in the kitchen layer was the 3.6 mm, 1.6 m$^3$.hr$^{-1}$ case.

- With hydrogen, the highest release rate in Phase 1 (7.2 mm, 18.6 m$^3$.hr$^{-1}$) produced highly reactive concentrations above 30%vol within a high level layer in the kitchen.

- 20 %vol hydrogen concentrations exhibit laminar burning velocities$^2$ similar to that of ethylene and a factor of 2 higher than the worst case for methane. Concentrations of 30 %vol have a burning velocity about a factor of 5 higher than the worst case for methane. This can have significant effect on the severity of any subsequent explosion, even where some venting is available through weak parts of the structure such as windows.

- Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the largest hydrogen release rate case had the effect of reducing the concentration in the kitchen layer by about one third from ~30 %vol to ~20 %vol with only small increases observed in other areas of the house.

- Addition of 4 x 100 mm vent holes in the bottom and 4 x 100 mm vent holes in the side of the kitchen base cupboard in the largest release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 40 %vol to approximately 25-30 %vol. There was no significant effect on the concentrations in the bulk volume of the kitchen.

- Combining results from Phase 1 and Phase 2, it is possible to compare similar release rates with hydrogen and the effects of the various vent combinations. The chart in Figure 34 shows this comparison for the kitchen ceiling measured concentration:

  - All vent combinations involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
  
  - At the highest flow rate in Phase 2 (78.6 m$^3$.hr$^{-1}$), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (~60 %vol) to that of a more reactive fuel : air ratio (~40 %vol, around the maximum burning velocity for hydrogen mixtures).
  
  - Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.

It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments in making these comparisons. It is considered that this would not materially affect the conclusions.

---

7 FIGURES

Figure 1: HyStreet drawings

Figure 2: Kitchen layout (1)
Figure 3: Kitchen layout (2)

Figure 4: 100 mm diameter vent opening above kitchen door into hallway
Figure 5: 8 x 100 mm diameter vent openings in kitchen base cupboard

Figure 6: 78 cm² and 141 cm² ducted ceiling vents in kitchen
Figure 7: External meter box (1)

Figure 8: External meter box (2)

Figure 9: Living room
Figure 10: Hallway

Figure 11: 1st floor
Figure 12: Attic

Figure 13: Pneumatically operated window ram
To house

V37

V36

Flow control valve – V35

V33

V34

V31

V30

To house

V37

V36

Flow control valve – V35

V33

V34

V31

V30

Nitrogen in

Non-return valve

Actuated valve

Manual Valve

Relief Valve

Temperature probe

Pressure transducer

Vent

Hydrogen or natural gas supply from reservoir or bottle pack

Figure 14: Pipework and valve layout diagram

Figure 15: Release control arrangement
Figure 16: Sampling panel

Figure 17: Stream selection and analysers

Figure 18: Sample point locations for releases into under sink cupboard

Figure 19: Under sink cupboard

Figure 20: Sample point locations for releases into kitchen wall cupboard
Figure 21: Kitchen wall cupboard

Figure 22: Sample point locations for releases into kitchen base cupboard

Figure 23: Sample point locations for releases behind kitchen base cupboard
Figure 24: Sample point locations for meter cupboard releases

Figure 25: Meter box

Figure 26: Cavity wall sample point on 1st floor
Figure 27: Sample point locations on the ground floor

Figure 28: Sample point locations on the 1st floor

Figure 29: Sample point locations in the attic
Figure 30: Hy Street SCADA control system

Figure 31: Hy Street SCADA system for analyser set up
Figure 32: Hy Street SCADA screen for sample point monitoring and last known values
Figure 33: Volumetric sensor linearity

![Graph showing volumetric sensor linearity with equation and R² value](image)

Figure 34: Observations of kitchen ceiling concentration with vent combinations

![Graph showing effect of vent combinations on kitchen ceiling concentration](image)
### 8 TABLES

**Table 1: Master test plan (MTP)**

<table>
<thead>
<tr>
<th>Exp. ID</th>
<th>Fuel</th>
<th>Target Release Pressure (mbarg)</th>
<th>Hole Size (mm)</th>
<th>Nominal Release Rate (m³/hr)</th>
<th>Source</th>
<th>Orientation / Location</th>
<th>Enclosure</th>
<th>Area</th>
<th>Sealing</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-002</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-003</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-004</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-005</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-006</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-007</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-010</td>
<td>Methane</td>
<td>20</td>
<td>0.6</td>
<td>0.04</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-011</td>
<td>Methane</td>
<td>20</td>
<td>0.9</td>
<td>0.1</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-012</td>
<td>Methane</td>
<td>20</td>
<td>1.8</td>
<td>0.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-013</td>
<td>Methane</td>
<td>20</td>
<td>2.5</td>
<td>0.8</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-014</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>1.6</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-015</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>3.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-016</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>6.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-018</td>
<td>Methane</td>
<td>20</td>
<td>0.6</td>
<td>0.04</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>Exp. ID</td>
<td>Fuel</td>
<td>Target Release Pressure (mbarg)</td>
<td>Hole Size (mm)</td>
<td>Nominal Release Rate (m³/hr)</td>
<td>Source</td>
<td>Orientation / Location</td>
<td>Enclosure</td>
<td>Area</td>
<td>Sealing</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>---------------------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>--------------</td>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>---------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>L2-019</td>
<td>Methane</td>
<td>20</td>
<td>0.9</td>
<td>0.1</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-020</td>
<td>Methane</td>
<td>20</td>
<td>1.8</td>
<td>0.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-021</td>
<td>Methane</td>
<td>20</td>
<td>2.5</td>
<td>0.8</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-022</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>1.6</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-023</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>3.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-024</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>6.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-026</td>
<td>Methane</td>
<td>20</td>
<td>0.6</td>
<td>0.04</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-027</td>
<td>Methane</td>
<td>20</td>
<td>0.9</td>
<td>0.1</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-028</td>
<td>Methane</td>
<td>20</td>
<td>1.8</td>
<td>0.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-029</td>
<td>Methane</td>
<td>20</td>
<td>2.5</td>
<td>0.8</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-030</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>1.6</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-031</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>3.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-032</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>6.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Behind Kitchen Base Cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-034</td>
<td>Methane</td>
<td>20</td>
<td>0.6</td>
<td>0.04</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Undersink cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-035</td>
<td>Methane</td>
<td>20</td>
<td>0.9</td>
<td>0.1</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>‘Undersink cupboard’</td>
<td>‘House 3 Kitchen’</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>Exp. ID</td>
<td>Fuel</td>
<td>Target Release Pressure (mbarg)</td>
<td>Hole Size (mm)</td>
<td>Nominal Release Rate (m³/hr)</td>
<td>Source</td>
<td>Orientation / Location</td>
<td>Enclosure</td>
<td>Area</td>
<td>Sealing</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>---------------------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>---------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>L2-036</td>
<td>Methane</td>
<td>20</td>
<td>1.8</td>
<td>0.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-037</td>
<td>Methane</td>
<td>20</td>
<td>2.5</td>
<td>0.8</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-038</td>
<td>Methane</td>
<td>20</td>
<td>3.6</td>
<td>1.6</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-039</td>
<td>Methane</td>
<td>20</td>
<td>5.1</td>
<td>3.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-040</td>
<td>Methane</td>
<td>20</td>
<td>7.2</td>
<td>6.4</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-043</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-044</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-045</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, standard penetration</td>
</tr>
<tr>
<td>L2-046</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-047</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-048</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Inset Meter Box'</td>
<td>'House 3 South Wall'</td>
<td>Meter box door closed, 20mm hole into wall</td>
</tr>
<tr>
<td>L2-050</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.6</td>
<td>0.13</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-051</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.9</td>
<td>0.29</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-052</td>
<td>Hydrogen</td>
<td>20</td>
<td>1.8</td>
<td>1.15</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-053</td>
<td>Hydrogen</td>
<td>20</td>
<td>2.5</td>
<td>2.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>Exp. ID</td>
<td>Fuel</td>
<td>Target Release Pressure (mbarg)</td>
<td>Hole Size (mm)</td>
<td>Nominal Release Rate (m³/hr)</td>
<td>Source</td>
<td>Orientation / Location</td>
<td>Enclosure</td>
<td>Area</td>
<td>Sealing</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>---------------------------------</td>
<td>----------------</td>
<td>-----------------------------</td>
<td>-----------------</td>
<td>----------------------------------------</td>
<td>----------------------------</td>
<td>-----------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>L2-054</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-055</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-056</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Wall Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-058</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.6</td>
<td>0.13</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-059</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.9</td>
<td>0.29</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-060</td>
<td>Hydrogen</td>
<td>20</td>
<td>1.8</td>
<td>1.15</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-061</td>
<td>Hydrogen</td>
<td>20</td>
<td>2.5</td>
<td>2.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-062</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-063</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-064</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-066</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.6</td>
<td>0.13</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-067</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.9</td>
<td>0.29</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-068</td>
<td>Hydrogen</td>
<td>20</td>
<td>1.8</td>
<td>1.15</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-069</td>
<td>Hydrogen</td>
<td>20</td>
<td>2.5</td>
<td>2.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-070</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>Exp. ID</td>
<td>Fuel</td>
<td>Target Release Pressure (mbarg)</td>
<td>Hole Size (mm)</td>
<td>Nominal Release Rate (m3/hr)</td>
<td>Source</td>
<td>Orientation / Location</td>
<td>Enclosure</td>
<td>Area</td>
<td>Sealing</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>---------------------------------</td>
<td>----------------</td>
<td>------------------------------</td>
<td>--------------</td>
<td>------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>L2-071</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-072</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Behind Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-074</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.6</td>
<td>0.13</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-075</td>
<td>Hydrogen</td>
<td>20</td>
<td>0.9</td>
<td>0.29</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-076</td>
<td>Hydrogen</td>
<td>20</td>
<td>1.8</td>
<td>1.15</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-077</td>
<td>Hydrogen</td>
<td>20</td>
<td>2.5</td>
<td>2.2</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-078</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-079</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-080</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Undersink cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed</td>
</tr>
<tr>
<td>L2-062A</td>
<td>Hydrogen</td>
<td>20</td>
<td>3.6</td>
<td>4.59</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed + 100mm vent above kitchen door</td>
</tr>
<tr>
<td>L2-063A</td>
<td>Hydrogen</td>
<td>20</td>
<td>5.1</td>
<td>9.21</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed + 100mm vent above kitchen door</td>
</tr>
<tr>
<td>L2-064A</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed + 100mm vent above kitchen door</td>
</tr>
<tr>
<td>L2-064B</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed + Cupboard vent holes + 100mm vent above kitchen door</td>
</tr>
<tr>
<td>L2-064C</td>
<td>Hydrogen</td>
<td>20</td>
<td>7.2</td>
<td>18.36</td>
<td>Copper Pipe</td>
<td>Horizontal / Mid Height</td>
<td>'Kitchen Base Cupboard'</td>
<td>'House 3 Kitchen'</td>
<td>Cupboard Door, closed + Cupboard vent holes</td>
</tr>
</tbody>
</table>
### Table 2: Phase 2 Experimental Programme

<table>
<thead>
<tr>
<th>ID</th>
<th>Injection Location</th>
<th>Gas</th>
<th>Hole size</th>
<th>Nominal Injection rate</th>
<th>Vent Type</th>
<th>Vent size (cm$^2$)</th>
<th>Vents in cupboard?</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-A1</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>78</td>
<td>no</td>
</tr>
<tr>
<td>L2-A2</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>219</td>
<td>no</td>
</tr>
<tr>
<td>L2-A3</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>5.1mm</td>
<td>9.21m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>78</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A4</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>5.1mm</td>
<td>9.21m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>219</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A5</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>78</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A6</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>219</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A7</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>n/a</td>
<td>no</td>
</tr>
<tr>
<td>L2-A8</td>
<td>Kitchen Base Cupboard</td>
<td>methane</td>
<td>7.2mm</td>
<td>20m$^3$/hr</td>
<td>no vent</td>
<td>n/a</td>
<td>no</td>
</tr>
<tr>
<td>L2-A9</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>15mm</td>
<td>78.6m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>78</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A10</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>15mm</td>
<td>78.6m$^3$/hr</td>
<td>ceiling vent with pipe to external wall</td>
<td>219</td>
<td>yes</td>
</tr>
<tr>
<td>L2-A11</td>
<td>Kitchen Base Cupboard</td>
<td>Hydrogen</td>
<td>15mm</td>
<td>78.6m$^3$/hr</td>
<td>no vent</td>
<td>n/a</td>
<td>no</td>
</tr>
<tr>
<td>Room</td>
<td>Sample point on analyser</td>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Basement</strong></td>
<td>16, 17, 18</td>
<td>High, mid and low – centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Kitchen</strong></td>
<td>1, 2, 7</td>
<td>High, mid and low - centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Kitchen cupboard</strong></td>
<td>3</td>
<td>Centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Top front centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Top back centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Bottom back centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Living room</strong></td>
<td>8, 9</td>
<td>High and mid - centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hall</strong></td>
<td>10, 11</td>
<td>High and mid - centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1st floor</strong></td>
<td>12, 13</td>
<td>High and mid - centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Attic</strong></td>
<td>14, 15</td>
<td>High and mid - centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>External cavity wall</strong></td>
<td>19</td>
<td>Ground floor – living room, front elevation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internal stud wall</strong></td>
<td>20</td>
<td>Ground floor- living room, internal wall to hall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Void ground to 1st floor</strong></td>
<td>21</td>
<td>Living room ceiling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Void 1st floor to Attic</strong></td>
<td>22</td>
<td>1st floor ceiling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Void attic ceiling to roof</strong></td>
<td>23</td>
<td>Attic ceiling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 4: Sample point locations inside cupboards

<table>
<thead>
<tr>
<th>Cupboard</th>
<th>Sample point on analyser</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under sink cupboard</td>
<td>3</td>
<td>Centre</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Top front centre</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Top back centre</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Bottom back centre</td>
</tr>
<tr>
<td>Wall cupboard</td>
<td>3</td>
<td>Centre – between the cupboard shelves</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Top front centre</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Top back centre</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Bottom back centre</td>
</tr>
<tr>
<td>Base cupboard</td>
<td>3</td>
<td>Centre</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Top front centre</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Top back centre</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Bottom back centre</td>
</tr>
<tr>
<td>Behind base cupboard</td>
<td>3</td>
<td>Lower part of boiler cupboard</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Behind cupboard – in the same section as the release</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Under sink cupboard – high</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Under cupboard – behind kickboard</td>
</tr>
<tr>
<td>Meter cupboard</td>
<td>3</td>
<td>Inside meter box – top</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Inside meter box – bottom</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Cavity wall above release location on ground floor</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Cavity wall above release location on 1st floor</td>
</tr>
</tbody>
</table>
### Table 5: Maximum Non-linearity Error

<table>
<thead>
<tr>
<th>Measurement Range Start (%vol)</th>
<th>Measurement Range End (%vol)</th>
<th>Maximum Non-linearity Error (%vol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>1.63</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>2.48</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>2.62</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
<td>2.55</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
<td>1.84</td>
</tr>
<tr>
<td>50</td>
<td>60</td>
<td>-1.91</td>
</tr>
<tr>
<td>60</td>
<td>70</td>
<td>-4.96</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
<td>-8.79</td>
</tr>
<tr>
<td>80</td>
<td>90</td>
<td>-13.40</td>
</tr>
<tr>
<td>90</td>
<td>100</td>
<td>-18.79</td>
</tr>
</tbody>
</table>
APPENDIX A: PHASE 1 RESULTS
L2-002 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-002
Hole Size: 3.6 mm
Location: meter box
Gas: Methane
Date: 11/12/2019
Time: 13:20:00

Averaging Period Start: 120 min
End: 130 min

Notes: Suspect that VOL sensor has topped out in meter box

---

### Concentration Data

<table>
<thead>
<tr>
<th>Sensor Code</th>
<th>Sensor Type</th>
<th>Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LV_2 K-High</td>
<td>1st FLOOR</td>
<td>2.0</td>
</tr>
<tr>
<td>SP2LV_2 K-Mid</td>
<td>1st FLOOR</td>
<td>0.5</td>
</tr>
<tr>
<td>SP3LV_2 Cup-Mid</td>
<td>1st FLOOR</td>
<td>74.8</td>
</tr>
<tr>
<td>SP4LV_2 Cup-High-Front</td>
<td>1st FLOOR</td>
<td>74.9</td>
</tr>
<tr>
<td>SP8LV_2 Cup-High</td>
<td>1st FLOOR</td>
<td>2.0</td>
</tr>
<tr>
<td>SP9LV_2 Cup-Mid</td>
<td>1st FLOOR</td>
<td>0.5</td>
</tr>
<tr>
<td>SP10LV_2 Cup-Low</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP11LV_2 Cup-High-Front</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP12LV_2 Cup-Low</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP13LV_2 Cup-Mid</td>
<td>1st FLOOR</td>
<td>74.8</td>
</tr>
<tr>
<td>SP14LV_2 Cup-High-Front</td>
<td>1st FLOOR</td>
<td>74.9</td>
</tr>
<tr>
<td>SP15LV_2 Cup-High</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP16LV_2 Cup-Mid</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP17LV_2 Cup-Low</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP18LV_2 Cup</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP19LV_2 NWALL-Cav</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP20LV_2 STUD-Cav</td>
<td>1st FLOOR</td>
<td>0.1</td>
</tr>
<tr>
<td>SP21LV_2 SF-Void</td>
<td>1st FLOOR</td>
<td>0.7</td>
</tr>
<tr>
<td>SP22LV_2 SF-Void</td>
<td>1st FLOOR</td>
<td>0.7</td>
</tr>
<tr>
<td>SP23LV_2 SF-Void</td>
<td>1st FLOOR</td>
<td>0.7</td>
</tr>
</tbody>
</table>

---

### Mass Flow Rate

<table>
<thead>
<tr>
<th>Mass Flow Rate (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.4</td>
</tr>
</tbody>
</table>

---

### Volume Flow Rate

<table>
<thead>
<tr>
<th>Volume Flow Rate (SLPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.6</td>
</tr>
</tbody>
</table>

---

### Energy Flow Rate

<table>
<thead>
<tr>
<th>Energy Flow Rate (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.7</td>
</tr>
</tbody>
</table>

---

### External Wind Speed

<table>
<thead>
<tr>
<th>External Wind Speed (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9</td>
</tr>
</tbody>
</table>

---

### External Wind Direction

<table>
<thead>
<tr>
<th>External Wind Direction (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>242.5</td>
</tr>
</tbody>
</table>

---

### Hallway and Stud into Living Room

<table>
<thead>
<tr>
<th>Mass Flow Rate (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
</tr>
</tbody>
</table>

---

### Kitchen Concentrations

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Gas Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>40</td>
<td>1.5</td>
</tr>
<tr>
<td>60</td>
<td>2.0</td>
</tr>
<tr>
<td>80</td>
<td>2.5</td>
</tr>
<tr>
<td>100</td>
<td>3.0</td>
</tr>
</tbody>
</table>

---

### Meter Box / Cavity Concentrations

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Gas Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>40</td>
<td>1.5</td>
</tr>
<tr>
<td>60</td>
<td>2.0</td>
</tr>
<tr>
<td>80</td>
<td>2.5</td>
</tr>
<tr>
<td>100</td>
<td>3.0</td>
</tr>
</tbody>
</table>
**L2-003 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>3.7</td>
<td>3.8</td>
<td>3.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-High</td>
<td>73.7</td>
<td>73.7</td>
<td>73.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-front</td>
<td>73.9</td>
<td>73.9</td>
<td>73.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 GF cavity - above met</td>
<td>13.3</td>
<td>14.9</td>
<td>12.7</td>
<td>1.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 FF cavity - above met</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 K-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-High</td>
<td>73.7</td>
<td>73.7</td>
<td>73.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 LR-Mid</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High-Front</td>
<td>73.9</td>
<td>73.9</td>
<td>73.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 Cup-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_1 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 BM-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 STUD-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 FF-Void</td>
<td>9.4</td>
<td>9.4</td>
<td>9.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 SF-Void</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

**Notes:** Sensor 'topped out' in meter box sampling

**Kitchen Concentrations**

**Meter Box / Cavity Concentrations**

**Mass Flow Rate**

**Hallway and Stud into Living Room**

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-004 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-004
Hole Size: 7.2 mm
Location: meter box
Gas: Methane
Date: 11/12/2019
Time: 20:50:00
Averaging Period Start: 240 min
End: 250 min

Notes: Suspect VOL sensor "topped out" in meter box

Sensor | Average | Max | Min | STDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 3.5 | 3.5 | 3.4 | 0.0 | %vol
SP1LKV_1 K-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP1LKV_1 Met Box-High | 75.2 | 75.2 | 75.2 | 0.0 | %vol
SP1LKV_1 Met Box-Low | 75.3 | 75.3 | 75.3 | 0.3 | %vol
SP1LKV_1 GF cavity - above met | 11.9 | 11.9 | 11.9 | 0.0 | %vol
SP1LKV_1 FF cavity - above met | 3.5 | 3.6 | 3.4 | 0.1 | %vol
SP7LKV_1 K-Low | 1.0 | 1.0 | 1.0 | 0.0 | %vol
SP8LKV_1 LR-High | 3.5 | 3.5 | 3.4 | 0.0 | %vol
SP2LKV_1 K-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP1LKV_2 LR-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP1LKV_2 LR-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP1LKV_2 FF-High | 0.2 | 0.2 | 0.1 | 0.0 | %vol
SP1LKV_2 FF-Mid | 0.1 | 0.2 | 0.1 | 0.0 | %vol
SP1LKV_2 AT-High | 0.1 | 0.2 | 0.1 | 0.0 | %vol
SP1LKV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_1 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP1LKV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP1LKV_1 HWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP1LKV_1 STUD-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_1 FF-Void | 8.6 | 9.1 | 8.4 | 0.3 | %vol
SP1LKV_1 SF-Void | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP1LKV_1 ROOF-Void | 0.2 | 0.2 | 0.1 | 0.1 | %vol
RELEASEPRESSURE | 0.002 | 0.0209 | 0.0196 | 0.0003 | barg

LOWFLOWMETERCH4 | 1.6 | 1.7 | 1.6 | 0.0 | degC
OUTLET TEMP | 2.4 | 2.5 | 2.3 | 0.1 | degC
Volume Flow Rate | 137.1 | 139.7 | 134.7 | 1.2 | SLPM
Energy Flow Rate | 81.9 | 83.5 | 80.5 | 0.7 | kW
External Wind Speed | 2.9 | m/s
External Wind Direction | 236.6 | Bearing

Kitchen Concentrations

Mass Flow Rate
L2-005 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-005
Hole Size: 3.6 mm
Location: meter cupboard with 20 mm vent into cavity
Gas: methane
Date: 12/12/2019
Time: 03:40:00

Averaging Period Start: 190 min
End: 200 min

Sensor | Average | Max | Min | STDDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_2 K-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol
SP1LKV_2 K-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP1LKV_1 Met Box-High | 60.4 | 63.6 | 60.3 | 0.4 | %vol
SP4LKV_1 Met box-Low | 45.3 | 46.7 | 44.9 | 0.7 | %vol
SP1LKV_1 GF cavity - above met | 2.4 | 2.6 | 2.1 | 0.2 | %vol
SP1LKV_1 FF cavity - above met | 2.0 | 2.2 | 1.6 | 0.3 | %vol
SP7LKV_1 K-Low | 0.7 | 0.7 | 0.6 | 0.0 | %vol
SP8LKV_2 LR-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP9LKV_2 LR-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP10LKV_2 H-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP11LKV_2 H-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP12LKV_2 FF-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP13LKV_2 FF-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP14LKV_2 AT-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP15LKV_2 AT-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP16LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.4 | 0.8 | 0.4 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP21LKV_1 FF-Void | 4.6 | 4.7 | 4.5 | 0.1 | %vol
SP22LKV_1 SF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol
RELEASEPRESSURE | 0.0199 | 0.0 | 0.0 | 0.0 | barg
LOWFLOWMETERCH4 | 0.397 | 0.405 | 0.390 | 0.004 | g/s
OUTLET TEMP | 10.0 | 12.0 | 9.9 | 0.1 | degC
Volume Flow Rate | 33.2 | 33.9 | 32.6 | 0.4 | SLPM
Energy Flow Rate | 19.9 | 20.2 | 19.5 | 0.2 | kW
External Wind Speed | 1.8 | 2.0 | 1.5 | 0.2 | m/s
External Wind Direction | 180.0 | bearing

KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
KITCHEN
LIVING ROOM
BASEMENT
# L2-006 RESULT

## Hy4Heat WP7 Test Result

### Notes:
- Suspect VOL sensor ‘topped out’ for meter box sample points

### Sensor Summary

<table>
<thead>
<tr>
<th>Sensor ID</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>1.5</td>
<td>1.8</td>
<td>1.0</td>
<td>0.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Met Box-High</td>
<td>76.3</td>
<td>76.4</td>
<td>76.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Met Box-Low</td>
<td>76.3</td>
<td>76.3</td>
<td>76.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 GF cavity - above met</td>
<td>14.2</td>
<td>14.2</td>
<td>10.6</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 FF cavity - above met</td>
<td>2.8</td>
<td>2.9</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 K-High</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 K-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 K-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 FF-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 FF-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 AT-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 AT-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 AT-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 NWALL-Cav</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 STUD-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 FF-Void</td>
<td>6.0</td>
<td>6.6</td>
<td>5.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 SF-Void</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.8</td>
<td>0.9</td>
<td>0.7</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-High</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

### Gas Data
- Gas: methane
- Date: 12/12/2019
- Time: 08:15:00

### Averaging Period
- Start: 160 min
- End: 170 min

### Gas Flow and Temperature Data
- Volume Flow Rate: 66.1 SLPM
- Energy Flow Rate: 39.5 kW
- External Wind Speed: 1.2 m/s
- External Wind Direction: 68.3 bearing

### Kitchen Concentrations

### Cupboard Concentrations

### Hallway and Stud into Living Room

### Hallway

### Mass Flow Rate
## L2-007 RESULT

### Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1KUV_1 K-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 K-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met Box-High</td>
<td>76.6</td>
<td>76.7</td>
<td>76.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met Box-Low</td>
<td>76.7</td>
<td>76.8</td>
<td>76.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 FF cavity - above met</td>
<td>12.2</td>
<td>12.4</td>
<td>12.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 K-Low</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-High</td>
<td>76.6</td>
<td>76.7</td>
<td>76.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>76.7</td>
<td>76.8</td>
<td>76.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 FF cavity - above met</td>
<td>12.2</td>
<td>12.4</td>
<td>12.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 K-Low</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-High</td>
<td>76.6</td>
<td>76.7</td>
<td>76.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>76.7</td>
<td>76.8</td>
<td>76.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 FF cavity - above met</td>
<td>12.2</td>
<td>12.4</td>
<td>12.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 K-Low</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-High</td>
<td>76.6</td>
<td>76.7</td>
<td>76.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1KUV_1 Met box-Low</td>
<td>76.7</td>
<td>76.8</td>
<td>76.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

### Notes: Suspect VOL sensor 'topped out' in meter box sampling. Flow rate hard to control and steady state achieved quicker than other tests.

### Mass Flow Rate

**Time (minutes)**

- **0**: 0.0 g/s
- **5**: 0.5 g/s
- **10**: 1.0 g/s
- **15**: 1.5 g/s
- **20**: 2.0 g/s
- **25**: 2.5 g/s
- **30**: 3.0 g/s

**Mass Flow Rate (g/s)**

- **0**: 0.0 g/s
- **5**: 0.0 g/s
- **10**: 0.0 g/s
- **15**: 0.0 g/s
- **20**: 0.0 g/s
- **25**: 0.0 g/s
- **30**: 0.0 g/s

**Volume Flow Rate (SLPM)**

- **0**: 105.7 SLPM
- **5**: 107.2 SLPM
- **10**: 103.8 SLPM
- **15**: 1.0 SLPM

**External Wind Speed (m/s)**

- **0**: 2.9 m/s

**External Wind Direction (bearing)**

- **0**: 0.0
- **10**: 75.2°

**Low Flow Meter CH4 (g/s)**

- **0**: 1.3 g/s
- **5**: 1.3 g/s
- **10**: 1.2 g/s

**Outlet Temp (degC)**

- **0**: 1.7 degC
- **5**: 1.9 degC
- **10**: 1.6 degC
- **15**: 0.1 degC

**Energy Flow Rate (kW)**

- **0**: 63.2 kW
- **5**: 64.1 kW
- **10**: 62.0 kW
- **15**: 0.6 kW

**L2-007 RESULT**

- **MTP ID**: L2-007
- **Hole Size**: 7.2 mm
- **Location**: meter cupboard with 20 mm vent into cavity
- **Gas**: methane

**Date**: 12/12/2019

**Time**: 12:40:00

**Averaging Period Start**: 80 min
**End**: 90 min

---

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

---

**KITCHEN**

**LIVING ROOM**

**BASEMENT**

**1st FLOOR**

**2nd FLOOR**

**Hallway**
## L2-010 RESULT

### Hy4Heat WP7 Test Result

**MTF ID:** L2-010  
**Hole Size:** 0.6 mm  
**Location:** Kitchen wall cupboard, doors closed  
**Date:** 10/12/2019  
**Time:** 01:19:00

### Gas: Methane

**Averaging Period Start:** 120 min  
**End:** 130 min

### Notes:
- Note that Kitchen low point reports higher than kitchen mid and high. Perhaps to do with gap under kitchen door.
- Flammable mixtures inside cupboard only

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average (SLPM)</th>
<th>Max (SLPM)</th>
<th>Min (SLPM)</th>
<th>STDDEV (SLPM)</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.1</td>
<td>0.4</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>4.8</td>
<td>4.9</td>
<td>4.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>5.3</td>
<td>5.3</td>
<td>5.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>5.4</td>
<td>5.4</td>
<td>5.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-Low-Back</td>
<td>4.7</td>
<td>4.7</td>
<td>4.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>GFTKV_1 K-Low</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 F-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 F-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

### Units:
- **SLPM:** Standard Liters Per Minute
- **degC:** Celsius
- **kW:** Kilowatts
- **Cupboard Concentrations**
- **Kitchen Concentrations**

### Diagrams:
- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**
- **Mass Flow Rate**

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-011 RESULT

Hy4Heat WP7 Test Result

MTPI D: L2-011
Hole Size: 0.9 mm
Location: Kitchen wall cupboard, doors closed

Gas: Methane
Date: 10/12/2019
Time: 06:24:10

Averaging Period Start: 130 min
End: 140 min

Notes: 0.1% offset removed from SP17-SP23 (analyser 3, vol sensor)

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_2 K-High | 0.5 | 0.6 | 0.5 | 0.0 | %vol
SP2LKV_2 K-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP3LKV_1 Cup-Mid | 7.9 | 7.9 | 7.9 | 0.0 | %vol
SP4LKV_1 Cup-High-Front | 8.6 | 8.6 | 8.6 | 0.0 | %vol
SP5LKV_1 Cup-High-Back | 8.8 | 8.8 | 8.8 | 0.0 | %vol
SP6LKV_1 Cup-Low-Back | 9.0 | 9.0 | 8.9 | 0.0 | %vol
SP7LKV_1 K-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP8LKV_1 LR-High | 0.1 | 0.1 | 0.0 | 0.0 | %vol
SP9LKV_2 LR-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP10LKV_2 H-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP11LKV_2 H-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP12LKV_2 FF-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP13LKV_2 FF-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP14LKV_2 AT-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP15LKV_2 AT-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP16LKV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP21LKV_1 FF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP22LKV_1 SF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol
RELEASEPRESSURE | 0.0200 | 0.0 | 0.0 | 0.0 | barg
LOWFLOWMETERCH4 | 0.0 | 0.0 | 0.0 | 0.0 | g/s
OUTLET TEMP | 5.3 | 5.4 | 5.2 | 0.1 | degC
Volume Flow Rate | -0.1 | 0.0 | 0.0 | 0.0 | SLPM
Energy Flow Rate | 0.0 | 0.0 | 0.0 | 0.0 | kW
External Wind Speed | 4.3 | 0.0 | 0.0 | 0.0 | m/s
External Wind Direction | 198.3 | 0.0 | 0.0 | 0.0 | bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate

Hallway

0.0

7.9

9.0

Cupboard (top is average of SP4 and SP5)
L2-012 RESULT

Hy4Heat WP7 Test Result

### MTP ID: L2-012
### Hole Size: 1.8 mm
### Location: Kitchen wall cupboard, doors closed
### Gas: Methane
### Date: 10/12/2019
### Time: 10:15:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>4.9</td>
<td>3.9</td>
<td>3.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>19.9</td>
<td>19.9</td>
<td>19.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>21.4</td>
<td>21.4</td>
<td>21.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>21.8</td>
<td>21.8</td>
<td>21.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>24.1</td>
<td>24.2</td>
<td>23.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>TF7KV_1 K-Low</td>
<td>2.2</td>
<td>2.2</td>
<td>2.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

### Notes:
Offset on analyser 3 (SP17-SP23) removed of -0.248% for analyser drift at time of averaging.

### Gas Concentrations

#### Kitchen Concentrations

- **SP1LKV_1 K-High**
- **SP2LKV_1 K-Mid**
- **SP7LKV_1 K-Low**

#### Cupboard Concentrations

- **SP3LKV_1 Cup-Mid**
- **SP4LKV_1 Cup-High-Front**
- **SP5LKV_1 Cup-High-Back**
- **SP6LKV_1 Cup-Low-Back**

### Other Measurements

- **LOWFLOWMETERCH4**
- **OUTLET TEMP**
- **Volume Flow Rate**
- **Energy Flow Rate**
- **External Wind Speed**
- **External Wind Direction**

### Diagrams

- **Kitchen Gas Concentrations**
- **Cupboard Gas Concentrations**
- **Mass Flow Rate**

### Diagram Legends

- **Hallway and Stud into Living Room**
- **KITCHEN**
- **LIVING ROOM**
- **BASEMENT**

### Additional Information

- **External Wind Speed**
- **Energy Flow Rate**
- **Volume Flow Rate**
- **Mass Flow Rate**
### L2-013 RESULT

**Hy4Heat WP7 Test Result**

- **MTP ID:** L2-013
- **Hole Size:** 2.5 mm
- **Location:** Kitchen wall cupboard, doors closed
- **Date:** 10/12/2019
- **Time:** 14:15:00

#### Notes:
- 0.2% offset applied to analyzer 3 (SP17-23) for volumetric sensor drift. LEL sensor non-functioning in this experiment.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>8.2</td>
<td>8.4</td>
<td>8.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>3.8</td>
<td>3.8</td>
<td>3.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>28.0</td>
<td>28.0</td>
<td>27.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>28.6</td>
<td>28.6</td>
<td>28.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Bak</td>
<td>29.1</td>
<td>29.1</td>
<td>29.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>34.3</td>
<td>34.3</td>
<td>34.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>GT7KV_1 K-Low</td>
<td>4.1</td>
<td>4.2</td>
<td>4.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>8.2</td>
<td>8.2</td>
<td>8.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>3.8</td>
<td>3.8</td>
<td>3.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 LR-Mid</td>
<td>28.0</td>
<td>28.0</td>
<td>27.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-High</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 H-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0198</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

- **LOWFLOWMETERCH4:** 0.2 ± 0.2 g/s
- **OUTLET TEMP:** 65.6 ± 6.2 degC
- **Volume Flow Rate:** 16.5 ± 0.0 SLPM
- **Energy Flow Rate:** 9.9 ± 0.0 kW
- **External Wind Speed:** 4.2 ± 0.5 m/s
- **External Wind Direction:** 288.3 ± 200.0°

#### Kitchen Concentrations

![Kitchen Concentrations Graph](image1)

- **SP1LKV_1 K-High**: Average = 8.2, Max = 8.4, Min = 8.1, STDEV = 0.1
- **SP2LKV_1 K-Mid**: Average = 3.8, Max = 3.8, Min = 3.7, STDEV = 0.0
- **SP3LKV_1 Cup-Mid**: Average = 28.0, Max = 28.0, Min = 27.8, STDEV = 0.1
- **SP4LKV_1 Cup-High-Back**: Average = 28.6, Max = 28.6, Min = 28.5, STDEV = 0.0
- **SP5LKV_1 Cup-High-Back**: Average = 29.1, Max = 29.1, Min = 29.0, STDEV = 0.0
- **SP6LKV_1 Cup-Low-Back**: Average = 34.3, Max = 34.3, Min = 34.0, STDEV = 0.0
- **GT7KV_1 K-Low**: Average = 4.1, Max = 4.2, Min = 4.0, STDEV = 0.1
- **SP8LKV_1 LR-High**: Average = 8.2, Max = 8.2, Min = 8.0, STDEV = 0.0
- **SP9LKV_1 LR-Mid**: Average = 3.8, Max = 3.8, Min = 3.7, STDEV = 0.0
- **SP10LKV_1 LR-Mid**: Average = 28.0, Max = 28.0, Min = 27.8, STDEV = 0.1
- **SP11LKV_2 H-High**: Average = 0.6, Max = 0.6, Min = 0.5, STDEV = 0.0
- **SP12LKV_2 H-Mid**: Average = 0.4, Max = 0.4, Min = 0.3, STDEV = 0.0
- **SP20LKV_1 STUD-Cav**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP21LKV_1 FF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP22LKV_1 SF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP23LKV_1 ROOF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **RELEASEPRESSURE**: Average = 0.0198 barg

#### Cupboard Concentrations

![Cupboard Concentrations Graph](image2)

- **SP3LKV_1 Cup-Mid**: Average = 28.0, Max = 28.0, Min = 27.8, STDEV = 0.1
- **SP4LKV_1 Cup-High-Front**: Average = 28.6, Max = 28.6, Min = 28.5, STDEV = 0.0
- **SP5LKV_1 Cup-High-Back**: Average = 29.1, Max = 29.1, Min = 29.0, STDEV = 0.0
- **SP6LKV_1 Cup-Low-Back**: Average = 34.3, Max = 34.3, Min = 34.0, STDEV = 0.0
- **GT7KV_1 K-Low**: Average = 4.1, Max = 4.2, Min = 4.0, STDEV = 0.1
- **SP8LKV_1 LR-High**: Average = 8.2, Max = 8.2, Min = 8.0, STDEV = 0.0
- **SP9LKV_1 LR-Mid**: Average = 3.8, Max = 3.8, Min = 3.7, STDEV = 0.0
- **SP10LKV_1 LR-Mid**: Average = 28.0, Max = 28.0, Min = 27.8, STDEV = 0.1
- **SP11LKV_2 H-High**: Average = 0.6, Max = 0.6, Min = 0.5, STDEV = 0.0
- **SP12LKV_2 H-Mid**: Average = 0.4, Max = 0.4, Min = 0.3, STDEV = 0.0
- **SP20LKV_1 STUD-Cav**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP21LKV_1 FF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP22LKV_1 SF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **SP23LKV_1 ROOF-Void**: Average = 0.0, Max = 0.0, Min = 0.0, STDEV = 0.0
- **RELEASEPRESSURE**: Average = 0.0198 barg

#### Mass Flow Rate

![Mass Flow Rate Graph](image3)

- **Hallway and Stud into Living Room**
  - Average = 0.4 g/s
  - Max = 4.2 g/s
  - Min = 0.3 g/s
  - STDEV = 0.3 g/s

- **KITCHEN**: Average = 8.2 g/s
  - Max = 10.0 g/s
  - Min = 6.2 g/s
  - STDEV = 0.8 g/s

- **LIVING ROOM**: Average = 3.8 g/s
  - Max = 4.1 g/s
  - Min = 0.2 g/s
  - STDEV = 0.3 g/s

**Kitchen and Cupboard Concentrations**

- **KITCHEN**
  - Gas: Methane
  - Date & Time: 10/12/2019 14:15:00
  - Gas Flow: 16.5 SLPM
  - Energy Flow: 9.9 kW
  - External Wind: 4.2 m/s

- **CUPBOARD**
  - Gas: Methane
  - Date & Time: 10/12/2019 14:15:00
  - Gas Flow: 16.5 SLPM
  - Energy Flow: 9.9 kW
  - External Wind: 4.2 m/s

**Visualization**

- **Hallway and Stud into Living Room**
  - Average = 0.4 g/s

- **KITCHEN**
  - Average = 8.2 g/s

- **LIVING ROOM**
  - Average = 3.8 g/s

**Note:** 0.2% offset applied to analyzer 3 (SP17-23) for volumetric sensor drift. LEL sensor non-functioning in this experiment.
L2-014 RESULT

Hy4Heat WP7 Test Result

---

Sensor | Average | Max | Min | STDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 13.8 | 13.8 | 13.8 | 0.0 | %vol
SP1LKV_1 K-Mid | 8.5 | 8.6 | 8.5 | 0.1 | %vol
SP3LKV_1 Cup-Mid | 37.0 | 37.2 | 37.0 | 0.1 | %vol
SP4LKV_1 Cup-High-Front | 36.8 | 36.8 | 36.7 | 0.0 | %vol
SP5LKV_1 Cup-High-Back | 37.3 | 37.3 | 37.3 | 0.0 | %vol
SP6LKV_1 Cup-Low-Back | 43.8 | 44.0 | 43.7 | 0.1 | %vol
SP7LKV_1 K-Low | 6.1 | 6.1 | 6.0 | 0.1 | %vol
SP8LKV_2 L-High | 1.0 | 1.0 | 0.9 | 0.0 | %vol
SP9LKV_1 LR-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP10LKV_2 H-High | 1.0 | 1.1 | 1.0 | 0.1 | %vol
SP11LKV_2 H-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol
SP12LKV_3 FF-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP13LKV_2 FF-Mid | 0.6 | 0.6 | 0.5 | 0.0 | %vol
SP14LKV_2 L-High | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP15LKV_2 L-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP16LKV_3 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP18LKV_3 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol
SP21LKV_1 FF-Void | 8.3 | 8.4 | 8.3 | 0.0 | %vol
SP22LKV_1 SF-Void | 0.7 | 0.8 | 0.7 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol
RELEASEPRESSURE | 0.00 | 0.0 | 0.0 | 0.0 | barg

LOWFLOWMETERCH1 Four (0.4 | 0.4 | 0.4 | 0.4 | g/s
OUTLET TEMP | 8.4 | 8.6 | 7.0 | 0.0 | degC
Volume Flow Rate | 34.3 | 34.3 | 34.3 | 0.0 | SLPM
Energy Flow Rate | 20.5 | 20.5 | 20.5 | 0.0 | kW
External Wind Speed | 5.4 | 5.4 | 5.4 | 0.0 | m/s
External Wind Direction | 227.4 | 227.4 | 227.4 | 0.0 | bearing

---

Notes:

- Hallway and Stud into Living Room
- Hallway Concentrations
- Cupboard Concentrations
- Mass Flow Rate

---

DNV GL - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com
**L2-015 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>23.3</td>
<td>23.3</td>
<td>23.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>19.4</td>
<td>19.4</td>
<td>19.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>42.3</td>
<td>42.3</td>
<td>42.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>32.2</td>
<td>32.4</td>
<td>31.8</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>32.8</td>
<td>32.0</td>
<td>31.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>47.5</td>
<td>47.6</td>
<td>47.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>GFTKLV_1 K-Low</td>
<td>5.3</td>
<td>5.3</td>
<td>5.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 LR-High</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 LR-Mid</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 H-High</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 H-Mid</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 FF-High</td>
<td>0.8</td>
<td>0.9</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 FF-Mid</td>
<td>0.7</td>
<td>0.8</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 AT-High</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 AT-Mid</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_2 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 STUD-Cav</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 FF-Void</td>
<td>16.7</td>
<td>16.8</td>
<td>16.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 SF-Void</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPSLKV_1 ROOF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0020</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4** 0.9 0.9 0.9 0.0 g/s

**OUTLET TEMP** 4.3 4.5 4.2 0.1 degC

**Volume Flow Rate** 76.0 0.0 0.0 0.0 SLPM

**Energy Flow Rate** 45.5 0.0 0.0 0.0 kW

**External Wind Speed** 4.7 0.1 m/s

**External Wind Direction** 219.4 bearing

---

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

**Mass Flow Rate**

**Notes:**

*Hallway* 1.9 0.6 0.8

*Living Room* 3.7 19.4 5.3 0.7

*KITCHEN* 23.3

*BASEMENT* 0.1

*1st FLOOR* 0.8

*2nd FLOOR* 0.5

*100% Gas*

*Test Result* 0.5

---

**Location:** Kitchen wall cupboard

**Date:** 11/12/2019

**Time:** 00:50:00
### L2-016 RESULT

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-016  
**Hole Size:** 7.2 mm  
**Location:** kitchen wall cupboard  
**Gas:** methane  
**Date:** 11/12/2019  
**Time:** 06:45:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>40.5</td>
<td>40.8</td>
<td>40.0</td>
<td>0.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>36.2</td>
<td>36.2</td>
<td>36.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>65.1</td>
<td>65.3</td>
<td>64.9</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>52.0</td>
<td>52.7</td>
<td>51.7</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Bac</td>
<td>52.2</td>
<td>52.5</td>
<td>50.5</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>71.7</td>
<td>71.7</td>
<td>71.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>GP7LKV_1 K-Low</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>7.8</td>
<td>7.9</td>
<td>7.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>6.6</td>
<td>6.6</td>
<td>6.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>2.0</td>
<td>2.1</td>
<td>2.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>2.3</td>
<td>2.4</td>
<td>2.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>2.2</td>
<td>2.3</td>
<td>2.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>1.9</td>
<td>2.0</td>
<td>1.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>2.0</td>
<td>2.0</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>30.7</td>
<td>31.3</td>
<td>29.8</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>2.5</td>
<td>2.6</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0189</td>
<td>0.0202</td>
<td>0.0181</td>
<td>0.0007</td>
<td>barg</td>
</tr>
</tbody>
</table>

- **LOWFLOWMETERCH4:** 1.9416, 2.0019, 1.9116, 0.0520 g/s
- **OUTLET TEMP:** 2.2, 2.4, 2.0, 0.1 degC
- **Volume Flow Rate:** 162.4, 167.4, 159.9, 2.7 SLPM
- **Energy Flow Rate:** 97.1, 100.1, 95.6, 1.6 kW
- **External Wind Speed:** 2.3 m/s
- **External Wind Direction:** 221.8 bearing

### Kitchen Concentrations

#### Mass Flow Rate

![Mass Flow Rate Graph](chart1.png)

### Cupboard Concentrations

#### Mass Flow Rate

![Mass Flow Rate Graph](chart2.png)

**Notes:**
- **Hallway and Stud into Living Room:**
  - **Hallway:** 6.6 m/s
  - **Stud:** 2.0 m/s
- **Cupboard (top is average of SP4 and SP5):**
  - **Cupboard:** 1.8 m/s

**Volume Flow Rate:** 162.4, 167.4, 159.9, 2.7 SLPM
L2-018 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-018
Hole Size: 0.6 mm
Location: Kitchen base cupboard, doors closed
Date: 07/12/2019 Time: 02:15:00

Averaging Period Start: 195 min End: 205 min

Notes: Flow rate below measurable range on flow meter, calculated at approx 1 SLPM

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_2 K-High</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 K-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 Cup-Mid</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-High-Front</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-High-Back</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Cup-Low-Back</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SFTKV_2 K-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8KV_2 IR-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9KV_2 IR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

RELEASEPRESSURE 0.0196 0.0 0.0 0.0 barg
LOWFLOWMETERCH4 0.0 0.0 0.0 0.0 g/s
OUTLET TEMP 7.2 7.4 7.1 0.1 degC
Volume Flow Rate 0.0 0.0 0.0 0.0 SLPM
Energy Flow Rate 0.0 0.0 0.0 0.0 kW
External Wind Speed 4.8 m/s
External Wind Direction 267.6 bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate
# L2-019 Result

## Hy4Heat WP7 Test Result

**MTP ID:** L2-019  
**Hole Size:** 0.9 mm  
**Location:** Kitchen base cupboard, doors closed  
**Gas:** Methane  
**Date:** 07/12/2019  
**Time:** 06:30:00  
**Averaging Period Start:** 240 min  
**End:** 250 min  

**Notes:** No flammable observations in cupboard

### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP4LKV_2 K-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 K-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-Mid</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-High-Front</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-High-Back</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-High</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 FF-Void</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 ROOF-Void</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0195</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>bar</td>
</tr>
</tbody>
</table>

### Concentration Graphs

- **Kitchen Concentrations**

- **Cupboard Concentrations**

### Mass Flow Rate

- **Hallway and Stud into Living Room**

- **Mass Flow Rate**

---

**DNV GL - Report No. 630650, Rev. 3 FINAL – www.dnvgl.com**
L2-020 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-020
Hole Size: 1.8 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019
Time: 13:40:00
Averaging Period Start: 200 min
End: 210 min

Notes: 0.2% offset removed from analyser 3 (SP17-23)

Sensor Average Max Min STDEV units
SP1LKV_2 K-High 2.4 2.5 2.4 0.1 %vol
SP1LKV_2 K-Mid 2.1 2.1 2.0 0.0 %vol
SP4LKV_1 Cup-High-Back 10.7 10.7 10.6 0.0 %vol
SPBLK_1 Cup-Low-Back 1.5 1.6 1.5 0.1 %vol
SP1LKV_2 K-Low 1.2 1.2 1.2 0.0 %vol
SP2LKV_2 K-Mid 0.3 0.3 0.3 0.0 %vol
SP10LKV_2 H-Mid 0.3 0.3 0.2 0.0 %vol
SP2LKV_2 H-High 0.4 0.4 0.4 0.0 %vol
SP12LKV_2 H-Mid 0.2 0.2 0.1 0.0 %vol
SP14LKV_2 H-High 0.1 0.1 0.0 0.0 %vol
SP16LKV_2 H-High 0.0 0.0 0.0 0.0 %vol
SP18LKV_1 BM-Mid 0.1 0.1 0.1 0.0 %vol
SP20LKV_1 STUD-Cav 0.3 0.3 0.3 0.0 %vol
SP22LKV_1 SF-Void 0.3 0.3 0.3 0.0 %vol
SP24LKV_1 ROOF-Void 0.0 0.0 0.0 0.0 %vol
RELEASEPRESSURE 0.0200 0.0 0.0 0.0 barg
LOWFLOWMETERCH4 0.1 0.1 0.1 0.0 g/s
OUTLET TEMP 9.4 9.5 9.2 0.1 degC
Volume Flow Rate 8.4 0.0 0.0 0.0 SLPM
Energy Flow Rate 5.0 0.0 0.0 0.0 kW
External Wind Speed 3.1 3.1 3.1 0.0 m/s
External Wind Direction 217.8 217.8 217.8 0.0 bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate
L2-021 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-021
Hole Size: 2.5 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019
Time: 19:00:00

Averaging Period Start: 150 min
End: 250 min

Notes: Cupboard now rich, high point in kitchen hearing flammable

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP3LKV_1 K-High</td>
<td>4.9</td>
<td>3.9</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 K-Mid</td>
<td>2.4</td>
<td>2.4</td>
<td>2.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-Mid</td>
<td>12.6</td>
<td>12.6</td>
<td>12.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>13.4</td>
<td>13.4</td>
<td>13.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>13.6</td>
<td>13.6</td>
<td>13.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Cup-Low-Back</td>
<td>1.1</td>
<td>1.3</td>
<td>1.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>GFTKV_2 K-Low</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 LR-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_3 Hi-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_3 FF-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 AT-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 AT-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 NWall-Cav</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 STUD-Cav</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 FF-Void</td>
<td>2.1</td>
<td>2.1</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 FF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

RELEASEPRESSURE: 0.0195
LOWFLOWMETERCH4: 0.2
OUTLET TEMP: 9.1
Volume Flow Rate: 16.9 SLPM
Energy Flow Rate: 10.1 kW
External Wind Speed: 0.0 m/s
External Wind Direction: 0.0

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Cupboard top is average of SPA and SP5
### L2-022 RESULT

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-022  
**Hole Size:** 3.6 mm  
**Location:** Kitchen base cupboard, doors closed

**Gas:** Methane  
**Date:** 07/12/2019  
**Time:** 23:15:00

**Averaging Period Start:** 220 min  
**End:** 230 min

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>9.1</td>
<td>9.3</td>
<td>9.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>7.7</td>
<td>7.8</td>
<td>7.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>21.6</td>
<td>21.8</td>
<td>21.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>23.9</td>
<td>22.1</td>
<td>21.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>7.1</td>
<td>7.8</td>
<td>6.8</td>
<td>0.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>4.5</td>
<td>4.7</td>
<td>4.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>9.1</td>
<td>9.3</td>
<td>9.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>1.0</td>
<td>1.1</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE**  
0.0196 barg

**LOWFLOWMETERCH4**  
0.4 g/s

**OUTLET TEMP**  
8.3 degC

**Volume Flow Rate**  
33.6 SLPM

**Energy Flow Rate**  
20.1 kW

**External Wind Speed**  
3.6 m/s

**External Wind Direction**  
229.6 bearing

---

**Notes:** Above UFL in cupboard, near stoichometric at ceiling in kitchen

---

**Kitchen Concentrations**

- **Hallway and Stud into Living Room**
  - **Hallway:** 1.4 m/s
  - **Stud:** 1.0 m/s

**Cupboard Concentrations**

**Mass Flow Rate**

---

**Legend:**
- **KITCHEN**
  - **LIVING ROOM**
  - **BASEMENT**

---

**Diagram:**

- **Kitchen Concentrations**
- **Cupboard Concentrations**

---

**Diagrams:**

- **Mass Flow Rate**
- **Hallway and Stud into Living Room**
L2-023 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-023
Hole Size: 5.1 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 08/12/2019
Time: 04:10:00
Averaging Period Start: 150 min
End: 160 min

Notes:
Above UFL at kitchen ceiling, near UFL mid-height kitchen, kitchen ceiling show flammable mixture but nowhere else. 0.1% offset on analyser 3, volumetric sensor removed (SP17-23)

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_1 K-High | 17.6 | 17.7 | 17.5 | 0.1 | %vol
SP1LKV_1 K-Mid | 14.1 | 14.1 | 14.0 | 0.1 | %vol
SP1LKV_1 Cup-Mid | 31.7 | 31.9 | 31.5 | 0.2 | %vol
SP4LKV_1 Cup-High-Front | 33.2 | 33.4 | 33.0 | 0.2 | %vol
SP5LKV_1 Cup-High-Back | 33.5 | 33.6 | 33.2 | 0.2 | %vol
SP6LKV_1 Cup-Low-Back | 18.8 | 19.1 | 18.1 | 0.4 | %vol
GF7LKV_1 K-Low | 10.2 | 10.3 | 9.8 | 0.2 | %vol
SP8LKV_1 LR-High | 3.8 | 3.9 | 3.7 | 0.0 | %vol
SP9LKV_1 LR-Mid | 1.8 | 1.9 | 1.7 | 0.0 | %vol
SP10LKV_2 H-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP11LKV_2 H-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP12LKV_2 FF-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP13LKV_2 FF-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP14LKV_2 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP15LKV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP16LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 1.5 | 1.6 | 1.5 | 0.1 | %vol
SP21LKV_1 FF-Void | 1.5 | 1.6 | 1.5 | 0.1 | %vol
SP22LKV_1 SF-Void | 1.5 | 1.6 | 1.5 | 0.1 | %vol
SP23LKV_1 ROOF-Void | 1.5 | 1.6 | 1.5 | 0.1 | %vol
RELEASEPRESSURE | 0.0195 | 0.0 | 0.0 | 0.0 | barg
LOWFLOWMETERCH4 | 0.9 | 0.9 | 0.9 | 0.0 | g/s
OUTLET TEMP | 5.5 | 5.7 | 5.4 | 0.1 | degC
Volume Flow Rate | 71.8 | 0.0 | 0.0 | 0.0 | SLPM
Energy Flow Rate | 42.9 | 0.0 | 0.0 | 0.0 | kW
External Wind Speed | 6.7 | 0.0 | 0.0 | 0.0 | m/s
External Wind Direction | 228.6 | 0.0 | 0.0 | 0.0 | bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate

Hallway and 2nd Floor

1st Floor

KITCHEN

LIVING ROOM

BASEMENT
**L2-024 RESULT**

Hy4Heat WP7 Test Result

**MTP ID:** L2-024  
**Hole Size:** 7.2 mm  
**Location:** Kitchen base cupboard, doors closed  
**Gas:** Methane

**Date:** 08/12/2019  
**Time:** 08:30:00  
**Averaging Period Start:** 160 min  
**End:** 170 min

**Notes:** Above UFL in most of kitchen by end, just flammable in hall / living room

---

**Sensor**  
**Average**  
**Max**  
**Min**  
**STDEV**  
**units**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>25.1</td>
<td>25.6</td>
<td>25.1</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>21.1</td>
<td>21.3</td>
<td>21.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>43.0</td>
<td>43.4</td>
<td>42.8</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High-Front</td>
<td>44.4</td>
<td>44.5</td>
<td>44.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High-Back</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low-Back</td>
<td>27.2</td>
<td>27.9</td>
<td>26.8</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Low</td>
<td>14.1</td>
<td>14.2</td>
<td>14.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 LR-High</td>
<td>5.7</td>
<td>5.8</td>
<td>5.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 LR-Mid</td>
<td>5.7</td>
<td>5.8</td>
<td>5.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-Mid</td>
<td>3.2</td>
<td>3.4</td>
<td>3.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-High</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 FF-High</td>
<td>2.4</td>
<td>2.5</td>
<td>2.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 FF-Mid</td>
<td>2.3</td>
<td>2.3</td>
<td>2.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 AT-High</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 AT-Mid</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 BM-High</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 BM-Mid</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 BM-Low</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 NWALL-Cav</td>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 STUD-Cav</td>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 FF-Void</td>
<td>16.5</td>
<td>16.8</td>
<td>16.3</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 SF-Void</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 ROOF-Void</td>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0192</td>
<td>0.0196</td>
<td>0.0187</td>
<td>0.0002</td>
<td>barg</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4** 0.16  
**OUTLET TEMP** 16.3  
**Volume Flow Rate** 131.9  
**Energy Flow Rate** 78.8  
**External Wind Speed** 4.8  
**External Wind Direction** 220.5

---

**Kitchen Concentrations**

**Cupboard Concentrations**

---

**Hallway and Stud into Living Room**

**Mass Flow Rate**
**L2-026 RESULT**

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-026  
**Hole Size:** 0.6 mm  
**Location:** Behind kitchen base cupboard, doors closed  
**Gas:** Methane  
**Date:** 08/12/2019  
**Time:** 12:30:00  
**Averaging Period Start:** 170 min  
**End:** 180 min

**Notes:** Basement showing very low concentration 'hangover' from previous higher flow test, not removed. No flammable concentrations recorded throughout house and experiment.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_2 K-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 K-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 Boil-Cup-Bottom-Hi</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 Behind-Cup-High</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 Sink-Cup-Hi</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 Under-Cupboards</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 LR-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 FF-High</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF1LKV_2 N-Wall-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF1LKV_2 STUD-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF2LKV_2 Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF3LKV_2 Roof-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0020</td>
<td>0.0020</td>
<td>0.0000</td>
<td>0.0000</td>
<td>barg</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4**  
0.004 0.0000 0.0032 g/s

**OUTLET TEMP**  
5.0 5.2 4.9 1.0 degC

**Volume Flow Rate**  
0.1 0.0 0.0 0.0 SLPM

**Energy Flow Rate**  
0.1 0.0 0.0 0.0 kW

**External Wind Speed**  
6.5 m/s

**External Wind Direction**  
217.5° bearing

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

**Mass Flow Rate**
**L2-027 RESULT**

Hy4Heat WP7 Test Result

**MTP ID:** L2-027  
**Hole Size:** 0.9 mm  
**Location:** Behind kitchen base cupboard  
**Gas:** methane  
**Date:** 08/12/2019  
**Time:** 17:00:30  
**Averaging Period Start:** 180 min  
**End:** 190 min

**Notes:** No flammable observations anywhere in property throughout experiment

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LK_2 K-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_2 K-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_2 Boil-Cup-Bottom-Hi</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 Behind-Cup-High</td>
<td>4.2</td>
<td>4.2</td>
<td>4.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_2 Sink-Cup-Hi</td>
<td>1.8</td>
<td>2.0</td>
<td>1.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_2 Under-Cupboards</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LK_2 K-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LK_2 L-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LK_2 L-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LK_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LK_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LK_2 FF-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LK_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LK_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LK_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LK_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LK_1 BM-Low</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LK_2 NVALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LK_2 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LK_1 FF-Void</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LK_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LK_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4**
0.0100 0.010 0.004 0.004 g/s

**OUTLET TEMP**
5.4 5.4 5.3 0.0 degC

**Volume Flow Rate**
0.8 0.0 0.0 0.0 SLPM

**Energy Flow Rate**
0.5 0.0 0.0 0.0 kW

**External Wind Speed**
6.9 m/s

**External Wind Direction**
246.8 bearing

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

**Cupboards and behind kick board**

**DNS GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com**
## L2-028 RESULT

### Hy4Heat WP7 Test Result

**MTP ID:** L2-028  
**Hole Size:** 1.8 mm  
**Location:** behind kitchen base cupboard  
**Gas:** methane  
**Date:** 08/12/2019  
**Averaging Period Start:** 21:15:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPl1KV_1 K-High</td>
<td>4.9</td>
<td>4.0</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 K-Mid</td>
<td>3.3</td>
<td>3.4</td>
<td>3.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 Cup-Mid</td>
<td>2.5</td>
<td>2.6</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 Cup-High-Front</td>
<td>10.7</td>
<td>10.7</td>
<td>10.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 Cup-High-Bach</td>
<td>8.1</td>
<td>8.1</td>
<td>8.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 Cup-Low-Back</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 K-Low</td>
<td>2.1</td>
<td>2.3</td>
<td>2.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 LR-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_1 LR-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 H-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 H-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 FF-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 FF-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 AT-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 AT-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl1KV_2 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl2KV_2 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl2KV_1 FF-Void</td>
<td>3.6</td>
<td>3.6</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl2KV_1 SF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPl2KV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**Notes:**

**LOWFLOWMETERCH4** 0.1033 0.1087 0.1012 0.0034 g/s  
**OUTLET TEMP** 5.1 5.2 5.1 0.0 degC  
**Volume Flow Rate** 8.6 9.1 8.5 0.3 SLPM  
**Energy Flow Rate** 5.2 5.4 5.1 0.2 kW  
**External Wind Speed** 3.9 m/s  
**External Wind Direction** 298.5 bearing

### Diagrams

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Mass Flow Rate**

---

**DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com**
L2-029 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-029
Hole Size: 2.5 mm
Location: Behind kitchen base cupboard
Gas: methane

Date: 09/12/2019
Time: 02:15:00

Averaging Period Start: 190 min
End: 200 min

Notes:
Flammable observations in cupboard and kitchen. Cannot see any reason the basement concentrations are not valid. Offset not observed on other SP’s on same analyser

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_1 K-High | 6.6 | 6.7 | 6.5 | 0.1 | %vol
SP1LKV_1 K-Mid | 6.3 | 6.4 | 6.3 | 0.0 | %vol
SP1LKV_1 Boil-Cup-Bottom-Hi | 4.3 | 4.3 | 4.3 | 0.0 | %vol
SP4LKV_1 Behind-Cup-High | 14.0 | 14.0 | 13.9 | 0.1 | %vol
SP8LKV_1 Sink-Cup-Hi | 11.4 | 11.6 | 11.3 | 0.0 | %vol
SP6LKV_1 Under-Cupboards | 2.0 | 2.1 | 1.9 | 0.1 | %vol
SP7LKV_1 K-Low | 1.1 | 1.1 | 1.1 | 0.0 | %vol
SP8LKV_1 LR-High | 0.7 | 0.7 | 0.7 | 0.0 | %vol
SP3LKV_1 LR-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP10LKV_1 H-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP11LKV_1 H-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP12LKV_1 FF-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP13LKV_1 FF-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP14LKV_1 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP15LKV_1 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP16LKV_1 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP21LKV_1 FF-Void | 5.6 | 5.6 | 5.6 | 0.0 | %vol
SP22LKV_1 SF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol

RELEASEPRESSURE
0.0201
0.0200
0.0200
0.0000
barg

LOWFLOWMETERCH4
0.207
0.210
0.202
0.002
g/s

OUTLET TEMP
4.1
4.2
4.0
0.1
degC

Volume Flow Rate
17.3
0.0
0.0
0.0
SLPM

Energy Flow Rate
10.3
0.0
0.0
0.0
kW

External Wind Speed
2.8
m/s

External Wind Direction
316.7
bearing

Hallway and Stud into Living Room

Cupboards and behind kick board

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
**L2-030 RESULT**

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-030  
**Gas:** Methane  
**Location:** Behind kitchen base cupboard  
**Date:** 09/12/2019  
**Time:** 06:30:00  
**Notes:** 0.2% offset on Analyser3 (SP17-23) removed. Rich but flammable concentrations in kitchen at end of experiment

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>11.4</td>
<td>11.5</td>
<td>11.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>11.9</td>
<td>11.9</td>
<td>11.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Oil-Cup-Bottom-Hi</td>
<td>10.8</td>
<td>11.0</td>
<td>10.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Behind-Cup-High</td>
<td>21.0</td>
<td>21.0</td>
<td>21.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Hi</td>
<td>16.9</td>
<td>17.0</td>
<td>16.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Under-Cupboards</td>
<td>3.4</td>
<td>3.5</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>2.1</td>
<td>2.1</td>
<td>2.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 BM-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.019</td>
<td>0.020</td>
<td>0.019</td>
<td>0.000</td>
<td>barg</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4**  
0.415  
0.420  
0.409  
0.004  
g/s

**OUTLET TEMP**  
4.7  
5.0  
4.5  
0.1  
deGC

**Volume Flow Rate**  
34.7  
0.0  
4.5  
0.0  
SLPM

**Energy Flow Rate**  
20.8  
0.0  
0.0  
0.0  
kW

**External Wind Speed**  
2.4  
m/s

**External Wind Direction**  
298.8  
-bearing

### Kitchen Concentrations

![Kitchen Concentrations Graph](image-url)

### Cupboard Concentrations

![Cupboard Concentrations Graph](image-url)

### Mass Flow Rate

![Mass Flow Rate Graph](image-url)
L2-031 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-031
Hole Size: 5.1 mm
Location: Behind kitchen base cupboard
Gas: methane

Date: 09/12/2019  Time: 12:15:00
Averaging Period Start: 190 min  End: 200 min

Notes: 0.1% offset removed from Analyser3 (SP17-23). Some gas concentration 'hangover' in basement evident, overcome by averaging period. >UFL in most of kitchen and cupboard, <LFL elsewhere.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>18.6</td>
<td>18.7</td>
<td>18.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-High</td>
<td>19.5</td>
<td>19.5</td>
<td>19.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Boil-Cup-Bottom-Hi</td>
<td>17.2</td>
<td>17.3</td>
<td>17.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Behind-Cup-High</td>
<td>27.5</td>
<td>27.5</td>
<td>27.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Hi</td>
<td>27.1</td>
<td>27.1</td>
<td>27.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Under-Cupboards</td>
<td>3.9</td>
<td>4.0</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>2.7</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>2.3</td>
<td>2.4</td>
<td>2.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>1.5</td>
<td>1.5</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>1.6</td>
<td>1.6</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 SF-Void</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 ROOF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0199</td>
<td>0.020</td>
<td>0.019</td>
<td>0.000</td>
<td>barg</td>
</tr>
</tbody>
</table>

LOWFLOWMETERCH4 | 0.872 | 0.882 | 0.862 | 0.005 | g/s  |
OUTLET TEMP      | 2.8    | 3.2   | 2.4   | 0.2   | degC |
Volume Flow Rate | 73.0   | 0.0   | 0.0   | 0.0   | SLPM |
Energy Flow Rate | 43.6   | 0.0   | 0.0   | 0.0   | kW   |
External Wind Speed | 1.2   | 1.5   | 1.5   | 0.1   | m/s  |
External Wind Direction | 0     | 250   | 250   | 1.0   | Bearing |

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Cupboards and behind kick board
## L2-032 RESULT

### Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LK_1 K-High</td>
<td>27.8</td>
<td>27.9</td>
<td>27.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 K-Mid</td>
<td>29.1</td>
<td>29.1</td>
<td>29.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 Boil-Cup-Bottom-Hi</td>
<td>24.1</td>
<td>24.4</td>
<td>23.8</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LK_1 Behind-Cup-High</td>
<td>37.3</td>
<td>37.4</td>
<td>37.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LK_1 Sink-Cup-Hi</td>
<td>18.7</td>
<td>18.7</td>
<td>18.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LK_1 Under-Cupboards</td>
<td>15.1</td>
<td>15.2</td>
<td>15.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 K-Low</td>
<td>4.4</td>
<td>4.4</td>
<td>4.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LK_1 LR-High</td>
<td>7.1</td>
<td>7.1</td>
<td>7.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LK_1 LR-Mid</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LK_1 H-High</td>
<td>6.2</td>
<td>6.3</td>
<td>6.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LK_1 H-Mid</td>
<td>4.2</td>
<td>4.3</td>
<td>4.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LK_1 FF-High</td>
<td>4.4</td>
<td>4.4</td>
<td>4.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LK_1 FF-Mid</td>
<td>4.2</td>
<td>4.3</td>
<td>4.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 AT-High</td>
<td>3.9</td>
<td>3.9</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LK_1 AT-Mid</td>
<td>3.9</td>
<td>4.0</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LK_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LK_1 BM-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LK_1 BM-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LK_1 NWALL-Cav</td>
<td>3.3</td>
<td>3.3</td>
<td>3.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LK_1 STUD-Cav</td>
<td>23.7</td>
<td>23.7</td>
<td>23.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LK_1 SF-Void</td>
<td>2.5</td>
<td>2.6</td>
<td>2.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LK_1 ROOF-Void</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0092</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

### Notes:
- 0.2% offset removed from SP17-23 for analyser drift.
- >UFL in most of kitchen, some >LFL observed in hallway and living room.

### Parameters
- **Gas:** Methane
- **Date:** 09/12/2019
- **Time:** 17:30:00
- **Averaging Period Start:** 250 min
- **End:** 260 min

### Kitchen Concentrations

### Cupboard Concentrations

### Hallway and Stud into Living Room

### Mass Flow Rate

### Diagrams
- Kitchen Concentrations
- Cupboard Concentrations
- Hallway and Stud into Living Room
- Mass Flow Rate

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
### L2-034 RESULT

**Hy4Heat WP7 Test Result**

**MTIP ID:** L2-034  
**Hole Size:** 0.6 mm  
**Location:** Under sink cupboard  
**Gas:** Methane  

**Date:** 05/11/2019  
**Time:** 18:00:00  
**Averaging Period Start:** 150 min  
**End:** 160 min

**Notes:** 0.2% offset removed from SP17-23 for analyser drift. Suspected zero error pre-test was re-zeroed mid test. No flammable concentrations observed.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_2 K-High</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 Cup-Mid</td>
<td>2.9</td>
<td>2.9</td>
<td>2.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>2.0</td>
<td>2.0</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Cup-Low-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE**

- 0.0200 barg

**LOWFLOWMETERCH4**

- 0.0 g/s

**OUTLET TEMP**

- 10.6 10.7 10.5 degC

**Volume Flow Rate**

- 0.2 SLPM

**Energy Flow Rate**

- 0.1 kW

**External Wind Speed**

- 6.0 m/s

**External Wind Direction**

- 254.6 bearing

**KITCHEN**

- 0.2

**LIVING ROOM**

- 0.1

**BASEMENT**

- 0.0

**1st FLOOR**

- 0.0

**2nd FLOOR**

- 0.0

**Hallway and Stud into Living Room**

- 1.9

- 2.9

- 0.2

**Cupboard (top is average of SP4 and SP5)**

- 0.1

**Hallway**

- 0.1

**Mass Flow Rate**

- 0.0 to 5.0 g/s
L2-035 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-035
Hole Size: 0.9 mm
Location: Under sink cupboard
Gas: methane

Date: 05/12/2019
Time: 22:30:00
Averaging Period Start: 180 min
End: 190 min

Notes: 0.1% offset removed from SP17-23. No flammable concentrations observed

Sensor | Average | Max | Min | STDEV | units
-------|---------|-----|-----|-------|-----
SP1LKV_2 K-High | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP1LKV_2 K-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP3KLV_1 Cup-Mid | 2.5 | 2.5 | 2.5 | 0.0 | %vol
SP4KLV_1 Cup-High-Front | 3.3 | 3.3 | 3.3 | 0.0 | %vol
SP4KLV_1 Cup-High-Back | 3.5 | 3.5 | 3.5 | 0.0 | %vol
SP6KLV_1 Cup-Low-Back | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP7KLV_1 K-Low | 0.1 | 0.2 | 0.1 | 0.0 | %vol
SP8LKV_2 LR-High | 0.3 | 0.4 | 0.3 | 0.0 | %vol
SP9LKV_2 LR-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP10LKV_2 H-High | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP11LKV_2 H-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP12LKV_2 FF-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP13LKV_2 FF-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP14LKV_2 AT-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP15LKV_2 AT-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP16LKV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP21LKV_1 FF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP22LKV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol
RELEASEPRESSURE | 0.0200 | 0.0 | 0.0 | 0.0 | barg

LOWFLOWMETERCH4 | 0.0152 | 0.0187 | 0.0075 | 0.0022 | g/s
OUTLET TEMP | 10.7 | 10.9 | 10.7 | 0.1 | degC
Volume Flow Rate | 1.3 | 0.0 | 0.0 | 0.0 | SLPM
Energy Flow Rate | 0.8 | 0.0 | 0.0 | 0.0 | kW
External Wind Speed | 5.3 | 0.0 | 0.0 | 0.0 | m/s
External Wind Direction | 225.5 | 0.0 | 0.0 | 0.0 | bearing

---

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
Hy4Heat WP7 Test Result

MTP ID: L2-036
Hole Size: 1.8 mm
Location: Under sink cupboard
Date: 06/12/2019 02:00:00

Averaging Period Start: 120 min End: 130 min

Notes: 0.2% offset on SP17-23 removed. >LFL observed in cupboard only

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>2.1</td>
<td>2.2</td>
<td>2.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>7.6</td>
<td>7.7</td>
<td>7.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>9.1</td>
<td>9.1</td>
<td>9.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>9.8</td>
<td>9.8</td>
<td>9.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>2.3</td>
<td>2.4</td>
<td>2.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>1.4</td>
<td>1.5</td>
<td>1.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>1.4</td>
<td>1.4</td>
<td>1.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETERCH4</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>10.9</td>
<td>10.9</td>
<td>10.8</td>
<td>0.0</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>9.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>5.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>5.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>232.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>bearing</td>
</tr>
</tbody>
</table>

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)
### L2-037 RESULT

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-037  
**Hole Size:** 2.5 mm  
**Location:** Under sink cupboard  
**Date:** 06/12/2019  
**Time:** 05:15:00  
**Gas:** methane

**Notes:** 0.2% offset removed from SP17-23. Approaching LFL concentrations observed in the kitchen

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>4.5</td>
<td>4.5</td>
<td>4.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>4.3</td>
<td>4.3</td>
<td>4.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>11.6</td>
<td>11.7</td>
<td>11.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>13.2</td>
<td>13.2</td>
<td>13.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High</td>
<td>13.9</td>
<td>13.9</td>
<td>13.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>2.8</td>
<td>2.9</td>
<td>2.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>GFTLKV_1 K-Low</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPBKV_1LKV_1 1L-High</td>
<td>1.2</td>
<td>1.3</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 UR-Mid</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 2H-High</td>
<td>2.9</td>
<td>2.9</td>
<td>2.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>2.4</td>
<td>2.5</td>
<td>2.2</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>1.0</td>
<td>1.2</td>
<td>0.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 BM-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 NVALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0020</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>barg</td>
</tr>
</tbody>
</table>

**LOWFLOWMETERCH4** | 0.2 | 0.3 | 0.2 | 0.0 | g/s |

**OUTLET TEMP** | 10.7 | 10.8 | 10.6 | 0.0 | degC |

**Volume Flow Rate** | 17.5 | 0.0 | 0.0 | 0.0 | SLPM |

**Energy Flow Rate** | 10.5 | 0.0 | 0.0 | 0.0 | kW |

**External Wind Speed** | 2.9 | 2.9 | 2.9 | 2.9 | m/s |

**External Wind Direction** | 296.3 | 296.3 | 296.3 | 296.3 | bearing |

**KITCHEN** | 4.5 | 13.5 | 4.3 | 31.6 |

**LIVING ROOM** | 1.2 | 2.7 |

**BASEMENT** | 0.8 |

**Hallway and Stud into Living Room**

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Mass Flow Rate (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>20</td>
<td>0.0</td>
</tr>
<tr>
<td>40</td>
<td>0.0</td>
</tr>
<tr>
<td>60</td>
<td>0.0</td>
</tr>
<tr>
<td>80</td>
<td>0.0</td>
</tr>
<tr>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>120</td>
<td>0.0</td>
</tr>
<tr>
<td>140</td>
<td>0.0</td>
</tr>
<tr>
<td>160</td>
<td>0.0</td>
</tr>
<tr>
<td>180</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Cupboard Concentrations**

**Notes:** 0.2% offset removed from SP17-23. Approaching LFL concentrations observed in the kitchen

**Hallway and Stud into Living Room**

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Mass Flow Rate (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>20</td>
<td>0.0</td>
</tr>
<tr>
<td>40</td>
<td>0.0</td>
</tr>
<tr>
<td>60</td>
<td>0.0</td>
</tr>
<tr>
<td>80</td>
<td>0.0</td>
</tr>
<tr>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>120</td>
<td>0.0</td>
</tr>
<tr>
<td>140</td>
<td>0.0</td>
</tr>
<tr>
<td>160</td>
<td>0.0</td>
</tr>
<tr>
<td>180</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Notes:** 0.2% offset removed from SP17-23. Approaching LFL concentrations observed in the kitchen

**Kitchen Concentrations**

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Mass Flow Rate (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>20</td>
<td>0.0</td>
</tr>
<tr>
<td>40</td>
<td>0.0</td>
</tr>
<tr>
<td>60</td>
<td>0.0</td>
</tr>
<tr>
<td>80</td>
<td>0.0</td>
</tr>
<tr>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>120</td>
<td>0.0</td>
</tr>
<tr>
<td>140</td>
<td>0.0</td>
</tr>
<tr>
<td>160</td>
<td>0.0</td>
</tr>
<tr>
<td>180</td>
<td>0.0</td>
</tr>
</tbody>
</table>
L2-038 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-038
Hole Size: 3.6 mm
Location: Under sink cupboard
Gas: methane

Date: 06/12/2019  
Time: 10:30:00

Averaging Period Start: 220 min  
End: 230 min

Gas: methane

### L2-038 RESULT

**Notes:** 0.1% offset removed from SP17-23.

### Gas Concentrations

- **Cupboard (top Bearing Hallway and Stud)**
  - **Basement:** 1.1
  - **1st Floor:** 0.8
  - **2nd Floor:** 0.8

- **Kitchen:** 7.7
- **Living Room:** 10.6
- **Basement:** 0.1

### Mass Flow Rate

- **Time (min):** 0 to 300
- **Mass Flow Rate (slpm):** 0 to 5

- **Cupboard (top Bearing Hallway and Stud):**
  - **Mass Flow Rate (slpm):** 0 to 5

- **Hallway:** 1.4
- **Stud:** 0.9

### Notes

- **10:30:00**
- **220 min End:**
- **230 min End:**
- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Diagrams

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**

### Details

- **Location:**
- **MTP ID:**
- **Date:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Results

- **Gas:**
- **Cupboard (top Bearing Hallway and Stud):**
  - **Basement:** 1.1
  - **1st Floor:** 0.8
  - **2nd Floor:** 0.8

- **Kitchen:** 7.7
- **Living Room:** 10.6
- **Basement:** 0.1

### Final Notes

- **10:30:00**
- **220 min End:**
- **230 min End:**
- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Diagrams

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**

### Details

- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Results

- **Gas:**
- **Cupboard (top Bearing Hallway and Stud):**
  - **Basement:** 1.1
  - **1st Floor:** 0.8
  - **2nd Floor:** 0.8

- **Kitchen:** 7.7
- **Living Room:** 10.6
- **Basement:** 0.1

### Final Notes

- **10:30:00**
- **220 min End:**
- **230 min End:**
- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Diagrams

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**

### Details

- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Results

- **Gas:**
- **Cupboard (top Bearing Hallway and Stud):**
  - **Basement:** 1.1
  - **1st Floor:** 0.8
  - **2nd Floor:** 0.8

- **Kitchen:** 7.7
- **Living Room:** 10.6
- **Basement:** 0.1

### Final Notes

- **10:30:00**
- **220 min End:**
- **230 min End:**
- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Diagrams

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**

### Details

- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**

### Results

- **Gas:**
- **Cupboard (top Bearing Hallway and Stud):**
  - **Basement:** 1.1
  - **1st Floor:** 0.8
  - **2nd Floor:** 0.8

- **Kitchen:** 7.7
- **Living Room:** 10.6
- **Basement:** 0.1

### Final Notes

- **10:30:00**
- **220 min End:**
- **230 min End:**
- **Location:**
- **MTP ID:**
- **Date:**
- **Sensor:**
- **Gas:**
- **Average:**
- **Max:**
- **Min:**
- **STDEV:**
- **Units:**
L2-039 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-039
Hole Size: 5.1 mm
Location: Under sink cupboard
Gas: Methane
Date: 06/12/2019
Time: 15:45:00

Averaging Period Start: 225 min
End: 235 min

Notes:

L2-039

1.5

MTP ID:

Hole Size:

Location:

Gas:

Date:

Time:

Averaging Period Start:

End:

Sensor | Average | Max | Min | STDEV | units
-------|---------|-----|-----|--------|------
SP1LKV_1 K-High | 19.7 | 19.8 | 19.6 | 0.0 | %vol
SP1LKV_1 K-Mid | 20.0 | 20.2 | 20.0 | 0.0 | %vol
SP1LKV_1 Cup-Mid | 31.4 | 31.6 | 31.3 | 0.1 | %vol
SP4LKV_1 Cup-High-Front | 33.9 | 34.0 | 33.8 | 0.1 | %vol
SP6LKV_1 Cup-High-Back | 33.3 | 33.3 | 33.3 | 0.0 | %vol
SP8LKV_1 Cup-Low-Back | 12.2 | 12.2 | 12.1 | 0.1 | %vol
SP7LKV_1 K-Low | 12.5 | 12.6 | 12.5 | 0.1 | %vol
SP9LKV_1 Cup-High-Front | 5.3 | 5.4 | 5.3 | 0.0 | %vol
SP1LKV_1 Cup-High-Back | 2.4 | 2.5 | 2.3 | 0.0 | %vol
SP1LKV_1 Cup-Low-Back | 4.2 | 4.3 | 4.2 | 0.0 | %vol
SP1LKV_1 2 H-Mid | 1.9 | 1.9 | 1.8 | 0.0 | %vol
SP1LKV_1 2 FF-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol
SP1LKV_1 2 FF-Mid | 1.8 | 1.8 | 1.8 | 0.0 | %vol
SP1LKV_1 2 AT-High | 1.5 | 1.5 | 1.5 | 0.0 | %vol
SP1LKV_1 2 AT-Mid | 1.6 | 1.6 | 1.5 | 0.0 | %vol
SP1LKV_1 2 BM-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP1LKV_1 2 BM-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP1LKV_1 2 BM-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP1LKV_1 1 NWALL-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP1LKV_1 1 STUD-Cav | 2.4 | 2.4 | 2.4 | 0.0 | %vol
SP1LKV_1 1 FF-Void | 16.3 | 16.4 | 16.2 | 0.1 | %vol
SP1LKV_1 1 BM-Void | 12.5 | 12.5 | 12.5 | 0.0 | %vol
SP1LKV_1 1 RR-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol
RELEASEPRESSURE | 0.0200 | 0.0203 | 0.0196 | 0.0002 | barg
LOWFLOWMETERCH4 | 0.918 | 0.920 | 0.915 | 0.002 | g/s
OUTLET TEMP | 6.9 | 7.0 | 6.9 | 0.0 | degC
Volume Flow Rate | 76.8 | 0.0 | 0.0 | 0.0 | SLPM
Energy Flow Rate | 45.9 | 0.0 | 0.0 | 0.0 | kW
External Wind Speed | 2.6 | m/s
External Wind Direction | 252.5 | bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate
**L2-040 RESULT**

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-040  
**Hole Size:** 7.2 mm  
**Location:** Under sink cupboard  
**Gas:** methane  
**Date:** 06/12/2019  
**Time:** 21:00:00  

**Averaging Period Start:** 160 min  
**End:** 170 min

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>32.4</td>
<td>32.4</td>
<td>32.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>33.5</td>
<td>33.6</td>
<td>33.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>41.8</td>
<td>42.0</td>
<td>41.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>44.7</td>
<td>44.9</td>
<td>44.3</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>44.7</td>
<td>44.9</td>
<td>44.4</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>17.7</td>
<td>19.8</td>
<td>16.1</td>
<td>1.8</td>
<td>%vol</td>
</tr>
<tr>
<td>GT7LKV_1 K-Low</td>
<td>13.6</td>
<td>14.8</td>
<td>13.1</td>
<td>0.8</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>8.4</td>
<td>8.7</td>
<td>8.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>8.4</td>
<td>8.7</td>
<td>8.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>6.8</td>
<td>7.1</td>
<td>6.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>3.9</td>
<td>3.9</td>
<td>3.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>4.2</td>
<td>4.2</td>
<td>4.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>4.0</td>
<td>4.1</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>2.7</td>
<td>2.8</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>2.7</td>
<td>2.8</td>
<td>2.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**Notes:**

**LOWFLOWMETERCH4**: 2.011 2.017 2.002 0.002 g/s  
**OUTLET TEMP**: 6.1 6.3 6.0 0.1 degC  
**Volume Flow Rate**: 168.2 0.0 0.0 0.0 SLPM  
**Energy Flow Rate**: 100.6 0.0 0.0 0.0 kW  
**External Wind Speed**: 2.8 m/s  
**External Wind Direction**: 225.5 bearing  

**Mass Flow Rate**

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
**L2-043 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Met Box-High</td>
<td>70.3</td>
<td>70.3</td>
<td>70.3</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 Met box-Low</td>
<td>53.9</td>
<td>55.8</td>
<td>53.6</td>
<td>0.6</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 GF cavity - above met</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 FF cavity - above met</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0203</td>
<td>0.0192</td>
<td>0.0003</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.1537</td>
<td>0.1547</td>
<td>0.1516</td>
<td>0.0008</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET_TEMP</td>
<td>7.6</td>
<td>7.6</td>
<td>7.5</td>
<td>0.1</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>103.7</td>
<td>104.4</td>
<td>102.3</td>
<td>0.5</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>18.4</td>
<td>18.5</td>
<td>18.2</td>
<td>0.1</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>29.6</td>
<td></td>
<td></td>
<td></td>
<td>bearing</td>
</tr>
</tbody>
</table>

Notes:

- Hole Size: 3.6 mm
- Date: 24/11/2019
- Time: 15:15:00
- Gas: Hydrogen

---

**Kitchen Concentrations**

- SP1LKV_1 K-High: 0.6 to 0.6 %vol
- SP1LKV_1 K-Mid: 0.2 to 0.2 %vol
- SP1LKV_1 Met Box-High: 70.3 to 70.3 %vol
- SP2LKV_1 Met box-Low: 53.9 to 55.8 %vol
- SP5LKV_1 GF cavity - above met: 2.1 to 2.1 %vol
- SP6LKV_1 FF cavity - above met: 0.3 to 0.3 %vol
- SP7LKV_1 K-Low: 0.2 to 0.2 %vol
- SP8LKV_1 LR-High: 0.3 to 0.3 %vol
- SP9LKV_2 LR-Mid: 0.2 to 0.2 %vol
- SP11LKV_2 H-High: 0.4 to 0.4 %vol
- SP12LKV_2 FF-High: 0.2 to 0.2 %vol
- SP13LKV_2 FF-Mid: 0.2 to 0.2 %vol
- SP14LKV_2 AT-High: 0.3 to 0.3 %vol
- SP15LKV_2 AT-Mid: 0.3 to 0.3 %vol
- SP16LKV_2 BM-High: 0.0 to 0.0 %vol
- SP17LKV_2 BM-Mid: 0.0 to 0.0 %vol
- SP18LKV_2 BM-Low: 0.0 to 0.0 %vol
- SP19LKV_2 BM-Low: 0.0 to 0.0 %vol
- SP20LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP21LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP22LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP23LKV_1 SF-Void: 0.0 to 0.0 %vol

---

**Cupboard Concentrations**

- SP3LKV_1 Met Box-High: 70.3 to 70.3 %vol
- SP4LKV_1 Met box-Low: 53.9 to 55.8 %vol
- SP5LKV_1 GF cavity - above met: 2.1 to 2.1 %vol
- SP6LKV_1 FF cavity - above met: 0.3 to 0.3 %vol
- SP7LKV_1 K-Low: 0.2 to 0.2 %vol
- SP8LKV_1 LR-High: 0.3 to 0.3 %vol
- SP9LKV_2 LR-Mid: 0.2 to 0.2 %vol
- SP10LKV_2 H-High: 0.4 to 0.4 %vol
- SP11LKV_2 H-Mid: 0.2 to 0.2 %vol
- SP12LKV_2 FF-High: 0.2 to 0.2 %vol
- SP13LKV_2 FF-Mid: 0.2 to 0.2 %vol
- SP14LKV_2 AT-High: 0.3 to 0.3 %vol
- SP15LKV_2 AT-Mid: 0.3 to 0.3 %vol
- SP16LKV_2 BM-High: 0.0 to 0.0 %vol
- SP17LKV_2 BM-Mid: 0.0 to 0.0 %vol
- SP18LKV_2 BM-Low: 0.0 to 0.0 %vol
- SP19LKV_2 BM-Low: 0.0 to 0.0 %vol
- SP20LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP21LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP22LKV_1 SF-Void: 0.0 to 0.0 %vol
- SP23LKV_1 SF-Void: 0.0 to 0.0 %vol

---

**Hallway and Stud into Living Room**

- Hallway: 0.1 %vol
- Stud into Living Room: 0.2 %vol

---

**Volume Flow Rate**

- 103.7 to 104.4 SLPM

---

**Energy Flow Rate**

- 18.4 to 18.5 kW

---

**Outlet Temperature**

- 7.6 degC

---

**Wind Speed**

- 2.1 m/s
L2-044 RESULT

Hy4Heat WP7 Test Result

Sensor | Average | Max | Min | STDDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 1.5 | 1.5 | 1.4 | 0.0 | %vol
SP2LKV_1 K-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP3LKV_1 Met Box-High | 77.1 | 77.2 | 76.9 | 0.1 | %vol
SP4LKV_1 Met box-Low | 74.2 | 74.4 | 73.8 | 0.3 | %vol
SP5LKV_1 GF cavity - above met | 1.8 | 2.1 | 1.7 | 0.2 | %vol
SP6LKV_1 FF cavity - above met | 0.3 | 0.4 | 0.3 | 0.0 | %vol
SP7LKV_1 K-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP8LKV_1 LR-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP9LKV_1 LR-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP10LKV_1 H-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol
SP11LKV_1 H-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP12LKV_1 FF-High | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP13LKV_1 FF-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP14LKV_1 AT-High | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP15LKV_1 AT-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP16LKV_1 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP17LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP18LKV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP21LKV_1 FF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP22LKV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol

RELEASEPRESSURE | 0.0200 | 0.0206 | 0.0196 | 0.0003 | barg
LOWFLOWMETER | 0.3124 | 0.3160 | 0.3099 | 0.0018 | g/s
OUTLET TEMP | 73.1 | 73.6 | 73.2 | 0.1 | degC
Volume Flow Rate | 210.9 | 213.3 | 209.2 | 1.2 | SLPM
Energy Flow Rate | 37.5 | 37.9 | 37.2 | 0.2 | kW
External Wind Speed | 0.7 | m/s
External Wind Direction | 54.0 | bearing

Kitchen Concentrations

Hallway and Stud into Living Room

Cupboard Concentrations

Mass Flow Rate
L2-045 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-045
Hole Size: 7.2 mm
Location: meter box
Gas: hydrogen

Date: 25/11/2019
Time: 01:45:00

Averaging Period Start: 340 min
End: 350 min

Notes:

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_2 K-High | 1.1 | 1.3 | 1.1 | 0.1 |
SP1LKV_2 K-Mid | 0.2 | 0.2 | 0.2 | 0.0 |
SP1LKV_1 Met Box-High | 77.2 | 77.2 | 77.0 | 0.0 |
SP14KV_1 Met box-Low | 76.1 | 76.1 | 76.1 | 0.0 |
SP1LKV_3 GF cavity - above met | 0.5 | 0.5 | 0.5 | 0.0 |
SP1LKV_1 FF cavity - above met | 0.4 | 0.4 | 0.3 | 0.1 |
SP7LKV_2 K-Low | 0.2 | 0.2 | 0.2 | 0.0 |
SP8LKV_2 LR-High | 0.2 | 0.2 | 0.2 | 0.0 |
SP9LKV_2 LR-Mid | 0.0 | 0.0 | 0.0 | 0.0 |
SP11LKV_2 K-High | 0.2 | 0.2 | 0.2 | 0.0 |
SP12LKV_2 H-High | 0.0 | 0.0 | 0.0 | 0.0 |
SP1LKV_3 BM-High | 0.0 | 0.0 | 0.0 | 0.0 |
SP17LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 |
SP18LKV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 |
SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 |
SP20LKV_1 STUD-Cav | 0.0 | 0.0 | 0.0 | 0.0 |
SP21LKV_1 FF-Void | 0.1 | 0.1 | 0.1 | 0.0 |
SP22LKV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 |
SP23LKV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 |

RELEASEPRESSURE | 0.0174 | 0.0189 | 0.0162 | 0.0007 | barg
LOWFLOWMETER | 0.5296 | 0.5483 | 0.5116 | 0.0112 | g/s
OUTLET_TEMP | 7.8 | 7.9 | 7.6 | 0.1 | degC
Volume Flow Rate | 357.4 | 370.1 | 345.3 | 7.6 | SLPM
Energy Flow Rate | 63.5 | 65.7 | 61.3 | 1.3 | kW
External Wind Speed | 1.5 | m/s
External Wind Direction | 93.3 | bearing

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate
### L2-046 RESULT

**Hy4Heat WP7 Test Result**

#### MTP ID: L2-046
- **Hole Size:** 3.6 mm
- **Location:** meter box with 30 mm hole into cavity wall

**Gas:** Hydrogen

**Date:** 25/11/2019 **Time:** 15:35:00

**Averaging Period Start:** 150 min **End:** 160 min

#### Notes:
- 0.1% offset removed from SP21

#### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Met Box-High</td>
<td>73.4</td>
<td>73.6</td>
<td>73.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Met Box-Low</td>
<td>71.1</td>
<td>71.3</td>
<td>70.5</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 GF cavity - above met</td>
<td>2.5</td>
<td>2.8</td>
<td>2.4</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 FF cavity - above met</td>
<td>1.1</td>
<td>1.2</td>
<td>1.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_3 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_3 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_3 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_3 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_3 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_3 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_3 ROOF-Void</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0206</td>
<td>0.0196</td>
<td>0.0003</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.1537</td>
<td>0.1550</td>
<td>0.1523</td>
<td>0.0009</td>
<td>g/s</td>
</tr>
</tbody>
</table>

---

**OUTLET TEMP**

<table>
<thead>
<tr>
<th>Mass Flow (g/s)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>0.1</td>
<td>20</td>
</tr>
<tr>
<td>0.1</td>
<td>40</td>
</tr>
<tr>
<td>0.1</td>
<td>60</td>
</tr>
<tr>
<td>0.1</td>
<td>80</td>
</tr>
<tr>
<td>0.1</td>
<td>100</td>
</tr>
<tr>
<td>0.1</td>
<td>120</td>
</tr>
<tr>
<td>0.1</td>
<td>140</td>
</tr>
<tr>
<td>0.1</td>
<td>160</td>
</tr>
<tr>
<td>0.1</td>
<td>180</td>
</tr>
<tr>
<td>0.1</td>
<td>200</td>
</tr>
</tbody>
</table>

**Volume Flow Rate**

<table>
<thead>
<tr>
<th>Mass Flow (g/s)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>103.7</td>
<td>0</td>
</tr>
<tr>
<td>104.8</td>
<td>20</td>
</tr>
<tr>
<td>102.7</td>
<td>40</td>
</tr>
<tr>
<td>102.7</td>
<td>60</td>
</tr>
<tr>
<td>102.7</td>
<td>80</td>
</tr>
<tr>
<td>102.7</td>
<td>100</td>
</tr>
<tr>
<td>102.7</td>
<td>120</td>
</tr>
<tr>
<td>102.7</td>
<td>140</td>
</tr>
<tr>
<td>102.7</td>
<td>160</td>
</tr>
<tr>
<td>102.7</td>
<td>180</td>
</tr>
<tr>
<td>102.7</td>
<td>200</td>
</tr>
</tbody>
</table>

**Energy Flow Rate**

<table>
<thead>
<tr>
<th>Mass Flow (g/s)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.4</td>
<td>0</td>
</tr>
<tr>
<td>18.6</td>
<td>20</td>
</tr>
<tr>
<td>18.2</td>
<td>40</td>
</tr>
<tr>
<td>18.2</td>
<td>60</td>
</tr>
<tr>
<td>18.2</td>
<td>80</td>
</tr>
<tr>
<td>18.2</td>
<td>100</td>
</tr>
<tr>
<td>18.2</td>
<td>120</td>
</tr>
<tr>
<td>18.2</td>
<td>140</td>
</tr>
<tr>
<td>18.2</td>
<td>160</td>
</tr>
<tr>
<td>18.2</td>
<td>180</td>
</tr>
<tr>
<td>18.2</td>
<td>200</td>
</tr>
</tbody>
</table>

---

**HALLWAY and Stud into Living Room**

---

**KITCHEN Concentrations**

<table>
<thead>
<tr>
<th>Mass Flow (g/s)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>73.4</td>
<td>0</td>
</tr>
<tr>
<td>71.3</td>
<td>20</td>
</tr>
<tr>
<td>71.3</td>
<td>40</td>
</tr>
<tr>
<td>71.3</td>
<td>60</td>
</tr>
<tr>
<td>71.3</td>
<td>80</td>
</tr>
<tr>
<td>71.3</td>
<td>100</td>
</tr>
<tr>
<td>71.3</td>
<td>120</td>
</tr>
<tr>
<td>71.3</td>
<td>140</td>
</tr>
<tr>
<td>71.3</td>
<td>160</td>
</tr>
<tr>
<td>71.3</td>
<td>180</td>
</tr>
<tr>
<td>71.3</td>
<td>200</td>
</tr>
</tbody>
</table>

---

**LIVING ROOM Concentrations**

---

**BASEMENT**

---

**KITCHEN**

**LIVING ROOM**

---

**Hallway Concentrations**
### L2-047 RESULT

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-047  
**Hole Size:** 5.1 mm  
**Location:** Meter box with 20 mm vent into cavity

**Date:** 25/11/2019  
**Time:** 20:00:00

**Averaging Period Start:** 240 min  
**End:** 360 min

#### Gas: Hydrogen

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP14LK_1 K-High</td>
<td>0.0</td>
<td>1.1</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 Met Box-High</td>
<td>76.9</td>
<td>77.2</td>
<td>76.8</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 Met box-Low</td>
<td>75.9</td>
<td>76.5</td>
<td>75.5</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 GF cavity - above met</td>
<td>1.5</td>
<td>1.5</td>
<td>1.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 FF cavity - above met</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 K-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 LR-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 H-High</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 FF-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 FF-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 AT-High</td>
<td>1.3</td>
<td>1.3</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 AT-Mid</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 FWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 STUD-Cav</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 FF-Void</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 SP-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 ROOF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0199</td>
<td>0.0203</td>
<td>0.0196</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.3108</td>
<td>0.3136</td>
<td>0.3087</td>
<td>0.0007</td>
<td>g/s</td>
</tr>
</tbody>
</table>

#### Notes:

- **OUTLET TEMP:** 8.5  
- **Volume Flow Rate:** 209.8  
- **Energy Flow Rate:** 37.3  
- **External Wind Speed:** 2.2  
- **External Wind Direction:** 80.6  

### Kitchen Concentrations

![Kitchen Concentrations](image)

### Cupboard Concentrations

![Cupboard Concentrations](image)

### Mass Flow Rate

![Mass Flow Rate](image)

---

**Hallway and Stud into Living Room**

**1st FLOOR**

**KITCHEN**

**LIVING ROOM**

**BASEMENT**

---

**www.dnvgl.com**

**DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com**
L2-048 RESULT

Hy4Heat WP7 Test Result

MTF ID: L2-048
Hole Size: 7.2 mm
Location: Meter box with 20 mm vent into cavity
Gas: Hydrogen
Date: 26/11/2019 00:45:00

Averaging Period Start: 340 min
End: 350 min

Notes: SP21 removed - suspect blocked

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP3LKV_1 K-High</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 K-Mid</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Met Box-High</td>
<td>77.1</td>
<td>77.1</td>
<td>77.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Met box-Low</td>
<td>76.2</td>
<td>76.3</td>
<td>76.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 GF cavity - above met</td>
<td>2.8</td>
<td>2.9</td>
<td>2.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 FF cavity - above met</td>
<td>1.1</td>
<td>1.2</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 FF-High</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 AT-High</td>
<td>2.6</td>
<td>2.6</td>
<td>2.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 AT-Mid</td>
<td>2.3</td>
<td>2.3</td>
<td>2.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_3 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_3 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.4</td>
<td>0.7</td>
<td>0.3</td>
<td>0.2</td>
<td>%vol</td>
</tr>
</tbody>
</table>

RELEASEPRESSURE: 0.0200

LOWFLOWMETER: 0.5692

OUTLET_TEMP: 8.3

Volume Flow Rate: 384.2
Energy Flow Rate: 68.2
External Wind Speed: 1.8

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Hallway and Stud into Living Room
L2-050 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-050
Hole Size: 0.6 mm
Location: Wall Cupboard
Gas: Hydrogen
Date: 28/10/2019
Time: 14:30:00
Averaging Period Start: 0 min
End: 150 min

Notes:

Sensor | Average | Max | Min | STDEV | units
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LK2_3_K-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_Cup-Mid</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_Cup-High-Front</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_Cup-High-Back</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_Cup-Low-Back</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_K-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_1_L-High</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_L-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_H-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_F-F-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_F-F-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_A-T-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_A-T-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_B-M-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_B-M-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_N-Wall-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_2 Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_2 Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_2 Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_2 Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK2_3_2 Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>PRESSURE</td>
<td>0.0184</td>
<td>0.0185</td>
<td>0.0174</td>
<td>0.0003</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0021</td>
<td>0.0022</td>
<td>0.0016</td>
<td>0.0002</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET_TEMP</td>
<td>5.2</td>
<td>5.4</td>
<td>5.1</td>
<td>0.1</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>0.2</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>2.7</td>
<td>m/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>17.9</td>
<td>deg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

- Cupboard (top is average of SP4 and SP5)
- Hallway and Stud into Living Room

KITCHEN
LIVING ROOM
BASEMENT
1st FLOOR
2nd FLOOR

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-051 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-051
Hole Size: 0.9 mm
Location: Wall Cupboard
Gas: Hydrogen
Date: 29/10/2019
Time: 16:00:00

Averaging Period Start: 120 min
End: 130 min

Notes:

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP2LKV_2 K-High</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Med</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>3.2</td>
<td>3.5</td>
<td>3.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 II-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 II-Med</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_3 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_3 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_3 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_3 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_3 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_3 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_3 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_3 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_3 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_3 NVALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_3 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>1.9</td>
<td>1.9</td>
<td>1.8</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0081</td>
<td>0.0003</td>
<td>0.0016</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0070</td>
<td>0.0073</td>
<td>0.0067</td>
<td>0.0003</td>
</tr>
<tr>
<td>OUTLET_TEMP</td>
<td>4.8</td>
<td>4.9</td>
<td>4.7</td>
<td>0.1 degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>4.7</td>
<td>5.0</td>
<td>4.5</td>
<td>0.2 SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>4.6</td>
<td>4.8</td>
<td>4.5</td>
<td>0.2 m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>90.0</td>
<td>Bearing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Hallway

Cupboard (top is average of SP4 and SP5)

Mass flow Rate
L2-052 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-052
Hole Size: 1.8 mm
Location: wall cupboard
Gas: Hydrogen
Date: 26/10/2019
Time: 13:00:00

Sensor | Average | Max | Min | STDEV | units |
-------|---------|-----|-----|-------|-------|
SP1LKV_1 K-High | 5.7 | 5.7 | 5.6 | 0.1 | %vol |
SP2LKV_1 K-Mid | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
SP3LKV_1 Cup-Mid | 25.8 | 26.0 | 25.7 | 0.1 | %vol |
SP4LKV_1 Cup-High-Front | 25.3 | 25.3 | 25.3 | 0.0 | %vol |
SP5LKV_1 Cup-High-Back | 26.5 | 26.5 | 26.5 | 0.0 | %vol |
SP6LKV_1 Cup-Low-Back | 20.3 | 20.5 | 20.0 | 0.3 | %vol |
SP7LKV_2 K-Low | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
SP8LKV_2 LR-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
SP9LKV_2 LR-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
SP10LKV_2 H-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
SP11LKV_2 H-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
SP12LKV_2 FF-High | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
SP13LKV_2 FF-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
SP14LKV_2 AT-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
SP15LKV_2 AT-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
SP16LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
SP17LKV_2 BM-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
SP18LKV_2 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
SP19LKV_2 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP20LKV_3 STUD-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP21LKV_1 FF-Void | 7.8 | 7.8 | 7.8 | 0.0 | %vol |
SP22LKV_1 SF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
SP23LKV_1 ROOF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
RELEASEPRESSURE | 0.0213 | 0.0221 | 0.0206 | 0.0003 | barg |
LOWFLOWMETER | 0.0423 | 0.0439 | 0.0415 | 0.0004 | g/s |
OUTLET_TEMP | 6.6 | 6.9 | 6.4 | 0.1 | degC |
Volume Flow Rate | 28.6 | 29.7 | 28.0 | 0.3 | SLPM |
Energy Flow Rate | 5.1 | 5.3 | 5.0 | 0.0 | kW |
External Wind Speed | 2.1 | 2.1 | 2.1 | 0.1 | m/s |
External Wind Direction | 255.5 | bearing |

Notes:

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)

Hallway and Stud into Living Room

L2-052 - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com
**L2-053 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>16.0</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>2.5</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>36.0</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Front</td>
<td>37.3</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Back</td>
<td>37.3</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low-Back</td>
<td>34.8</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.6</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>16.0</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP8LKV_1 LR-Mid</td>
<td>2.5</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 H-High</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 FF-High</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 FF-Mid</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 AT-High</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 AT-Mid</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 BM-High</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 BM-Mid</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_2 BM-Low</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP11LKV_3 NWALL-Cav</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP21LKV_2 SF-Void</td>
<td>13.7</td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP21LKV_3 ROOF-Void</td>
<td></td>
<td>%vol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0202</td>
<td>barg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0801</td>
<td>g/s</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** Data no present on SCADA system, below reproduced from Log Book notes

- **Hole Size:** 2.5 mm
- **Location:** wall cupboard
- **Date:** 28/10/2019
- **Time:** 16:25:00
- **Averaging Period Start:** 146 min
- **End:** 146 min

**Cupboard (top is average of SP4 and SP5):**
- **KITCHEN:** 16.0
- **LIVING ROOM:** 2.5
- **BASEMENT:** 0.6

**Kitchen Concentrations**

**Cupboard Concentrations**

**Hallway and Stud into Living Room**

**Mass Flow Rate**
L2-054 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-054
Hole Size: 3.6 mm
Location: wall cupboard
Gas: Hydrogen
Date: 27/10/2019
Time: 10:30:00

Notes:

Sensor | Average | Max | Min | STDDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_1 K-High | 23.5 | 24.1 | 22.7 | 0.3 | %vol
SP1LKV_1 K-Mid | 1.4 | 1.5 | 1.4 | 0.0 | %vol
SP1LKV_1 Cup-Mid | 47.9 | 48.2 | 47.4 | 0.3 | %vol
SP4LKV_1 Cup-High Front | 46.6 | 46.9 | 46.3 | 0.3 | %vol
SP1LKV_1 Cup-High Back | 47.6 | 47.6 | 47.6 | 0.0 | %vol
SP6LKV_1 Cup-Low-Back | 50.8 | 50.8 | 50.8 | 0.0 | %vol
SP7LKV_1 K-Low | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP8LKV_1 LR-High | 1.5 | 1.6 | 1.5 | 0.0 | %vol
SP9LKV_1 LR-Mid | 1.4 | 1.5 | 1.4 | 0.0 | %vol
SP10LKV_2 H-High | 2.6 | 2.6 | 2.5 | 0.1 | %vol
SP11LKV_2 H-Mid | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP12LKV_2 FF-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol
SP13LKV_2 FF-Mid | 1.0 | 1.0 | 1.0 | 0.0 | %vol
SP14LKV_2 AT-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP15LKV_2 AT-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol
SP16LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP17LKV_2 BM-Mid | 0.1 | 0.1 | 0.0 | 0.0 | %vol
SP18LKV_2 BM-Low | 0.1 | 0.1 | 0.0 | 0.0 | %vol
SP19LKV_3 NWALL-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP20LKV_2 STUD-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol
SP21LKV_1 FF-Void | 20.2 | 20.2 | 20.2 | 0.0 | %vol
SP22LKV_2 SF-Void | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP23LKV_3 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol

RELEASEPRESSURE | 0.0209 | 0.0246 | 0.0184 | 0.0016 | barg
LOWFLOWMETER | 0.1677 | 0.1819 | 0.1581 | 0.0062 | g/s
OUTLET TEMP | 11.4 | 11.6 | 11.0 | 0.2 | degC
Volume Flow Rate | 113.2 | 122.8 | 106.7 | 4.2 | SLPM
Energy Flow Rate | 20.1 | 21.8 | 19.0 | 0.7 | kW
External Wind Speed | 4.5 | --- | --- | --- | m/s
External Wind Direction | 251.8 | --- | --- | --- | bearing

KITCHEN

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room

Hallway

0.9

0.8

2.6

47.1

47.9

50.8

KITCHEN

LIVING ROOM

2.2

0.8

0.7

2nd FLOOR

0.6

1st FLOOR

0.7

0.1

0.1

0.1

BASEMENT

20.2

1.4

0.9

0.1

0.1

0.1

23.5

1.5

0.2

0.1

0.1

0.1

Volume Flow Rate

Energy Flow Rate

External Wind Speed

External Wind Direction
**L2-055 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>35.2</td>
<td>35.2</td>
<td>35.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-Mid</td>
<td>3.5</td>
<td>4.7</td>
<td>-10.0</td>
<td>4.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>59.1</td>
<td>59.1</td>
<td>59.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>57.4</td>
<td>57.4</td>
<td>57.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>58.9</td>
<td>58.9</td>
<td>58.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>61.7</td>
<td>61.7</td>
<td>61.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>-0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>59.1</td>
<td>59.1</td>
<td>59.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 FF-High</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 FF-Mid</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-Low-Back</td>
<td>61.7</td>
<td>61.7</td>
<td>61.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>6.4</td>
<td>6.4</td>
<td>6.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_3 BM-Mid</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>-10.0</td>
<td>-10.0</td>
<td>-10.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>32.3</td>
<td>32.3</td>
<td>32.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**Notes:** SPB, living room high removed.

**Hallway and Stud into Living Room**

- Cupboard (top is average of SP4 and SP5)
L2-056 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-056
Hole Size: 7.2 mm
Location: wall cupboard
Gas: Hydrogen
Date: 23/10/2019
Time: 15:00:00

Averaging Period Start: 180 min
End: 200 min

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_1 K-High | 52.5 | 52.7 | 52.0 | 0.1 | %vol
SP2LKV_1 K-Mid | 17.6 | 17.8 | 17.1 | 0.3 | %vol
SP3LKV_1 Cup-High-Mid | 72.1 | 72.1 | 72.0 | 0.0 | %vol
SP4LKV_1 Cup-High-Front | 68.4 | 68.4 | 69.3 | 0.0 | %vol
SP5LKV_1 Cup-High-Back | 71.0 | 71.0 | 71.0 | 0.0 | %vol
SP6LKV_1 Cup-Low-Back | 73.9 | 73.9 | 73.8 | 0.1 | %vol
SP7LKV_1 K-Low | 0.8 | 0.9 | 0.8 | 0.0 | %vol
SP8LKV_1 LR-High | 52.5 | 52.7 | 52.0 | 0.1 | %vol
SP9LKV_1 LR-Mid | 17.6 | 17.8 | 17.1 | 0.3 | %vol
SP10LKV_1 H-High | 12.1 | 12.2 | 11.9 | 0.1 | %vol
SP11LKV_1 H-Mid | 12.1 | 12.2 | 11.9 | 0.1 | %vol
SP12LKV_1 FF-High | 52.5 | 52.7 | 52.0 | 0.1 | %vol
SP13LKV_1 FF-Mid | 17.6 | 17.8 | 17.1 | 0.3 | %vol
SP14LKV_1 AT-High | 68.4 | 68.4 | 69.3 | 0.0 | %vol
SP15LKV_1 AT-Mid | 72.1 | 72.1 | 72.0 | 0.0 | %vol
SP16LKV_1 BM-High | 17.6 | 17.8 | 17.1 | 0.3 | %vol
SP17LKV_1 BM-Mid | 17.6 | 17.8 | 17.1 | 0.3 | %vol
SP18LKV_1 BM-Low | 52.5 | 52.7 | 52.0 | 0.1 | %vol
SP19LKV_1 NWALL-Cav | 72.1 | 72.1 | 72.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 68.4 | 68.4 | 69.3 | 0.0 | %vol
SP21LKV_1 FF-Void | 43.9 | 44.1 | 43.4 | 0.3 | %vol
SP22LKV_1 SF-Void | 0.5 | 0.5 | 0.4 | 0.0 | %vol
SP23LKV_1 ROOF-Void | 1.3 | 1.3 | 1.3 | 0.1 | %vol
RELEASEPRESSURE | 0.0190 | 0.0199 | 0.0184 | 0.0003 | barg
LOWFLOWMETER | 0.7304 | 0.7315 | 0.7038 | 0.0052 | g/s
OUTLET_TEMP | 9.4 | 9.7 | 9.1 | 0.2 | degC
Volume Flow Rate | 479.4 | 486.9 | 475.0 | 3.5 | LPM
Energy Flow Rate | 85.2 | 86.5 | 84.4 | 0.6 | kW
External Wind Speed | 2.9 | | | | m/s
External Wind Direction | 192.9 | | | | bearing

Notes: SP17 removed

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate

DCN GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-058 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-058
Hole Size: 0.6 mm
Location: Kitchen Base cupboard
Date: 11/11/2019
Time: 04:30:00
Averaging Period Start: 270 min
End: 280 min

Notes:

- **Kitchen Concentrations**
  - SP1LKV_1 K-High
  - SP2LKV_1 K-Mid
  - SP7LKV_1 K-Low
  - SP10LKV_1 LR-High
  - SP11LKV_1 K-High
  - SP12LKV_1 LR-Mid
  - SP13LKV_1 Cup-Mid
  - SP14LKV_1 Cup-High-Front
  - SP15LKV_1 Cup-High-Back
  - SP16LKV_1 Cup-Low-Back
  - SP17LKV_1 Cup-Low
  - SP18LKV_1 H-High
  - SP19LKV_1 H-Mid
  - SP20LKV_1 FF-High
  - SP21LKV_1 FF-Mid
  - SP22LKV_1 AT-High
  - SP23LKV_1 AT-Mid
  - SP24LKV_2 BM-High
  - SP25LKV_2 BM-Mid
  - SP26LKV_2 BM-Low
  - SP27LKV_2 NWALL-Cav
  - SP28LKV_2 STUD-Cav
  - SP29LKV_2 FF-Void
  - SP30LKV_2 SF-Void
  - SP31LKV_2 ROOF-Void

- **Cupboard Concentrations**
  - SP3LKV_1 Cup-High-Front
  - SP4LKV_1 Cup-High-Back
  - SP5LKV_1 Cup-Low-Back
  - SP6LKV_1 Cup-Low
  - SP3LKV_2 FF-High
  - SP4LKV_2 FF-Mid
  - SP5LKV_2 AT-High
  - SP6LKV_2 AT-Mid

- **Release Pressure**
  - 0.0200

- **Low Flow Meter**
  - 0.0022

- **Outlet Temp**
  - 3.6

- **Volume Flow Rate**
  - 1.5

- **Energy Flow Rate**
  - 0.3

- **External Wind Speed**
  - 2.1

- **External Wind Direction**
  - 213.5

- **Hallway and Stud into Living Room**
  - Mass Flow Rate

- **Cupboard Concentrations**
  - SP3LKV_1 Cup-Mid
  - SP4LKV_1 Cup-High-Front
  - SP5LKV_1 Cup-High-Back
  - SP6LKV_1 Cup-Low-Back

- **Hallway and Stud into Living Room**
  - Mass Flow Rate

- **Hallway and Stud into Living Room**
  - Mass Flow Rate
**L2-059 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Front</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Back</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low-Back</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 F-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 F-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 A-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 A-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 R-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 R-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 S-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 S-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 S-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 S-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 R-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0203</td>
<td>0.0196</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0066</td>
<td>0.0073</td>
<td>0.0061</td>
<td>0.0003</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>4.4</td>
<td>4.3</td>
<td>4.0</td>
<td>0.0</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>4.5</td>
<td>4.1</td>
<td>4.0</td>
<td>0.2</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>0.8</td>
<td>0.7</td>
<td>0.9</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>4.1</td>
<td>2.5</td>
<td>1.5</td>
<td>0.0</td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>266.6</td>
<td>266.6</td>
<td>266.6</td>
<td>266.6</td>
<td>bearing</td>
</tr>
</tbody>
</table>

### Notes:
- Hole Size: 0.9 mm
- Date: 11/11/2019
- Time: 13:00:00
- Gas: Hydrogen
- Gas: Hydrogen

### Diagrams:
- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Mass Flow Rate**

**Hallway and Stud into Living Room**

**Cupboard (top is average of SP4 and SP5)**

### Hallway and Stud into Living Room:
- 0.2
- 2.5
- 0.9
**L2-060 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>2.8</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>7.6</td>
<td>7.6</td>
<td>7.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>7.6</td>
<td>7.7</td>
<td>7.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-Low-Back</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>3.9</td>
<td>4.0</td>
<td>3.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE** 0.0200 0.0203 0.0192 0.0002 barg

**LOWFLOWMETER** 0.0412 0.0416 0.0397 0.0003 g/s

**OUTLET_TEMP** 6.6 6.7 6.5 0.0 degC

**Volume Flow Rate** 27.8 28.1 26.8 0.2 SLPM

**Energy Flow Rate** 4.9 5.0 4.8 0.0 kW

**External Wind Speed** 5.7 m/s

**External Wind Direction** 135.0 bearing

Notes:

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Mass Flow Rate**

Hallway and Stud into Living Room
### L2-061 RESULT

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LK_1 K-High</td>
<td>3.7</td>
<td>3.9</td>
<td>3.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LK_1 K-Mid</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LK_1 Cup-Mid</td>
<td>14.0</td>
<td>14.1</td>
<td>14.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LK_1 Cup-High-Front</td>
<td>12.8</td>
<td>12.8</td>
<td>12.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LK_1 Cup-High-Back</td>
<td>13.8</td>
<td>13.9</td>
<td>13.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LK_1 Cup-Low-Back</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LK_1 K-Low</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LK_1 LR-High</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LK_1 LR-Mid</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LK_1 LR-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LK_1 LR-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LK_1 Cup-Low-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LK_1 Cup-High-Front</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_1 Cup-High-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LK_1 Cup-Low-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LK_1 Cup-High-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LK_1 Cup-High-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LK_1 Cup-Low-Back</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**Notes:**
- **Hole Size:** 2.5 mm
- **Location:** kitchen base cupboard
- **Gas:** Hydrogen
- **Date:** 31/10/2019
- **Time:** 13:00:10
- **Averaging Period Start:** 130 min
- **End:** 140 min

**Hallway and Stud into Living Room**

**Cupboard (top is average of SP4 and SP5)**

**Outlet Temperature**

**Volume Flow Rate**

**Energy Flow Rate**

**External Wind Speed**

**External Wind Direction**

**Mass Flow Rate**
**L2-062 RESULT**

**Hy4Heat WP7 Test Result**

**Notes:**

- **MTP ID:** L2-062
- **Hole Size:** 3.6 mm
- **Location:** Kitchen base cupboard
- **Gas:** Hydrogen
- **Date:** 31/10/2019
- **Time:** 08:30:20

**Average Period Start:** 135 min  **End:** 145 min

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>9.4</td>
<td>9.4</td>
<td>9.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>22.8</td>
<td>22.8</td>
<td>22.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>21.4</td>
<td>21.3</td>
<td>21.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>22.5</td>
<td>22.6</td>
<td>22.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>4.6</td>
<td>4.8</td>
<td>4.1</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>1.3</td>
<td>1.5</td>
<td>1.1</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>2.2</td>
<td>2.4</td>
<td>2.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_3 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 NWALL-Cav</td>
<td>10.9</td>
<td>11.4</td>
<td>10.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 SF-Void</td>
<td>10.3</td>
<td>11.1</td>
<td>10.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 ROOF-Void</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASE PRESSURE:** 0.0199  0.0209  0.0189  0.0005 barg

**LOWFLOWMETER:** 0.1384  0.1614  0.1553  0.0017 g/s

**OUTLET TEMP:** 10.8  11.2  10.5  0.2 degC

**Energy Flow Rate:** 19.0  19.3  18.6  0.2 kW

**External Wind Speed:** 2.6  m/s

**External Wind Direction:** 90.0  bearing

**Hallway and Stud into Living Room**

**Cupboard (top is average of SP4 and SP5)**

**Volume Flow Rate:** 106.9  108.9  104.8  1.1 SLPM

**Energy Flow Rate:** 19.0  19.3  18.6  0.2 kW

**External Wind Speed:** 2.6  m/s

**External Wind Direction:** 90.0  bearing
L2-062A RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-062A
Hole Size: 3.6 mm
Location: kitchen base cupboard with vent above kitchen door
Gas: hydrogen
Date: 10/01/2020
Time: 11:30:00

Averaging Period Start: 95 min
End: 105 min

Notes:

Sensor | Average | Max | Min | STDEV | units
---|---|---|---|---|---
SP3LKV_1 K-High | 6.2 | 6.2 | 5.9 | 0.1 | %vol
SP2LKV_1 K-Mid | 4.8 | 5.1 | 4.2 | 0.4 | %vol
SP1LKV_1 Cup-Mid | 15.9 | 16.0 | 15.8 | 0.1 | %vol
SP4LKV_1 Cup-High-Front | 17.0 | 17.5 | 16.5 | 0.5 | %vol
SP5LKV_1 Cup-High-Back | 17.4 | 17.7 | 16.9 | 0.4 | %vol
SP6LKV_1 Cup-Low-Back | 2.4 | 2.4 | 2.2 | 0.1 | %vol
SP7LKV_2 H-Low | 4.0 | 4.0 | 4.0 | 0.0 | %vol
SP9LKV_1 LR-Mid | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP10LKV_2 H-High | 4.0 | 4.0 | 4.0 | 0.0 | %vol
SP11LKV_2 H-Mid | 1.3 | 1.4 | 1.3 | 0.0 | %vol
SP12LKV_2 FF-High | 1.7 | 1.7 | 1.6 | 0.1 | %vol
SP13LKV_2 FF-Mid | 1.6 | 1.6 | 1.5 | 0.1 | %vol
SP14LKV_2 AT-High | 1.2 | 1.3 | 1.2 | 0.0 | %vol
SP15LKV_2 AT-Mid | 1.3 | 1.3 | 1.2 | 0.0 | %vol
SP16LKV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP17LKV_2 BM-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP18LKV_2 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP19LKV_2 NWALL-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP20LKV_2 STUD-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP21LKV_2 AT-High | 1.1 | 1.2 | 1.1 | 0.0 | %vol
SP22LKV_2 AT-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol
SP23LKV_2 AT-Low | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP24LKV_2 BM-High | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP25LKV_2 BM-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP26LKV_2 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP27LKV_2 NWALL-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP28LKV_2 STUD-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP29LKV_2 AT-High | 1.1 | 1.2 | 1.1 | 0.0 | %vol
SP30LKV_2 AT-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol
SP31LKV_2 AT-Low | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP32LKV_2 NWALL-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP33LKV_2 STUD-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP34LKV_2 AT-High | 1.1 | 1.2 | 1.1 | 0.0 | %vol
SP35LKV_2 AT-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol
SP36LKV_2 AT-Low | 0.9 | 1.0 | 0.9 | 0.0 | %vol
SP37LKV_2 NWALL-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol
SP38LKV_2 STUD-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol

RELEASEPRESSURE | 0.0195 | 0.0211 | 0.0180 | 0.0011 | barg
LOWFLOWMETER | 0.1289 | 0.1400 | 0.1223 | 0.0054 | g/s
OUTLET_TEMP | 5.5 | 5.7 | 5.4 | 0.1 | degC
Volume Flow Rate | 87.0 | 94.5 | 82.5 | 3.6 | SLPM
Energy Flow Rate | 15.5 | 16.8 | 14.7 | 0.6 | kW
External Wind Speed | 2.1 | m/s
External Wind Direction | 236.6 | bearing

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
### L2-063 RESULT

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-063  
**Hole Size:** 5.1 mm  
**Location:** kitchen base cupboard  
**Date:** 30/10/2019  
**Time:** 19:30:00

**Gas:** Hydrogen

#### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPM1K1_1K-High</td>
<td>21.8</td>
<td>21.8</td>
<td>21.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_1K-Mid</td>
<td>19.9</td>
<td>20.0</td>
<td>19.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_1Cup-Mid</td>
<td>34.2</td>
<td>34.3</td>
<td>34.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_1Cup-High</td>
<td>32.4</td>
<td>32.3</td>
<td>32.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_1Cup-HighBack</td>
<td>33.7</td>
<td>31.7</td>
<td>33.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_1Cup-Low-Back</td>
<td>12.9</td>
<td>13.2</td>
<td>12.5</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_2K-Low</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_2H-High</td>
<td>5.5</td>
<td>5.6</td>
<td>5.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K1_2H-Mid</td>
<td>3.0</td>
<td>3.0</td>
<td>2.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_2FF-High</td>
<td>3.3</td>
<td>3.4</td>
<td>3.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_2FF-Mid</td>
<td>3.1</td>
<td>3.2</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3AT-High</td>
<td>2.6</td>
<td>2.6</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3AT-Mid</td>
<td>2.6</td>
<td>2.7</td>
<td>2.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3BM-High</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3BM-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3NWALL-Cav</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3STUD-Cav</td>
<td>2.6</td>
<td>2.7</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3FF-Void</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_2SF-Void</td>
<td>1.1</td>
<td>1.2</td>
<td>1.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SPM1K2_3ROOF-Void</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE** 0.0200  
**LOWFLOWMETER** 0.3176  
**OUTLET TEMP** 2.8  
**Volume Flow Rate** 214.4  
**Energy Flow Rate** 38.1  
**External Wind Speed** 2.7  
**External Wind Direction** 85.3

#### Kitchen Concentrations

- **Time (minutes)**
- **% GAS**

#### Cupboard Concentrations

- **Time (minutes)**
- **% GAS**

#### Mass Flow Rate

- **Time (min)**
- **Max Mass Flow Rate (g/s)**

**Notes:**

- **Location:** 
- **MTP ID:** L2-063  
- **Gas:** Hydrogen  
- **Time:** 19:30:00

**Cupboard (top is average of SP4 and SP5)**

**Hallway and Stud into Living Room**

**Hallway and Stud into Living Room**

**Notes:**

- **Time (minutes)**
- **% GAS**

---

**DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com**
### L2-063A RESULT

#### Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>13.9</td>
<td>14.0</td>
<td>13.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>11.6</td>
<td>11.8</td>
<td>11.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High-Front</td>
<td>24.2</td>
<td>24.4</td>
<td>23.9</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>27.5</td>
<td>27.5</td>
<td>27.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>27.7</td>
<td>27.8</td>
<td>27.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LV_1 Cup-Low-Back</td>
<td>8.3</td>
<td>8.9</td>
<td>7.9</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-High</td>
<td>2.7</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-Mid</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-Mid</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>2.7</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High</td>
<td>13.9</td>
<td>14.0</td>
<td>13.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>11.6</td>
<td>11.8</td>
<td>11.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High</td>
<td>24.2</td>
<td>24.4</td>
<td>23.9</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Back</td>
<td>27.5</td>
<td>27.5</td>
<td>27.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>27.7</td>
<td>27.8</td>
<td>27.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LV_1 Cup-Low-Back</td>
<td>8.3</td>
<td>8.9</td>
<td>7.9</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-High</td>
<td>2.7</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-Mid</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-Mid</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>2.7</td>
<td>2.8</td>
<td>2.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

#### Kitchen Concentrations

- **SP1LKV_1 K-High**: 13.9 %vol
- **SP1LKV_1 K-Mid**: 11.6 %vol
- **SP1LKV_1 Cup-High-Front**: 24.2 %vol
- **SP4LKV_1 Cup-High-Back**: 27.5 %vol
- **SP5LKV_1 Cup-High-Back**: 27.7 %vol
- **SP1LV_1 Cup-Low-Back**: 8.3 %vol
- **SP2LKV_1 K-Low**: 0.6 %vol
- **SP3LKV_1 Cup-Mid**: 24.2 %vol
- **SP4LKV_1 Cup-High**: 2.7 %vol
- **SP5LKV_1 Cup-Mid**: 3.4 %vol
- **SP1LKV_1 Cup-Low**: 0.6 %vol
- **SP1LKV_1 Cup-Mid**: 2.7 %vol
- **SP1LKV_1 Cup-High**: 13.9 %vol
- **SP1LKV_1 Cup-Mid**: 11.6 %vol
- **SP1LKV_1 Cup-High**: 24.2 %vol
- **SP4LKV_1 Cup-High-Back**: 27.5 %vol
- **SP5LKV_1 Cup-High-Back**: 27.7 %vol
- **SP1LV_1 Cup-Low-Back**: 8.3 %vol
- **SP2LKV_1 K-Low**: 0.6 %vol
- **SP3LKV_1 Cup-Mid**: 24.2 %vol
- **SP4LKV_1 Cup-High**: 2.7 %vol
- **SP5LKV_1 Cup-Mid**: 3.4 %vol
- **SP1LKV_1 Cup-Low**: 0.6 %vol
- **SP1LKV_1 Cup-Mid**: 2.7 %vol

#### Cupboard Concentrations

- **SP3LKV_1 Cup-Mid**: 11.6 %vol
- **SP4LKV_1 Cup-High-Front**: 27.6 %vol
- **SP5LKV_1 Cup-High-Back**: 27.7 %vol
- **SP1LV_1 Cup-Low-Back**: 8.2 %vol
- **SP2LKV_1 K-Low**: 0.6 %vol
- **SP3LKV_1 Cup-Mid**: 24.2 %vol
- **SP4LKV_1 Cup-High**: 2.7 %vol
- **SP5LKV_1 Cup-Mid**: 3.4 %vol
- **SP1LKV_1 Cup-Low**: 0.6 %vol
- **SP1LKV_1 Cup-Mid**: 2.7 %vol
- **SP1LKV_1 Cup-High**: 13.9 %vol
- **SP1LKV_1 Cup-Mid**: 11.6 %vol
- **SP1LKV_1 Cup-High**: 24.2 %vol
- **SP4LKV_1 Cup-High-Back**: 27.5 %vol
- **SP5LKV_1 Cup-High-Back**: 27.7 %vol
- **SP1LV_1 Cup-Low-Back**: 8.3 %vol
- **SP2LKV_1 K-Low**: 0.6 %vol
- **SP3LKV_1 Cup-Mid**: 24.2 %vol
- **SP4LKV_1 Cup-High**: 2.7 %vol
- **SP5LKV_1 Cup-Mid**: 3.4 %vol
- **SP1LKV_1 Cup-Low**: 0.6 %vol
- **SP1LKV_1 Cup-Mid**: 2.7 %vol

#### Hallway and Stud into Living Room

- **Hallway**: 2.8 %vol
- **Stud**: 3.6 %vol

#### Mass Flow Rate

- **OUTLET TEMP**: 4.1 degC
- **Volume Flow Rate**: 193.6 SLPM
- **Energy Flow Rate**: 34.4 kW
- **External Wind Speed**: 2.9 m/s
- **External Wind Direction**: 228.7 bearing

---

**Notes:**
- **MTP ID**: L2-063A
- **Hole Size**: 5.1 mm
- **Location**: kitchen base cupboard with vent above kitchen door
- **Gas**: hydrogen
- **Date**: 10/01/2020
- **Time**: 14:45:00
- **Averaging Period Start**: 175 min
- **End**: 185 min

**L2-063A**

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
### Hy4Heat WP7 Test Result

**MTP ID:** L2-064  
**Hole Size:** 7.2 mm  
**Location:** kitchen base cupboard  
**Date:** 30/10/2019  
**Time:** 14:20:10  
**Gas:** Hydrogen

#### Notes:

- **Hole Size:** 7.2 mm
- **Location:** kitchen base cupboard
- **Date:** 30/10/2019
- **Time:** 14:20:10
- **Gas:** Hydrogen

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>32.0</td>
<td>32.1</td>
<td>31.9</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>29.9</td>
<td>30.0</td>
<td>29.7</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>44.0</td>
<td>44.1</td>
<td>44.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>42.4</td>
<td>42.4</td>
<td>42.3</td>
<td>0.0</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High-Back</td>
<td>43.7</td>
<td>43.7</td>
<td>43.6</td>
<td>0.1</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>21.3</td>
<td>21.5</td>
<td>21.1</td>
<td>0.2</td>
</tr>
<tr>
<td>SP1LKV_2 K-Low</td>
<td>7.8</td>
<td>8.1</td>
<td>7.7</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 H-High</td>
<td>3.8</td>
<td>4.0</td>
<td>3.6</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 H-Mid</td>
<td>3.9</td>
<td>4.0</td>
<td>3.7</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 FF-High</td>
<td>4.5</td>
<td>4.5</td>
<td>4.4</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 FF-Mid</td>
<td>4.2</td>
<td>4.3</td>
<td>4.1</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 AT-High</td>
<td>3.6</td>
<td>3.7</td>
<td>3.5</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_1 AT-Mid</td>
<td>3.7</td>
<td>3.7</td>
<td>3.6</td>
<td>0.1</td>
</tr>
<tr>
<td>SP1LKV_3 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SP1LKV_1 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>SP1LKV_1 BM-Low</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>SP1LKV_2 NVALL-Cav</td>
<td>0.4</td>
<td>0.4</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>SP2LKV_1 STUD-Cav</td>
<td>3.6</td>
<td>3.6</td>
<td>3.5</td>
<td>0.1</td>
</tr>
<tr>
<td>SP2LKV_1 FF-Void</td>
<td>29.9</td>
<td>29.9</td>
<td>29.9</td>
<td>0.0</td>
</tr>
<tr>
<td>SP2LKV_1 SF-Void</td>
<td>1.0</td>
<td>1.2</td>
<td>0.9</td>
<td>0.1</td>
</tr>
<tr>
<td>SP2LKV_1 ROOF-Void</td>
<td>1.1</td>
<td>1.3</td>
<td>1.0</td>
<td>0.1</td>
</tr>
</tbody>
</table>
| RELA
teresS| 0.0203 0.0209 0.0196 0.0003 barg |
| LOWFLO

<table>
<thead>
<tr>
<th>Meter</th>
<th>0.5385 0.5942 0.5838 0.0025 g/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTLET TEMP</td>
<td>7.7 8.1 7.4 0.2 degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>397.2 401.0 394.0 1.7 SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>70.6 71.2 70.0 0.3 kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>2.9 m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>74.2</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>397.2 401.0 394.0 1.7 SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>70.6 71.2 70.0 0.3 kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>2.9 m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>74.2</td>
</tr>
</tbody>
</table>

![Kitchen Concentrations](image1)

**Kitchen Concentrations**

- **SP1LKV_1 K-High**
- **SP2LKV_1 K-Mid**
- **SP7LKV_2 K-Low**

![Cupboard Concentrations](image2)

**Cupboard Concentrations**

- **SP3LKV_1 Cup-Mid**
- **SP4LKV_1 Cup-High-Front**
- **SP5LKV_1 Cup-High-Back**
- **SP6LKV_1 Cup-Low-Back**
- **SP1LKV_1 FF-Void**
- **SP2LKV_1 SF-Void**
- **SP1LKV_1 ROOF-Void**

![Mass Flow Rate](image3)

**Mass Flow Rate**

- **Hallway**
- **Living Room**
- **Kitchen**

**Hallway and Stud into Living Room**

- **Hallway**
- **Living Room**

- **Cupboard (top is average of SP4 and SP5)**

- **Hallway and Stud into Living Room**

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-064A RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-064A
Hole Size: 7.2 mm
Location: kitchen base cupboard with vent above kitchen door
Gas: hydrogen
Date: 11/01/2020
Time: 09:00:00
Averaging Period Start: 140 min
End: 150 min

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LV1_K-High</td>
<td>20.2</td>
<td>20.3</td>
<td>20.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LV1_K-Mid</td>
<td>17.0</td>
<td>17.0</td>
<td>17.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LV1_Cup-Mid</td>
<td>37.6</td>
<td>38.2</td>
<td>35.5</td>
<td>1.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LV1_Cup-High-Front</td>
<td>39.2</td>
<td>39.6</td>
<td>37.0</td>
<td>0.8</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LV1_Cup-High-Back</td>
<td>38.9</td>
<td>39.6</td>
<td>36.2</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LV1_Cup-Low-Back</td>
<td>13.9</td>
<td>14.9</td>
<td>13.5</td>
<td>0.6</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LV1_K-Low</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LV1_1R-High</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LV1_1R-Mid</td>
<td>3.2</td>
<td>3.3</td>
<td>3.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LV1_1H-High</td>
<td>10.6</td>
<td>10.7</td>
<td>10.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LV1_1H-Mid</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LV1_1F-High</td>
<td>4.8</td>
<td>4.8</td>
<td>4.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LV1_1F-Mid</td>
<td>4.6</td>
<td>4.6</td>
<td>4.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LV1_1AT-High</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LV1_1AT-Mid</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LV1_2BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LV1_2BM-Mid</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LV1_1NWALL-Cav</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LV1_2STUD-Cav</td>
<td>2.5</td>
<td>2.6</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LV1_1FF-Void</td>
<td>15.2</td>
<td>15.9</td>
<td>14.8</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LV1_2SF-Void</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LV1_2ROOF-Void</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

Notes:
Averaging Period start: 140 min, end: 150 min

Sensor Average Max  Min  STDEV units
SP1LV1_1K-High 20.2 20.3 20.1 0.1 %vol
SP2LV1_1K-Mid 17.0 17.0 17.0 0.0 %vol
SP3LV1_Cup-Mid 37.6 38.2 35.5 1.1 %vol
SP4LV1_Cup-High-Front 39.2 39.6 37.0 0.8 %vol
SP5LV1_Cup-High-Back 38.9 39.6 36.2 0.5 %vol
SP6LV1_Cup-Low-Back 13.9 14.9 13.5 0.6 %vol
SP7LV1_K-Low 1.1 1.1 1.1 0.0 %vol
SP8LV1_1R-High 2.9 2.9 2.9 0.0 %vol
SP9LV1_1R-Mid 3.2 3.3 3.2 0.0 %vol
SP10LV1_1H-High 10.6 10.7 10.6 0.1 %vol
SP11LV1_1H-Mid 3.6 3.6 3.6 0.0 %vol
SP12LV1_1F-High 4.8 4.8 4.7 0.0 %vol
SP13LV1_1F-Mid 4.6 4.6 4.4 0.1 %vol
SP14LV1_1AT-High 3.8 3.8 3.8 0.0 %vol
SP15LV1_1AT-Mid 3.9 3.9 3.9 0.0 %vol
SP16LV1_2BM-High 0.1 0.1 0.1 0.0 %vol
SP17LV1_2BM-Mid 0.7 0.7 0.7 0.0 %vol
SP18LV1_1NWALL-Cav 0.2 0.3 0.2 0.0 %vol
SP19LV1_2STUD-Cav 2.5 2.6 2.4 0.0 %vol
SP20LV1_1FF-Void 15.2 15.9 14.8 0.2 %vol
SP21LV1_2SF-Void 0.5 0.5 0.5 0.0 %vol
SP22LV1_2ROOF-Void 0.8 0.8 0.8 0.0 %vol

RELEASEPRESSURE 0.0178 0.0185 0.0170 0.0004 barg
LOWFLOWMETER 0.5008 0.5446 0.4523 0.0279 g/s
OUTLET TEMP 10.1 10.2 10.0 0.0 degC
Volume Flow Rate 338.0 317.6 305.3 18.8 SLPM
Energy Flow Rate 60.0 57.0 54.2 3.3 kW
External Wind Speed 15.4 m/s
External Wind Direction 215.0° bearing

Mass Flow Rate

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate
L2-064B RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-064B
Hole Size: 7.2 mm
kitchen base cupboard with vent above kitchen door
cupboard with 4 x 100 mm holes in side and 4 x 100 mm
holes in bottom of cupboard
Gas: hydrogen
Location: holes in bottom of cupboard
Date: 11/01/2020
Time: 14:00:00
Averaging Period Start: 170 min
End: 180 min

Notes:

Sensor | Average | Max | Min | STDDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 19.9 | 20.2 | 19.7 | 0.2 | %vol
SP2LKV_1 K-Mid | 18.5 | 18.5 | 18.4 | 0.1 | %vol
SP3LKV_1 Cup-Mid | 22.5 | 22.8 | 22.1 | 0.4 | %vol
SP4LKV_1 Cup-High-Front | 24.2 | 24.4 | 23.9 | 0.3 | %vol
SP5LKV_1 Cup-High-Back | 25.4 | 25.5 | 25.2 | 0.2 | %vol
SP6LKV_1 Cup-Low-Back | 9.8 | 10.6 | 9.4 | 0.2 | %vol
SP7LKV_1 K-Low | 5.9 | 5.9 | 5.9 | 0.0 | %vol
SP8LKV_1 H-High | 11.8 | 11.9 | 11.7 | 0.1 | %vol
SP9LKV_1 H-Mid | 5.6 | 5.6 | 5.6 | 0.0 | %vol
SP10LKV_1 FF-High | 6.3 | 6.4 | 6.3 | 0.0 | %vol
SP11LKV_1 FF-Mid | 6.1 | 6.1 | 6.1 | 0.0 | %vol
SP12LKV_1 FF-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP13LKV_1 NWALL-Cav | 0.5 | 0.5 | 0.4 | 0.0 | %vol
SP14LKV_1 STUD-Cav | 3.9 | 3.9 | 3.9 | 0.0 | %vol
SP15LKV_1 FF-Void | 1.3 | 1.4 | 1.1 | 0.1 | %vol
SP16LKV_1 SF-Void | 0.4 | 0.4 | 0.3 | 0.0 | %vol
SP17LKV_1 ROOF-Void | 1.3 | 1.4 | 1.1 | 0.1 | %vol
SP18LKV_1 BM-High | 0.3 | 0.3 | 0.2 | 0.0 | %vol
SP19LKV_1 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP20LKV_1 BM-Low | 0.7 | 0.7 | 0.7 | 0.0 | %vol
SP21LKV_1 NWALL-Cav | 0.5 | 0.5 | 0.4 | 0.0 | %vol
SP22LKV_1 FF-Void | 1.3 | 1.4 | 1.1 | 0.1 | %vol
SP23LKV_1 SF-Void | 0.4 | 0.4 | 0.3 | 0.0 | %vol
SP24LKV_1 ROOF-Void | 1.3 | 1.4 | 1.1 | 0.1 | %vol

RELEASEPRESSURE | 0.0147 | 0.0152 | 0.0142 | 0.0002 | bar
LOWFLOWMETER | 0.4725 | 0.4853 | 0.4664 | 0.0050 | g/s
OUTLET TEMP | 8.3 | 8.4 | 8.2 | 0.0 | degC
Volume Flow Rate | 318.9 | 327.6 | 314.8 | 3.4 | SLPM
Energy Flow Rate | 56.7 | 58.2 | 55.9 | 0.6 | kW
External Wind Speed | 2.6 | m/s
External Wind Direction | 208.5 | bearing

Cupboard Concentrations

Hallway and Stud into Living Room

Mass Flow Rate
**L2-064C RESULT**

Hy4Heat WP7 Test Result

**MTP ID:** L2-064C  
**Hole Size:** 7.2 mm  
**Hole Location:** kitchen base cupboard with vent above kitchen door closed and 4 x 100 mm holes in side and 4 x 100 mm holes in bottom of cupboard  
**Gas:** hydrogen  
**Date:** 12/01/2020  
**Time:** 08:45:00  
**Averaging Period Start:** 145 min  
**End:** 155 min

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>28.0</td>
<td>28.1</td>
<td>27.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>26.9</td>
<td>27.0</td>
<td>26.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-Mid</td>
<td>32.3</td>
<td>32.8</td>
<td>31.9</td>
<td>0.5</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>32.8</td>
<td>33.0</td>
<td>32.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High-Back</td>
<td>33.3</td>
<td>34.3</td>
<td>33.0</td>
<td>0.6</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>20.6</td>
<td>22.6</td>
<td>18.9</td>
<td>0.9</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>11.6</td>
<td>13.7</td>
<td>10.4</td>
<td>0.7</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>6.4</td>
<td>6.5</td>
<td>6.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>4.1</td>
<td>4.2</td>
<td>4.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>6.4</td>
<td>6.5</td>
<td>6.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>4.1</td>
<td>4.2</td>
<td>4.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>6.4</td>
<td>6.5</td>
<td>6.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_1 AT-High</td>
<td>3.6</td>
<td>3.6</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 AT-Mid</td>
<td>3.7</td>
<td>3.7</td>
<td>3.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 BM-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 BFMM-Cav</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 BF-Cav</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>24.5</td>
<td>24.5</td>
<td>24.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE**  
0.0182  
0.0203  
0.0174  
0.0008  
**barg**

**LOWFLOWMETER**  
0.5446  
0.5917  
0.4951  
0.0282  
**g/s**

**OUTLET_TEMP**  
6.4  
6.5  
6.3  
0.0  
**degC**

**Volume Flow Rate**  
367.4  
399.4  
334.2  
19.1  
**SLPM**

**Energy Flow Rate**  
65.3  
70.9  
59.4  
3.4  
**kW**

**External Wind Speed**  
6.0  
**m/s**

**External Wind Direction**  
249.1  
**bearing**

**Kitchen Concentrations**

**Cupboard Concentrations**

**Mass Flow Rate**

**Notes:**

**Hallway and Stud into Living Room**

**Cupboard (top is average of SP4 and SP5)**

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
Hy4Heat WP7 Test Result

Notes: No flammable concentrations observed in cupboard or elsewhere.

---

**Sensor**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_2 K-High</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 Boil-Cup-Bottom-Hi</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Behind-Cup-High</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 Sink-Cup-Hi</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 Under-Cupboards</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 AT-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 AT-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 BM-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 BM-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 BM-Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 NWALL-Cav</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 STUD-Cav</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 FF-Void</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 ROOF-Void</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0202</td>
<td>0.0209</td>
<td>0.0196</td>
<td>0.0003</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0027</td>
<td>0.0031</td>
<td>0.0012</td>
<td>0.0006</td>
<td>g/s</td>
</tr>
</tbody>
</table>

**Gas:** Hydrogen

**Date:** 13/11/2019  **Time:** 13:00:00

**Averaging Period:** Start: 200 min  End: 210 min

---

**Kitchen Concentrations**

**Hallway and Stud into Living Room**

- **Cupboards and behind kick board**
  - **Hallway:** 0.6
  - **Cupboards and behind kick board:** 0.2

---

**Mass Flow Rate**

- **0-2.5 SLPM**
  - **0-3.5 Mass Flow (g/s)**

---

**Volume Flow Rate**

- **1800 SLPM**
  - **2000 Mass Flow (g/s)**

---

**Energy Flow Rate**

- **0.4 kW**

---

**External Wind Speed**

- **1.9 m/s**

---

**External Wind Direction**

- **55.2°**

---

**Hallway Concentrations**

- **0.2**

---

**Living Room Concentrations**

- **0.1**

---

**Basement Concentrations**

- **0.1**
L2-067 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-067
Hole Size: 0.9 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 11/11/2019

Averaging Period Start: 19:55:10
End: 20:45:10

Sensor | Average | Max | Min | STDDEV | units |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SP11LKV_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 Under-Cupboards</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Under-Cupboards</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Hi</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_2 Boil-Cup-Bottom-Hi</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 Boil-Cup-Bottom-Hi</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>2.9</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 K-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 K-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

Notes:

- KITCHEN: 13
- LIVING ROOM: 0.1
- BASEMENT: 0.0
- Hallway: 0.2
- Cupboards and behind kick board: 0.1

Outlet Temp:

- 19:55:10
- Average: 76.0
- Max: 77.0
- Min: 75.0
- stdDev: 0.1
- units: degC

Volume Flow Rate:

- Average: 4.5
- Max: 5.0
- Min: 4.1
- stdDev: 0.2
- units: SLPM

Energy Flow Rate:

- Average: 0.8
- Max: 0.9
- Min: 0.7
- stdDev: 0.0
- units: kW

External Wind Speed:

- Average: 3.2
- Max: 4.2
- Min: 2.8
- stdDev: 0.5
- units: m/s
**L2-068 RESULT**

**Hy4Heat WP7 Test Result**

MTP ID: L2-068  
Hole Size: 1.8 mm  
Location: Behind kitchen base cupboard  
Gas: Hydrogen  
Date: 12/11/2019  
Time: 01:45:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>3.1</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_2 Bsl-Cup-Bottom-Hi</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Bsl-Cup-High</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Mid</td>
<td>11.1</td>
<td>11.1</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Under-Cupboards</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-High</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>3.1</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**Notes:**

- **Hole Size:** 1.8 mm
- **Location:** Behind kitchen base cupboard
- **Gas:** Hydrogen
- **Date:** 12/11/2019
- **Time:** 01:45:00

**Averaging Period Start:** 210 min  
**End:** 220 min

**KITCHEN**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>3.1</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**LIVING ROOM**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP3LKV_2 Boil-Cup-Bottom-Hi</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Bsl-Cup-High</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Mid</td>
<td>11.1</td>
<td>11.1</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 Under-Cupboards</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_2 K-Low</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-High</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>3.1</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td><strong>RELEASEPRESSURE</strong></td>
<td>0.0200</td>
<td>0.0202</td>
<td>0.0196</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td><strong>LOWFLOWMETER</strong></td>
<td>0.0411</td>
<td>0.0416</td>
<td>0.0410</td>
<td>0.0003</td>
<td>g/s</td>
</tr>
</tbody>
</table>

**OUTLET TEMP**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mass Flow (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.7</td>
</tr>
<tr>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>20</td>
<td>3.6</td>
</tr>
<tr>
<td>30</td>
<td>3.6</td>
</tr>
<tr>
<td>40</td>
<td>3.6</td>
</tr>
<tr>
<td>50</td>
<td>3.7</td>
</tr>
<tr>
<td>60</td>
<td>3.8</td>
</tr>
<tr>
<td>70</td>
<td>3.7</td>
</tr>
<tr>
<td>80</td>
<td>3.6</td>
</tr>
<tr>
<td>90</td>
<td>3.6</td>
</tr>
<tr>
<td>100</td>
<td>3.7</td>
</tr>
</tbody>
</table>

**Energy Flow Rate**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mass Flow (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>27.7</td>
</tr>
<tr>
<td>10</td>
<td>28.1</td>
</tr>
<tr>
<td>20</td>
<td>27.6</td>
</tr>
<tr>
<td>30</td>
<td>28.1</td>
</tr>
<tr>
<td>40</td>
<td>27.6</td>
</tr>
<tr>
<td>50</td>
<td>28.1</td>
</tr>
<tr>
<td>60</td>
<td>27.6</td>
</tr>
<tr>
<td>70</td>
<td>28.1</td>
</tr>
<tr>
<td>80</td>
<td>27.6</td>
</tr>
<tr>
<td>90</td>
<td>28.1</td>
</tr>
<tr>
<td>100</td>
<td>27.6</td>
</tr>
</tbody>
</table>

**Volume Flow Rate**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mass Flow (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.6</td>
</tr>
<tr>
<td>10</td>
<td>2.8</td>
</tr>
<tr>
<td>20</td>
<td>2.6</td>
</tr>
<tr>
<td>30</td>
<td>2.8</td>
</tr>
<tr>
<td>40</td>
<td>2.6</td>
</tr>
<tr>
<td>50</td>
<td>2.8</td>
</tr>
<tr>
<td>60</td>
<td>2.6</td>
</tr>
<tr>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>80</td>
<td>2.6</td>
</tr>
<tr>
<td>90</td>
<td>2.8</td>
</tr>
<tr>
<td>100</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**External Wind Speed**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mass Flow (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.6</td>
</tr>
<tr>
<td>10</td>
<td>2.8</td>
</tr>
<tr>
<td>20</td>
<td>2.6</td>
</tr>
<tr>
<td>30</td>
<td>2.8</td>
</tr>
<tr>
<td>40</td>
<td>2.6</td>
</tr>
<tr>
<td>50</td>
<td>2.8</td>
</tr>
<tr>
<td>60</td>
<td>2.6</td>
</tr>
<tr>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>80</td>
<td>2.6</td>
</tr>
<tr>
<td>90</td>
<td>2.8</td>
</tr>
<tr>
<td>100</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**External Wind Direction**

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mass Flow (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.6</td>
</tr>
<tr>
<td>10</td>
<td>2.8</td>
</tr>
<tr>
<td>20</td>
<td>2.6</td>
</tr>
<tr>
<td>30</td>
<td>2.8</td>
</tr>
<tr>
<td>40</td>
<td>2.6</td>
</tr>
<tr>
<td>50</td>
<td>2.8</td>
</tr>
<tr>
<td>60</td>
<td>2.6</td>
</tr>
<tr>
<td>70</td>
<td>2.8</td>
</tr>
<tr>
<td>80</td>
<td>2.6</td>
</tr>
<tr>
<td>90</td>
<td>2.8</td>
</tr>
<tr>
<td>100</td>
<td>2.6</td>
</tr>
</tbody>
</table>
### L2-069 RESULT

#### Hy4Heat WP7 Test Result

**MTP ID:** L2-069  
**Gas:** Hydrogen  
**Date:** 12/11/2019  
**Time:** 07:00:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>6.9</td>
<td>6.9</td>
<td>6.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>5.2</td>
<td>5.2</td>
<td>5.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Boll-Cup-Bottom-Hi</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Behind-Cup-High</td>
<td>16.9</td>
<td>17.0</td>
<td>16.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Hi</td>
<td>17.0</td>
<td>17.1</td>
<td>17.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Under-Cupboards</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>1.6</td>
<td>1.7</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>1.1</td>
<td>1.1</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>0.9</td>
<td>1.0</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE:** 0.0199 0.0203 0.0196 0.0000 0.0002 barg  
**LOWFLOWMETER:** 0.0758 0.0770 0.0746 0.0006 g/s

**Volume Flow Rate:** 51.2 52.0 50.3 0.4 SLPM  
**Energy Flow Rate:** 9.1 9.2 8.9 0.1 kW  
**External Wind Speed:** 2.0 m/s  
**External Wind Direction:** 205.5 bearing

**Notes:** SP21 removed

---

### Kitchen Concentrations

- **SP1LKV_1 K-High**
- **SP2LKV_1 K-Mid**
- **SP3LKV_1 Boll-Cup-Bottom-Hi**
- **SP4LKV_1 Behind-Cup-High**
- **SP5LKV_1 Sink-Cup-Hi**
- **SP6LKV_1 Under-Cupboards**
- **SP7LKV_1 K-Low**
- **SP8LKV_1 LR-High**
- **SP9LKV_1 LR-Mid**
- **SP10LKV_2 H-High**
- **SP11LKV_2 H-Mid**
- **SP12LKV_2 FF-High**
- **SP13LKV_2 FF-Mid**
- **SP14LKV_2 AT-High**
- **SP15LKV_2 AT-Mid**
- **SP16LKV_2 BM-High**
- **SP17LKV_2 BM-Mid**
- **SP18LKV_2 BM-Low**
- **SP19LKV_2 NWALL-Cav**
- **SP20LKV_2 STUD-Cav**
- **SP21LKV_1 FF-Void**
- **SP22LKV_2 SF-Void**
- **SP23LKV_2 ROOF-Void**

**Output Temperature:** 4.2 4.4 4.1 0.1 degC  
**Volume Flow Rate:** 51.2 52.0 50.3 0.4 SLPM  
**Energy Flow Rate:** 9.1 9.2 8.9 0.1 kW  
**External Wind Speed:** 2.6 m/s  
**External Wind Direction:** 205.5 bearing

### Cupboard Concentrations

**Released Pressure:** 0.0199 0.0203 0.0196 0.0000 0.0002 barg  
**Low Flow Meter:** 0.0758 0.0770 0.0746 0.0006 g/s

**Mass Flow Rate:** 0.8 0.8 0.8

**Kitchen Concentrations**

- **SP1LKV_1 K-High**
- **SP2LKV_1 K-Mid**
- **SP3LKV_1 Boll-Cup-Bottom-Hi**
- **SP4LKV_1 Behind-Cup-High**
- **SP5LKV_1 Sink-Cup-Hi**
- **SP6LKV_1 Under-Cupboards**
- **SP7LKV_1 K-Low**
- **SP8LKV_1 LR-High**
- **SP9LKV_1 LR-Mid**
- **SP10LKV_2 H-High**
- **SP11LKV_2 H-Mid**
- **SP12LKV_2 FF-High**
- **SP13LKV_2 FF-Mid**
- **SP14LKV_2 AT-High**
- **SP15LKV_2 AT-Mid**
- **SP16LKV_2 BM-High**
- **SP17LKV_2 BM-Mid**
- **SP18LKV_2 BM-Low**
- **SP19LKV_2 NWALL-Cav**
- **SP20LKV_2 STUD-Cav**
- **SP21LKV_1 FF-Void**
- **SP22LKV_2 SF-Void**
- **SP23LKV_2 ROOF-Void**

**Outlet Temperature:** 4.2 4.4 4.1 0.1 degC  
**Volume Flow Rate:** 51.2 52.0 50.3 0.4 SLPM  
**Energy Flow Rate:** 9.1 9.2 8.9 0.1 kW  
**External Wind Speed:** 2.6 m/s  
**External Wind Direction:** 205.5 bearing

**Hallway and Stud into Living Room**

- **Hallway**
- **Behind (Hallway)**
- **Cupboards and behind kick board**

**Mass Flow Rate**

- **0.8**
- **2.8**

**Hallway and Stud into Living Room**

- **17.0**
- **17.0**

**Cupboards and behind kick board**

- **1.5**
- **1.1**
# L2-070 RESULT

## Hy4Heat WP7 Test Result

**MTP ID:** L2-070  
**Hole Size:** 3.6 mm  
**Location:** Behind kitchen base cupboard  
**Gas:** Hydrogen

**Date:** 12/11/2019  
**Time:** 16:30:00  
**Averaging Period Start:** 180 min  
**End:** 190 min

### Notes:
SP21 removed, spurious -ve offset

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LK_1 K-High</td>
<td>13.1</td>
<td>13.1</td>
<td>11.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 K-Med</td>
<td>11.7</td>
<td>11.7</td>
<td>11.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LK_1 Oil-Cup-Bottom-Hi</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LK_1 Behind-Cup-High</td>
<td>25.1</td>
<td>25.2</td>
<td>24.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LK_1 Sink-Cup-Hi</td>
<td>25.4</td>
<td>25.4</td>
<td>25.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LK_1 Under-Cupboards</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LK_1 K-Low</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LK_1 K-Med</td>
<td>1.5</td>
<td>1.4</td>
<td>1.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LK_2 H-Mid</td>
<td>3.1</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LK_2 H-Med</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LK_2 FF-High</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LK_2 FF-Med</td>
<td>1.7</td>
<td>1.6</td>
<td>1.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LK_2 AT-High</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LK_2 AT-Med</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LK_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LK_2 BM-Med</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LK_2 BM-Low</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LK_2 NWALL-Cav</td>
<td>1.3</td>
<td>1.4</td>
<td>1.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LK_2 SWALL-Cav</td>
<td>2.3</td>
<td>2.4</td>
<td>2.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LK_2 Void</td>
<td>0.8</td>
<td>0.9</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LK_2 ROOF Void</td>
<td>1.6</td>
<td>1.7</td>
<td>1.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
</tbody>
</table>

| OUTLET TEMP | 5.1  | 5.2 | 5.1 | 0.0 | degC |
| Volume Flow Rate | 104.4  | 106.0 | 102.7 | 0.7 | SLPM |
| Energy Flow Rate | 18.5  | 18.8 | 18.2 | 0.1 | kW |
| External Wind Speed | 1.7  | m/s |
| External Wind Direction | 309.1  | bearing |

### Kitchen Concentrations

- **1st FLOOR:** 0.8  
- **2nd FLOOR:** 1.4  
- **KITCHEN:** 13.1  
- **LIVING ROOM:** 2.5  
- **BASEMENT:** 0.0

### Cupboard Concentrations

- **Hallway:** 2.3  
- **(Behind) Hallway:** 25.4  
- **Cupboards and behind kick board:** 0.8  
- **LIVING ROOM:** 3.9

### Mass Flow Rate

- **Max:** 0.2  
- **Min:** 0.06  
- **STDEV:** 0.0010  
- **units:** g/s

---

DNV GL - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com
# L2-071 RESULT

## Hy4Heat WP7 Test Result

**MTP ID:** L2-071  
**Gas:** Hydrogen  
**Location:** Behind kitchen base cupboard  
**Date:** 12/11/2019  
**Time:** 22:30:00  
**Averaging Period Start:** 180 min  
**End:** 190 min  

### Notes:
- SP20 removed from this table. Data is good up until LEL goes off range circa 150 mins @ 3.8%.

#### Kitchen Concentrations

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>24.5</td>
<td>24.5</td>
<td>24.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>21.7</td>
<td>21.8</td>
<td>21.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Sink-Cup-Bottom-Hi</td>
<td>36.9</td>
<td>37.0</td>
<td>36.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Under-Cupboards</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Low</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 H-Mid</td>
<td>3.6</td>
<td>3.7</td>
<td>3.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 FF-High</td>
<td>4.0</td>
<td>4.1</td>
<td>4.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 FF-Mid</td>
<td>3.7</td>
<td>3.8</td>
<td>3.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 AT-High</td>
<td>2.2</td>
<td>2.3</td>
<td>2.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 AT-Mid</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 BM-Mid</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 BM-Low</td>
<td>1.6</td>
<td>1.6</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_2 N/WALL-Cav</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 FF-Void</td>
<td>13.1</td>
<td>13.3</td>
<td>13.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 SF-Void</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 ROOF-Void</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.00199</td>
<td>0.0018</td>
<td>0.0017</td>
<td>0.0004</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.3110</td>
<td>0.3116</td>
<td>0.3020</td>
<td>0.0022</td>
<td>g/s</td>
</tr>
</tbody>
</table>

#### Mass Flow Rate

- **OUTLET TEMP:** -0.1  
- **Volume Flow Rate:** 209.9  
- **Energy Flow Rate:** 37.3  
- **External Wind Speed:** 1.1  
- **External Wind Direction:** 261.5

### Cupboard Concentrations

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP3LKV_1 Boil-Cup-Bottom-Hi</td>
<td>9.3</td>
<td>9.4</td>
<td>9.2</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Behind-Cup-High</td>
<td>37.8</td>
<td>37.8</td>
<td>37.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Sink-Cup-Hi</td>
<td>38.9</td>
<td>37.0</td>
<td>36.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Under-Cupboards</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>37.8</td>
<td>37.8</td>
<td>37.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>37.8</td>
<td>37.8</td>
<td>37.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_1 AT-High</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 AT-Mid</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-Mid</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>1.6</td>
<td>1.6</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 N/WALL-Cav</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 SF-Void</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>13.1</td>
<td>13.1</td>
<td>13.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 ROOF-Void</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
</tbody>
</table>

### Hallway and Stud into Living Room

- **Hallway:** 6.0  
- **(Behind):** 36.9  
- **Cupboards and behind kick board:** 0.5  
- **37.4 9.3**
**L2-072 RESULT**

**Hy4Heat WP7 Test Result**

**MTIP ID:** L2-072  
**Hole Size:** 7.2 mm  
**Location:** Behind kitchen base cupboard  
**Gas:** Hydrogen  
**Date:** 13/11/2019  
**Averaging Period Start:** 05:15:00

**Notes:** 0.2% offset removed from SP17-23

---

### Sensor Values

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
<th>%vol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>34.5</td>
<td>34.5</td>
<td>34.4</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>32.5</td>
<td>32.5</td>
<td>32.5</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP3LKV_1 Boil-Cup-Bottom-Hi</td>
<td>18.9</td>
<td>19.0</td>
<td>18.9</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP4LKV_1 Behind-Cup-High</td>
<td>47.9</td>
<td>48.0</td>
<td>47.9</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP5LKV_1 Sink-Cup-Hi</td>
<td>45.7</td>
<td>45.8</td>
<td>45.7</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP6LKV_1 Under-Cupboards</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP8LKV_1 L-High</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP9LKV_1 L-Mid</td>
<td>5.8</td>
<td>5.8</td>
<td>5.6</td>
<td>0.1</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>10.5</td>
<td>10.5</td>
<td>10.3</td>
<td>0.1</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>6.2</td>
<td>6.3</td>
<td>6.1</td>
<td>0.1</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>6.9</td>
<td>7.0</td>
<td>6.8</td>
<td>0.1</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>6.6</td>
<td>6.9</td>
<td>6.6</td>
<td>0.1</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>SP14LKV_1 AT-High</td>
<td>6.2</td>
<td>6.2</td>
<td>6.2</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP15LKV_1 AT-Mid</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>26.8</td>
<td>26.8</td>
<td>26.7</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
</tbody>
</table>

### Release Pressure

- **RELEASEREGRESSURE:** 0.0198 0.0206 0.0192 0.0003 barg
- **LOWFLOWMETER:** 0.5717 0.5825 0.5660 0.0046 g/s

### Concentration Graphs

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Mass Flow Rate**

### Notes

- *KITCHEN*
- *LIVING ROOM*
- *BASEMENT*
- *HALFWAY*
- *ROOM (Behind)*

---

**DNV GL - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com**
## L2-074 RESULT

### Hy4Heat WP7 Test Result

**MTP ID:** L2-074  
**Hole Size:** 0.6 mm  
**Location:** Undersink Cupboard  
**Gas:** Hydrogen  
**Date:** 10/20/19  
**Time:** 08:45:20

### Notes:

- **Hole Size:** 0.6 mm
- **Location:** Undersink Cupboard
- **Gas:** Hydrogen

### Averaging Period

- **Start:** 260 min
- **End:** 270 min

### Sensors and Measurements

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LV_2 K-High</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LV_2 K-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LV_2 Cup-Mid</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LV_2 Cup-High Front</td>
<td>2.1</td>
<td>2.1</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LV_2 Cup-High Back</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LV_2 Cup-Low-Back</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LV_2 K-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LV_3 LR-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LV_3 LR-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LV_3 H-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LV_3 H-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LV_3 FF-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LV_3 FF-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LV_3 AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LV_3 AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LV_3 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LV_3 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LV_3 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LV_3 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LV_3 STUD-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LV_2 FF-Void</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LV_3 SF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LV_3 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0205</td>
<td>0.0209</td>
<td>0.0202</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0022</td>
<td>0.0027</td>
<td>0.0009</td>
<td>0.0003</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>8.6</td>
<td>8.9</td>
<td>8.7</td>
<td>0.0</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>1.5</td>
<td>1.9</td>
<td>0.6</td>
<td>0.2</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td>bearing</td>
</tr>
</tbody>
</table>

### Graphs

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Mass Flow Rate**

---

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L0-075 RESULT

Hy4Heat WP7 Test Result

MTP ID: L0-075
Hole Size: 0.9 mm
Location: undersink cupboard
Gas: hydrogen
Date: 18/10/2019
Time: 15:00:00
Averaging Period Start: 290 min
End: 300 min

Notes: Analyser Zero's checked and re-applied circa 225 min and some drift corrected. SP17 removed.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Front</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-High Back</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Low-Back</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-Mid</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-AT-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-AT-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 H-BM-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 STUD-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 FF-Cav</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 ROOF-Void</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0200</td>
<td>0.0203</td>
<td>0.0196</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0070</td>
<td>0.0073</td>
<td>0.0067</td>
<td>0.0003</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>7.3</td>
<td>7.4</td>
<td>7.3</td>
<td>0.1</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>4.7</td>
<td>4.9</td>
<td>4.5</td>
<td>0.2</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>261.2</td>
<td></td>
<td></td>
<td></td>
<td>bearing</td>
</tr>
</tbody>
</table>

Kitchen Concentrations

Cupboard Concentrations

Hallway and Stud into Living Room

Mass flow Rate

Hallway
0.1
0.2

Cupboard (top is average of SP4 and SP5)
### L2-076 RESULT

#### Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF4LK_1 K-High</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 K-Mid</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 Cup-Mid</td>
<td>4.4</td>
<td>4.4</td>
<td>4.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 Cup-High Front</td>
<td>8.1</td>
<td>8.1</td>
<td>8.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 Cup-High Back</td>
<td>9.4</td>
<td>9.4</td>
<td>9.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 Cup-Low-Back</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 K-Low</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 FF-High</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 FF-Mid</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 FF-High-Front</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 FF-High</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 K-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 Cup-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 K-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 NVALL-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 STUD-Cav</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 FF-Void</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SF4LK_1 ROOF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

#### Notes:

- **1st FLOOR**: 0.6 1.0 0.2
- **2nd FLOOR**: 0.6 0.6 0.6
- **KITCHEN**: 2.3 1.1 0.2
- **LIVING ROOM**: 2.2 1.5 0.1
- **BASEMENT**: 0.2 1.2 0.1

#### Cupboard Concentrations

- **Hallway and Stud into Living Room**: 2.0 4.4 1.0

#### Mass Flow Rate

- **Hallway**: 0.7 8.7 0.4
- **Cupboard (top is average of SP4 and SP5)**

---

**MTP ID**: L2-076  
**Hole Size**: 1.8 mm  
**Location**: Undersink Cupboard

- **Gas**: Hydrogen  
- **Date**: 10/21/19  
- **Time**: 15:50:30

- **Averaging Period Start**: 240 min  
- **End**: 250 min
**L2-077 RESULT**

**Hy4Heat WP7 Test Result**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>10.0</td>
<td>10.2</td>
<td>9.7</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High Front</td>
<td>14.0</td>
<td>14.1</td>
<td>14.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High Back</td>
<td>15.7</td>
<td>15.7</td>
<td>15.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_2 LR-Mid</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 NWALL-Cav</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 STUD-Cav</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 FF-Void</td>
<td>4.4</td>
<td>4.4</td>
<td>4.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 SF-Void</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_1 ROOF-Void</td>
<td>0.6</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0193</td>
<td>0.0196</td>
<td>0.0197</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.0743</td>
<td>0.0753</td>
<td>0.0726</td>
<td>0.0005</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>8.5</td>
<td>8.4</td>
<td>8.3</td>
<td>0.2</td>
<td>°C</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>50.2</td>
<td>50.7</td>
<td>49.0</td>
<td>0.3</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>8.9</td>
<td>9.0</td>
<td>8.7</td>
<td>0.1</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>0.4</td>
<td>m/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>206.3</td>
<td>bearing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Kitchen Concentrations**

**Cupboard Concentrations**

**Mass flow Rate**

---

**Diagram:**
- Kitchen Concentrations
- Cupboard Concentrations
- Mass flow Rate

**Notes:**
- SP17 removed
- Map of gas distribution in different areas of the house.
**L2-078 RESULT**

Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>13.5</td>
<td>13.5</td>
<td>13.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>13.0</td>
<td>13.1</td>
<td>13.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>19.3</td>
<td>19.4</td>
<td>19.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High Front</td>
<td>22.8</td>
<td>22.8</td>
<td>22.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High Back</td>
<td>25.3</td>
<td>25.3</td>
<td>25.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>2.6</td>
<td>2.6</td>
<td>2.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>13.5</td>
<td>13.5</td>
<td>13.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>13.0</td>
<td>13.1</td>
<td>13.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>22.8</td>
<td>22.8</td>
<td>22.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>25.3</td>
<td>25.3</td>
<td>25.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_1 AT-High</td>
<td>1.8</td>
<td>2.0</td>
<td>1.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 AT-Mid</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 AT-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 BM-High</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 BM-Low</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 FF-Void</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 SF-Void</td>
<td>0.4</td>
<td>0.5</td>
<td>0.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 RM-Foot</td>
<td>0.7</td>
<td>0.7</td>
<td>0.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.0229</td>
<td>0.0231</td>
<td>0.0225</td>
<td>0.0002</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.1666</td>
<td>0.1672</td>
<td>0.1654</td>
<td>0.0005</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>7.7</td>
<td>7.7</td>
<td>7.6</td>
<td>0.0</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>111.8</td>
<td>112.9</td>
<td>111.6</td>
<td>0.3</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>19.9</td>
<td>20.1</td>
<td>19.8</td>
<td>0.1</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>170.5</td>
<td></td>
<td></td>
<td></td>
<td>bearing</td>
</tr>
<tr>
<td>Average % Gas</td>
<td>13.5</td>
<td>13.5</td>
<td>13.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Max % Gas</td>
<td>13.5</td>
<td>13.5</td>
<td>13.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Min % Gas</td>
<td>13.4</td>
<td>13.4</td>
<td>13.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>STDEV % Gas</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- SP17 removed

**Gases:**
- Hydrogen

**Date:** 17/10/2019
**Time:** 21:30:00
**Gas:** Hydrogen
**Location:** Under sink cupboard

**Average Period Start:** 170 min
**End:** 180 min

**Kitchen Concentrations**

![Kitchen Concentrations](image1)

**Cupboard Concentrations**

![Cupboard Concentrations](image2)

**Mass Flow Rate**

![Mass Flow Rate](image3)
L2-079 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-079
Hole Size: 5.1 mm
Location: undersink cupboard
Gas: hydrogen
Date: 22/10/2019
Time: 21:30:00
Averaging Period Start: 110 min
End: 120 min

Notes:

Sensor | Average | Max | Min | STDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 22.2 | 22.4 | 22.0 | 0.1 | %vol
SP1LKV_1 K-Mid | 21.7 | 21.8 | 21.6 | 0.1 | %vol
SP2LKV_1 Cup-Mid | 30.3 | 30.6 | 29.6 | 0.4 | %vol
SP4LKV_1 Cup-High Front | 34.1 | 34.2 | 34.0 | 0.1 | %vol
SP5LKV_1 Cup-High Back | 35.3 | 35.3 | 35.2 | 0.1 | %vol
SP6LKV_1 Cup-Low-Back | 1.4 | 1.5 | 1.3 | 0.1 | %vol
SP7LKV_1 K-Low | 3.3 | 3.4 | 3.3 | 0.0 | %vol
SP8LKV_1 LR-High | 2.6 | 2.7 | 2.5 | 0.1 | %vol
SP9LKV_1 LR-Mid | 2.6 | 2.8 | 2.6 | 0.1 | %vol
SP10LKV_1 H-High | 2.6 | 2.8 | 2.6 | 0.1 | %vol
SP11LKV_1 H-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP12LKV_1 BM-High | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP13LKV_1 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP14LKV_1 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP15LKV_1 BM-Low-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol
SP16LKV_1 BM-Mid-Cav | 1.3 | 1.3 | 1.3 | 0.0 | %vol
SP17LKV_1 BM-Mid-Cav Void | 17.6 | 17.7 | 17.4 | 0.1 | %vol
SP18LKV_1 BM-Mid-Front | 0.2 | 0.3 | 0.2 | 0.0 | %vol
SP19LKV_1 BM-Mid-Back | 0.3 | 0.4 | 0.3 | 0.0 | %vol
RELEASEPRESSURE | 0.0201 | 0.0206 | 0.0196 | 0.0002 | barg
LOWFLOWMETER | 0.3417 | 0.3430 | 0.3400 | 0.0010 | g/s
OUTLET TEMP | 9.4 | 9.5 | 9.3 | 0.0 | degC
Volume Flow Rate | 230.6 | 231.5 | 229.5 | 0.7 | SLPM
Energy Flow Rate | 41.0 | 41.1 | 40.8 | 0.1 | kW
External Wind Speed | 1.2 | | | | m/s
External Wind Direction | | | | | bearing

Kitchen Concentrations

Cupboard Concentrations

Mass flow Rate

Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)
**L2-080 RESULT**

**Hy4Heat WP7 Test Result**

**MTP ID:** L2-080  
**Hole Size:** 7.2 mm  
**Location:** undersink cupboard  
**Gas:** hydrogen  
**Date:** 18/10/2019  
**Time:** 19:56:00  
**Average Period Start:** 80 min  
**End:** 90 min

**Notes:** SP17 removed

---

### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>37.6</td>
<td>37.7</td>
<td>37.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 K-Mid</td>
<td>37.1</td>
<td>37.4</td>
<td>37.0</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP1LKV_1 Cup-Mid</td>
<td>44.9</td>
<td>45.4</td>
<td>44.4</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High Front</td>
<td>47.6</td>
<td>48.3</td>
<td>47.0</td>
<td>0.3</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-High Back</td>
<td>50.1</td>
<td>50.2</td>
<td>50.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-Low-Back</td>
<td>5.1</td>
<td>5.2</td>
<td>5.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>9.5</td>
<td>9.7</td>
<td>9.2</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 H-High</td>
<td>11.1</td>
<td>11.9</td>
<td>11.5</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 H-Mid</td>
<td>6.5</td>
<td>6.8</td>
<td>6.3</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>12.4</td>
<td>12.8</td>
<td>12.3</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>6.6</td>
<td>7.0</td>
<td>6.0</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 Cup-High-Front</td>
<td>7.4</td>
<td>7.8</td>
<td>6.9</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 Cup-High-Back</td>
<td>7.0</td>
<td>7.1</td>
<td>6.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_1 Cup-Low-Back</td>
<td>5.8</td>
<td>6.0</td>
<td>5.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_1 Cup-Mid</td>
<td>6.2</td>
<td>6.3</td>
<td>6.0</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_1 Cup-Mid</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_1 Cup-High</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_1 Cup-High</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_1 Cup-High</td>
<td>3.6</td>
<td>3.8</td>
<td>3.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_1 Cup-High</td>
<td>33.1</td>
<td>33.2</td>
<td>33.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_1 Cup-High</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_1 Roof-Void</td>
<td>2.1</td>
<td>2.2</td>
<td>2.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
</tbody>
</table>

**RELEASEPRESSURE**  
**LOWFLOWMETER**  
**OUTLET TEMP**  
**Volume Flow Rate**  
**Energy Flow Rate**  
**External Wind Speed**  
**External Wind Direction**

---

### Graphs

**Kitchen Concentrations**

**Cupboard Concentrations**

**Mass Flow Rate**
APPENDIX B: PHASE 2 RESULTS
### L2-A1 RESULT

#### Hy4Heat WP7 Test Result

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LV_1 K-High</td>
<td>17.4</td>
<td>17.5</td>
<td>17.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LV_1 K-Mid</td>
<td>13.9</td>
<td>15.1</td>
<td>13.7</td>
<td>0.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LV_1 Cup-High-back</td>
<td>35.9</td>
<td>36.0</td>
<td>35.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LV_1 Cup-High-Front</td>
<td>35.4</td>
<td>35.4</td>
<td>35.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LV_1 cup-low</td>
<td>37.2</td>
<td>37.2</td>
<td>37.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LV_1 Cup-mid</td>
<td>41.2</td>
<td>41.3</td>
<td>41.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LV_2 K-Low</td>
<td>3.5</td>
<td>3.6</td>
<td>3.3</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LV_1 2L-High</td>
<td>3.8</td>
<td>3.8</td>
<td>3.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LV_1 1L-Mid</td>
<td>1.1</td>
<td>1.2</td>
<td>1.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LV_2 FF-High</td>
<td>1.1</td>
<td>1.1</td>
<td>1.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LV_2 FF-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LV_2 NWALL-Cav</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LV_2 STUDE-Cav</td>
<td>0.7</td>
<td>0.7</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LV_2 FL-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LV_2 ROOF-Void</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>RELEASEPRESSURE</td>
<td>0.025</td>
<td>0.021</td>
<td>0.021</td>
<td>0.001</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>0.493</td>
<td>0.521</td>
<td>0.486</td>
<td>0.003</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET TEMP</td>
<td>17.0</td>
<td>17.1</td>
<td>16.9</td>
<td>0.1</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>332.2</td>
<td>351.9</td>
<td>328.0</td>
<td>4.8</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>59.0</td>
<td>62.5</td>
<td>58.3</td>
<td>0.9</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>4.9</td>
<td></td>
<td></td>
<td></td>
<td>m/s</td>
</tr>
<tr>
<td>External Wind Direction</td>
<td>74.2</td>
<td></td>
<td></td>
<td></td>
<td>bearing</td>
</tr>
</tbody>
</table>

**Notes:** Similar test with no vents gave ~30% conc. in kitchen high point.

### Kitchen Concentrations

#### Hallway and Stud into Living Room

#### Cupboard Concentrations

#### Mass Flow Rate
### L2-A2 RESULT

**Hy4Heat WP7 Test Result**

#### MTP ID: L2-A2
- Hole Size: 7.2 mm
- Location: kitchen base cupboard with 200cm² ceiling vent, no cupboard vents
- Gas: hydrogen

#### Date: 20/04/2020 06:35:00

#### Notes:
Similar no-vent test showed ~30% conc. at kitchen high point

#### Averaging Period Start: 75 min  End: 85 min

#### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>16.3</td>
<td>16.3</td>
<td>16.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>11.9</td>
<td>12.0</td>
<td>11.9</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-High-back</td>
<td>36.4</td>
<td>36.4</td>
<td>36.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>36.2</td>
<td>36.3</td>
<td>36.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 cup-low</td>
<td>37.9</td>
<td>38.0</td>
<td>37.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 kup-mid</td>
<td>41.8</td>
<td>41.9</td>
<td>41.7</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_2 LR-High</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_2 H-High</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_2 H-Mid</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_2 FF-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_2 FF-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP23LKV_2 ROOF-Void</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
</tbody>
</table>

#### Release Pressure
- 0.0117 barg

#### Low Flow Meter
- 0.4998 g/s

#### Outlet Temp
- 7.6° C

#### Mass Flow Rate
- 337.4 SLPM

#### Energy Flow Rate
- 59.9 kW

#### External Wind Speed
- 4.4 m/s

#### External Wind Direction
- 36.3° bearing

#### Diagrams

- Kitchen Concentrations
- Cupboard Concentrations
- Mass Flow Rate

---

DNV GL - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com
L2-A3 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-A3
Hole Size: 5.1 mm
Location: with cupboard vents
Gas: hydrogen

Averaging Period Start: 100 min
End: 120 min

Notes:
Similar flow rate, no-vent case registered ~22% conc. at kitchen high point

Sensor | Average | Max | Min | STDEV | units |
--- | --- | --- | --- | --- | --- |
SP1LK | 8.1 | 8.2 | 8.1 | 0.0 | %vol |
SP2LK | 6.8 | 6.9 | 6.7 | 0.1 | %vol |
SP3LK | 16.7 | 16.8 | 16.6 | 0.1 | %vol |
SP4LK | 17.1 | 17.3 | 16.9 | 0.2 | %vol |
SP5LK | 18.3 | 18.3 | 18.3 | 0.0 | %vol |
SP6LK | 25.2 | 25.2 | 25.0 | 0.1 | %vol |
SP7LK | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
SP8LK | 2.1 | 2.2 | 2.0 | 0.0 | %vol |
SP9LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP10LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP11LK | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
SP12LK | 1.9 | 1.9 | 1.8 | 0.0 | %vol |
SP13LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP14LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP15LK | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
SP16LK | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
SP17LK | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
SP18LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP19LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP20LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP21LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP22LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP23LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP24LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP25LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP26LK | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
SP27LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP28LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP29LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
SP30LK | 0.0 | 0.0 | 0.0 | 0.0 | %vol |

RELEASEPRESSURE: 0.0222 0.025 0.019 0.001 barg
LOWFLOWMETER: 0.2298 0.233 0.227 0.001 g/s
OUTLET_TEMP: 12.5 13.1 12.1 0.3 degC
Volume Flow Rate: 155.1 157.2 153.1 1.0 SLPM
Energy Flow Rate: 27.6 27.9 27.2 0.2 kW
External Wind Speed: 4.2 m/s
External Wind Direction: 66.3 bearing

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room
L2-A4 RESULT

Hy4Heat WP7 Test Result

Notes: Similar flow rate, no-vent test showed ~22% conc. at kitchen high point

Sensor | Average | Max | Min | STDEV | units
---|---|---|---|---|---
SP1LKV_1 K-High | 6.7 | 6.7 | 6.5 | 0.1 | %vol
SP1LKV_1 K-Mid | 4.5 | 4.6 | 3.6 | 0.1 | %vol
SP1LKV_1 Cup-high-back | 16.8 | 16.8 | 16.8 | 0.0 | %vol
SP1LKV_1 Cup-High-Front | 13.5 | 13.5 | 13.5 | 0.0 | %vol
SP1LKV_1 cup-low | 17.4 | 17.4 | 17.4 | 0.0 | %vol
SP1LKV_1 cup-mid | 26.1 | 26.1 | 26.0 | 0.2 | %vol
SP1LKV_2 H-Low | 2.1 | 2.1 | 2.1 | 0.0 | %vol
SP1LKV_2 H-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP1LKV_2 FF-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol
SP1LKV_2 FF-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol
SP1LKV_2 AT-High | 0.3 | 0.3 | 0.2 | 0.0 | %vol
SP1LKV_2 AT-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol
SP1LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_2 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_2 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP1LKV_2 STUD-Cav | 0.9 | 0.9 | 0.9 | 0.0 | %vol
SP1LKV_2 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol
SP1LKV_2 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol
OUTLET_PRESSURE | 0.0208 | 0.0235 | 0.0186 | 0.0012 | barg
LOWFLOWMETER | 0.2277 | 0.2353 | 0.2225 | 0.0025 | g/s
OUTLET_TEMP | 20.9 | 21.1 | 20.9 | 0.1 | degC
Volume Flow Rate | 153.7 | 158.8 | 150.2 | 1.7 | SLPM
Energy Flow Rate | 27.3 | 28.2 | 26.7 | 0.3 | kW
External Wind Speed | 4.6 | | | | m/s
External Wind Direction | 86.3 | | | | bearing

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate
L2-A5 RESULT

Hy4Heat WP7 Test Result

Notes: Similar configuration (L2-064C) without ceiling vent registered ~28% at high point in kitchen

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LK_1 K-High | 18.5 | 18.6 | 18.4 | 0.1 | %vol
SP2LK_1 K-Mid | 16.7 | 16.9 | 16.6 | 0.1 | %vol
SP3LK_1 Cup-high-back | 27.8 | 27.9 | 27.6 | 0.1 | %vol
SP4LK_1 Cup-High-Front | 28.5 | 28.8 | 28.4 | 0.1 | %vol
SP5LK_1 Cup-mid | 30.4 | 30.5 | 30.4 | 0.0 | %vol
SP6LK_1 K-Low | 37.4 | 38.1 | 37.2 | 0.3 | %vol
SP7LK_1 K-Mid | 0.6 | 0.7 | 0.6 | 0.0 | %vol
SP8LK_1 LR-High | 2.1 | 2.1 | 2.1 | 0.0 | %vol
SP9LK_1 LR-Mid | 1.3 | 1.4 | 1.2 | 0.1 | %vol
SP10LK_1 H-High | 3.7 | 3.8 | 3.6 | 0.1 | %vol
SP11LK_1 H-Mid | 1.5 | 1.6 | 1.4 | 0.0 | %vol
SP12LK_1 FF-High | 2.4 | 2.5 | 2.2 | 0.2 | %vol
SP13LK_1 FF-Mid | 0.2 | 0.3 | 0.1 | 0.1 | %vol
SP14LK_1 BM-High | 0.1 | 0.2 | 0.1 | 0.0 | %vol
SP15LK_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP16LK_1 BM-Low | 0.1 | 0.1 | 0.0 | 0.0 | %vol
SP17LK_1 NWall-Cav | 1.3 | 1.4 | 1.2 | 0.0 | %vol
SP18LK_1 STUD-Cav | 2.4 | 2.5 | 2.2 | 0.2 | %vol
SP19LK_2 AT-High | 0.2 | 0.3 | 0.1 | 0.1 | %vol
SP20LK_2 AT-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP21LK_2 AT-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP22LK_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP23LK_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP24LK_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP25LK_2 ROOF-Cav | 1.3 | 1.4 | 1.2 | 0.0 | %vol
SP26LK_2 ROOF-Mid | 0.2 | 0.3 | 0.1 | 0.1 | %vol
SP27LK_2 ROOF-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol
OUTLET_PRESSURE | 0.0455 | 0.048 | 0.044 | 0.001 | barg
LOWFLOWMETER | 0.4876 | 0.493 | 0.484 | 0.002 | g/s

OUTLET_TEMP | 16.3 | 17.7 | 14.9 | 0.9 | degC
Volume Flow Rate | 320.1 | 323.9 | 326.7 | 1.3 | SLPM
Energy Flow Rate | 58.5 | 59.1 | 58.0 | 0.2 | kW
External Wind Speed | 3.6 | m/s
External Wind Direction | 77.7 | bearing

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
L2-A6 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-A6
Hole Size: 7.2 mm
kitchen base cupboard with 200cm² ceiling vent,
Location: with cupboard vents
Gas: hydrogen
Date: 19/04/2020
Time: 08:49:00

Averaging Period Start: 120 min
End: 140 min

Notes: Similar arrangement and flow with no ceiling vent (L2-064C) registered ~28% conc at kitchen high point

Sensor | Average | Max | Min | STDEV | units |
-------|--------|-----|-----|-------|-------|
SP1LKV_1 K-High | 16.5 | 16.7 | 16.2 | 0.3 | %vol |
SP2LKV_1 K-Mid | 13.5 | 14.1 | 13.1 | 0.4 | %vol |
SP3LKV_1 Cup-High-back | 27.7 | 29.1 | 26.3 | 1.3 | %vol |
SP4LKV_1 Cup-High-Front | 28.1 | 29.5 | 26.7 | 1.3 | %vol |
SP5LKV_1 Cup-mid | 30.0 | 31.1 | 28.9 | 1.0 | %vol |
SP6LKV_1 Cup-low | 36.7 | 36.8 | 36.7 | 0.1 | %vol |
SP7LKV_2 K-Low | 0.6 | 0.8 | 0.4 | 0.2 | %vol |
SP8LKV_2 LR-High | 3.9 | 4.0 | 3.9 | 0.0 | %vol |
SP9LKV_1 LR-Mid | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
SP10LKV_2 H-High | 1.2 | 1.3 | 1.1 | 0.1 | %vol |
SP11LKV_2 H-Mid | 1.4 | 1.5 | 1.3 | 0.1 | %vol |
SP12LKV_2 FF-High | 1.3 | 1.4 | 1.3 | 0.1 | %vol |
SP13LKV_2 FF-Mid | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
SP14LKV_2 AT-High | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
SP15LKV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
SP16LKV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
SP17LKV_2 BM-Mid | 0.1 | 0.1 | 0.0 | 0.0 | %vol |
SP18LKV_2 BM-Low | 0.1 | 0.2 | 0.1 | 0.1 | %vol |
SP19LKV_2 NWALL-Cav | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
SP20LKV_2 STUD-Cav | 1.3 | 1.4 | 1.3 | 0.1 | %vol |
SP21LKV_2 FF-Void | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
SP22LKV_2 SF-Void | 0.3 | 0.4 | 0.1 | 0.1 | %vol |
SP23LKV_2 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
OUTLET_PRESSURE | 0.0448 | 0.048 | 0.043 | 0.001 | barg |
LOWFLOWMETER | 0.4884 | 0.492 | 0.484 | 0.002 | g/s |
OUTLET_TEMP | 16.7 | 17.1 | 16.4 | 0.2 | degC |
Volume Flow Rate | 329.6 | 332.1 | 326.7 | 1.2 | SLPM |
Energy Flow Rate | 58.6 | 59.0 | 58.0 | 0.2 | kW |
External Wind Speed | 4.1 | m/s |
External Wind Direction | 360° | bearing |

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room
L2-A7 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-A7
Hole Size: 7.2mm mm
Location: Kitchen base cupboard no vents
Date: 01/04/2020
Time: 10:41:00

Averaging Period Start: 100 min
End: 120 min

Gas: Hydrogen

Notes:

To be used as base case @20m3/hr, similar result to L2-064, 23.8m3/hr

Sensor | Average | Max | Min | STDEV | units
-------|---------|-----|-----|-------|-----
SP1LK_1 K-High | 30.3 | 30.6 | 30.0 | 0.1 | %vol
SP1LK_1 K-Mid | 28.1 | 28.5 | 27.9 | 0.2 | %vol
SP1LK_1 Cup-High-back | 42.5 | 42.7 | 42.1 | 0.2 | %vol
SP1LK_1 Cup-High-Front | 36.7 | 36.9 | 35.6 | 0.3 | %vol
SP1LK_1 Cup-Low | 25.8 | 26.5 | 25.5 | 0.4 | %vol
SP1LK_1 Cup-mid | 43.4 | 43.5 | 43.2 | 0.1 | %vol
SP1LK_1 K-Low | 1.9 | 2.0 | 1.9 | 0.0 | %vol
SP1LK_1 Lic-High | 5.7 | 5.9 | 5.7 | 0.1 | %vol
SP2LK_1 Lic-Mid | 2.9 | 3.1 | 2.5 | 0.1 | %vol
SP2LK_1 Lic-High | 5.9 | 6.2 | 5.7 | 0.1 | %vol
SP1LK_1 Lic-Mid | 3.0 | 3.2 | 2.8 | 0.1 | %vol
SP2LK_1 FF-High | 3.4 | 3.6 | 3.1 | 0.1 | %vol
SP2LK_1 FF-Mid | 3.2 | 3.3 | 3.0 | 0.1 | %vol
SP2LK_1 FF-Low | 2.6 | 2.8 | 2.5 | 0.1 | %vol
SP2LK_1 FF-Mid | 2.7 | 2.8 | 2.5 | 0.1 | %vol
SP2LK_1 BM-High | 0.3 | 0.4 | 0.3 | 0.0 | %vol
SP2LK_1 BM-Mid | 0.3 | 0.3 | 0.2 | 0.0 | %vol
SP2LK_1 BM-Low | 0.2 | 0.3 | 0.2 | 0.0 | %vol
SP2LK_1 BM-2Wall-Cav | 0.9 | 1.0 | 0.8 | 0.1 | %vol
SP2LK_1 FF-Void | 2.7 | 2.7 | 2.7 | 0.1 | %vol
SP2LK_1 SP-Void | 0.3 | 0.4 | 0.3 | 0.1 | %vol
SP2LK_1 ROOF-Void | 0.7 | 0.8 | 0.7 | 0.1 | %vol
OUTLET_PRESSURE | 0.0447 | 0.046 | 0.043 | 0.001 | barg
LOWFLOWMETER | 0.4977 | 0.512 | 0.486 | 0.005 | g/s
OUTLET TEMP | 8.6 | 8.7 | 8.4 | 0.1 | degC
Volume Flow Rate | 335.9 | 345.7 | 328.0 | 3.6 | SLPM
Energy Flow Rate | 59.7 | 61.4 | 58.3 | 0.6 | kW
External Wind Speed | 3.1 | m/s
External Wind Direction | 257.2 | bearing

Kitchen Concentrations

Hallway and Stud into Living Room

Cupboard Concentrations

Mass flow Rate

Hallway

5.9

3.1

Hallway and Stud

42.9

36.7

25.8

KITCHEN

LIVING ROOM

BASEMENT

0.3

0.3

0.3

0.2

0.2

0.2

0.2
Hy4Heat WP7 Test Result

MTP ID: L2-A8
Hole Size: 7.2 mm
Location: vents
Gas: methane
Date: 28/04/2020
Averaging Period Start: 00:00
Averaging Period End: 00:00

Notes: Analyst readings from cupboard over-range at ~55%. Kitchen readings just in range. No comparison for this flow rate with methane, closest is L2-024 giving 25% in kitchen high point for 7.8m3/hr

Sensor | Average | Max | Min | STDV | units
-- | -- | -- | -- | -- | --
SP3LKV_1 K-High | 54.5 | 54.6 | 54.5 | 0.0 | %vol
SP2LKV_1 K-Mid | 52.1 | 52.8 | 52.9 | 0.9 | %vol
SP3LKV_1 Cup-High-back | 55.0 | 55.0 | 54.9 | 0.0 | %vol
SP4LKV_1 Cup-Low | 54.9 | 54.9 | 54.9 | 0.0 | %vol
SP5LKV_1 Cup-High-Front | 55.0 | 55.1 | 55.0 | 0.0 | %vol
SP6LKV_1 cup-mid | 55.0 | 55.0 | 55.0 | 0.0 | %vol
SP7LKV_1 K-Low | 10.4 | 14.0 | 9.6 | 1.2 | %vol
SP8LKV_1 LR-High | 14.7 | 14.8 | 14.6 | 0.1 | %vol
SP9LKV_1 LR-Mid | 5.7 | 6.0 | 5.6 | 0.2 | %vol
SP10LKV_1 FF-Mid | 8.7 | 9.1 | 8.3 | 0.3 | %vol
SP11LKV_1 FF-Mid | 8.5 | 9.0 | 7.9 | 0.3 | %vol
SP12LKV_1 AT-High | 7.0 | 7.5 | 6.3 | 0.3 | %vol
SP13LKV_1 AT-Mid | 7.0 | 7.4 | 6.5 | 0.3 | %vol
SP14LKV_1 BM-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP15LKV_1 BM-Mid | -10.0 | -10.0 | -10.0 | 0.0 | %vol
SP16LKV_1 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol
SP17LKV_1 NWALL-Cav | 0.3 | 0.5 | 0.3 | 0.1 | %vol
SP18LKV_1 STUD-Cav | 4.7 | 5.3 | 4.5 | 0.2 | %vol
SP19LKV_1 SF-Void | 6.1 | 7.1 | 5.3 | 0.8 | %vol
SP20LKV_1 SF-Void | 0.7 | 0.7 | 0.4 | 0.1 | %vol
SP21LKV_1 ROOF-Void | 0.7 | 0.9 | 0.5 | 0.2 | %vol
RELEASEPRESSURE | 0.0973 | 0.101 | 0.095 | 0.001 | barg

LOWFLOWMETERCH4 | 3.9988 | 4.089 | 3.967 | 0.019 | g/s
OUTLET_TEMP | 14.0 | 15.8 | 13.1 | 0.9 | degC
Volume Flow Rate | 334.4 | 337.8 | 331.8 | 1.6 | SLPM
Energy Flow Rate | 199.9 | 201.9 | 198.3 | 0.9 | kW
External Wind Speed | 2.9 | | | | m/s
External Wind Direction | 92.5 | | | | bearing

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room
L2-A9 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-A9
Hole Size: 15 mm
Location: with cupboard vents
Gas: hydrogen

Date: 21/04/2020
Time: 06:05:00

Averaging Period Start: 90 min
End: 96 min

Notes: Similar arrangement and flow rate in L2-A11 gives ~60% at kitchen high and mid

Sensor | Average | Max | Min | STDEV | units
--- | --- | --- | --- | --- | ---
SP1LKV_1 K-High | 44.4 | 44.6 | 44.3 | 0.1 | %vol
SP2LKV_1 K-Mid | 42.3 | 42.4 | 42.1 | 0.2 | %vol
SP3LKV_1 Cup-high-back | 50.5 | 50.5 | 50.5 | 0.0 | %vol
SP4LKV_1 Cup-High-Front | 50.4 | 50.4 | 50.4 | 0.0 | %vol
SP5LKV_1 cup-low | 52.4 | 52.4 | 52.4 | 0.0 | %vol
SP6LKV_1 cup-mid | 48.5 | 48.5 | 48.3 | 0.0 | %vol
SP7LKV_1 K-Low | 1.4 | 1.4 | 1.4 | 0.0 | %vol
SP8LKV_1 LR-High | 4.9 | 5.1 | 4.7 | 0.0 | %vol
SP9LKV_1 LR-Mid | 2.7 | 2.7 | 2.7 | 0.0 | %vol
SP10LKV_1 H-High | 4.9 | 5.1 | 5.0 | 0.1 | %vol
SP11LKV_1 H-Mid | 1.3 | 1.3 | 1.2 | 0.0 | %vol
SP12LKV_1 FF-High | 5.8 | 5.5 | 5.5 | 0.0 | %vol
SP13LKV_1 FF-Mid | 42.3 | 42.4 | 42.1 | 0.2 | %vol
SP14LKV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP15LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP16LKV_2 BM-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol
SP17LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP18LKV_2 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP19LKV_2 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP20LKV_1 STUD-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP21LKV_1 FF-Void | 2.7 | 2.7 | 2.7 | 0.0 | %vol
SP22LKV_2 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol
SP23LKV_2 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol

OUTLET_PRESSURE | 0.4508 | 0.482 | 0.428 | 0.019 | barg
LOWFLOWMETER | 1.9368 | 1.984 | 1.673 | 0.037 | g/s
OUTLET_TEMP | 7.5 | 7.7 | 7.4 | 0.1 | degC
Volume Flow Rate | 1300.4 | 1338.9 | 1264.3 | 24.7 | SLPM
Energy Flow Rate | 231.0 | 237.9 | 224.6 | 4.4 | kW
External Wind Speed | 2.8 | 0.0 | 0.0 | 0.0 | m/s
External Wind Direction | 46.6 | 0.0 | 0.0 | 0.0 | bearing
Hy4Heat WP7 Test Result

L2-A10 RESULT

MTP ID: L2-A10
Hole Size: 15 mm
Notes: Similar configuration and flow rate with no vents gives ~60% at kitchen mid and high points
Location: with cupboard vents
Gas: hydrogen
Date: 21/04/2020 Time: 09:06:00

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1LKV_1 K-High</td>
<td>40.5</td>
<td>40.5</td>
<td>40.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 K-Mid</td>
<td>35.5</td>
<td>36.1</td>
<td>35.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP3LKV_1 Cup-High</td>
<td>49.7</td>
<td>49.7</td>
<td>49.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>49.2</td>
<td>49.2</td>
<td>49.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP5LKV_1 Cup-Low</td>
<td>50.8</td>
<td>50.8</td>
<td>50.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 Cup-mid</td>
<td>44.7</td>
<td>44.8</td>
<td>44.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP7LKV_1 K-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP8LKV_1 LR-High</td>
<td>40.5</td>
<td>40.5</td>
<td>40.4</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP9LKV_1 LR-Mid</td>
<td>35.5</td>
<td>36.1</td>
<td>35.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP10LKV_1 H-High</td>
<td>49.7</td>
<td>49.7</td>
<td>49.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP11LKV_1 H-Mid</td>
<td>35.5</td>
<td>36.1</td>
<td>35.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP12LKV_1 FF-High</td>
<td>49.2</td>
<td>49.2</td>
<td>49.1</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP13LKV_1 FF-Mid</td>
<td>35.5</td>
<td>36.1</td>
<td>35.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP14LKV_2 AT-High</td>
<td>49.4</td>
<td>50.8</td>
<td>49.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP15LKV_2 AT-Mid</td>
<td>2.9</td>
<td>3.0</td>
<td>2.9</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP16LKV_2 BM-High</td>
<td>44.7</td>
<td>44.8</td>
<td>44.6</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP17LKV_2 BM-Mid</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP18LKV_2 BM-Low</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP19LKV_2 NWALL-Cav</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP20LKV_2 STUD-Cav</td>
<td>2.5</td>
<td>2.6</td>
<td>2.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP21LKV_2 FF-Void</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP22LKV_2 SF-Void</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>OUTLET_PRESSURE</td>
<td>0.3797</td>
<td>0.382</td>
<td>0.377</td>
<td>0.001</td>
<td>barg</td>
</tr>
<tr>
<td>LOWFLOWMETER</td>
<td>1.9644</td>
<td>1.970</td>
<td>1.958</td>
<td>0.002</td>
<td>g/s</td>
</tr>
<tr>
<td>OUTLET_TEMP</td>
<td>18.4</td>
<td>19.3</td>
<td>17.9</td>
<td>0.4</td>
<td>degC</td>
</tr>
<tr>
<td>Volume Flow Rate</td>
<td>1325.8</td>
<td>1329.5</td>
<td>1321.6</td>
<td>1.5</td>
<td>SLPM</td>
</tr>
<tr>
<td>Energy Flow Rate</td>
<td>235.5</td>
<td>236.2</td>
<td>234.8</td>
<td>0.3</td>
<td>kW</td>
</tr>
<tr>
<td>External Wind Speed</td>
<td>5.0</td>
<td></td>
<td></td>
<td>0</td>
<td>m/s</td>
</tr>
</tbody>
</table>

Kitchen Concentrations

Cupboard Concentrations

Mass Flow Rate

Hallway and Stud into Living Room

DNV GL – Report No. 630650, Rev. 3 FINAL – www.dnvgl.com
## L2-A11 RESULT

### Hy4Heat WP7 Test Result

**MTP ID:** L2-A11  
**Hole Size:** 15 mm  
**Location:** Kitchen base cupboard no vents  
**Date:** 02/04/2020  
**Time:** 06:22:00  
**Gas:** Hydrogen  

**Averaging Period Start:** 0 min  
**End:** 110 min  

**Notes:** No equivalent configuration in past work, similar release with no vents into boiler cupboard produced 72% high and 36% mid height in the kitchen.

### Sensor Data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Average</th>
<th>Max</th>
<th>Min</th>
<th>STDEV</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP4LKV_1 AL-High</td>
<td>60.1</td>
<td>60.2</td>
<td>59.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 K-Mid</td>
<td>56.5</td>
<td>56.9</td>
<td>56.3</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-back</td>
<td>67.7</td>
<td>67.9</td>
<td>67.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 Cup-High-Front</td>
<td>64.6</td>
<td>65.3</td>
<td>64.0</td>
<td>0.6</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 cup-low</td>
<td>56.6</td>
<td>57.4</td>
<td>55.4</td>
<td>0.8</td>
<td>%vol</td>
</tr>
<tr>
<td>SP4LKV_1 cup-mid</td>
<td>68.6</td>
<td>68.7</td>
<td>68.4</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>GFTKV_1 K-Low</td>
<td>11.9</td>
<td>12.3</td>
<td>8.7</td>
<td>0.7</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 UR-High</td>
<td>20.7</td>
<td>20.8</td>
<td>20.5</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 UR-Mid</td>
<td>8.8</td>
<td>9.1</td>
<td>8.4</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 H-High</td>
<td>20.3</td>
<td>20.9</td>
<td>19.9</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 H-Mid</td>
<td>9.4</td>
<td>9.6</td>
<td>9.1</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 FF-High</td>
<td>12.2</td>
<td>12.6</td>
<td>11.7</td>
<td>0.4</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 FF-Mid</td>
<td>11.6</td>
<td>12.0</td>
<td>11.4</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 AT-High</td>
<td>9.8</td>
<td>10.1</td>
<td>9.5</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_1 AT-Mid</td>
<td>10.2</td>
<td>10.5</td>
<td>9.5</td>
<td>0.2</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 BM-High</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 BM-Mid</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 BM-Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP6LKV_2 NVALL-Cav</td>
<td>1.7</td>
<td>1.8</td>
<td>1.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 STUD-Cav</td>
<td>3.9</td>
<td>4.0</td>
<td>3.8</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 FF-Void</td>
<td>53.1</td>
<td>53.2</td>
<td>53.0</td>
<td>0.1</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_1 SF-Void</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.0</td>
<td>%vol</td>
</tr>
<tr>
<td>SP2LKV_2 ROOF-Void</td>
<td>2.8</td>
<td>3.0</td>
<td>2.6</td>
<td>0.2</td>
<td>%vol</td>
</tr>
</tbody>
</table>

### Concentration Graphs

- **Kitchen Concentrations**
- **Cupboard Concentrations**
- **Hallway and Stud into Living Room**

**Measuring Period:** From 0 min to 110 min

### Additional Data

- **Outlet Temp:** 6.4 degC  
- **Volume Flow Rate:** 1314.9 SLPM  
- **Energy Flow Rate:** 233.6 kW  
- **External Wind Speed:** 5.1 m/s  
- **Hallway and Stud into Living Room:** 9.4 %vol

---

**DNV GL - Report No. 630650, Rev. 3 FINAL - www.dnvgl.com**
APPENDIX C: AIR TIGHTNESS TESTING REPORT
Air Leakage Test Report

In compliance with ATTMA TSL1 and TSL2

Northern Air Tightness Testing Services Ltd

Building Address: East House
Excluding Cellar
MOD 5
Brampton, Cumbria
England

Performed for:

Performed by: Phil Ramshaw
Test date: 2019-10-14
Associated Test file: East House Excluding Cellar (2)
Report Number: 0000
Unique Property ID Number:
Summary

<table>
<thead>
<tr>
<th>Test date: 2019-10-14</th>
<th>By: Phil Ramshaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer:</td>
<td></td>
</tr>
<tr>
<td>Building Lot Number:</td>
<td></td>
</tr>
<tr>
<td>Building address:</td>
<td>East House</td>
</tr>
<tr>
<td></td>
<td>Excluding Cellar</td>
</tr>
<tr>
<td></td>
<td>MOD 5</td>
</tr>
<tr>
<td></td>
<td>Brampton, Cumbria</td>
</tr>
<tr>
<td></td>
<td>England</td>
</tr>
</tbody>
</table>

Building and Test Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test file name:</td>
<td>East House Excluding Cellar [2]</td>
</tr>
<tr>
<td>Building volume [m³]:</td>
<td>247</td>
</tr>
<tr>
<td>Envelope Area [m²]:</td>
<td>245.3</td>
</tr>
<tr>
<td>Floor Area [m²]:</td>
<td>37.7</td>
</tr>
<tr>
<td>Building Height (from ground to top) [m]:</td>
<td>0</td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air flow at 50 Pa, Q50 [m³/h]</td>
<td>1044.5</td>
</tr>
<tr>
<td>Air changes, n50</td>
<td>4.23</td>
</tr>
<tr>
<td>Equivalent leakage area at 50 Pa [cm²]</td>
<td>198.0</td>
</tr>
<tr>
<td>Permeability at 50 Pa [m³/h/m²]</td>
<td>4.259</td>
</tr>
</tbody>
</table>

Compliance

If you are not happy with my service, please contact me: Phil Ramshaw, or the Scheme Manager at BINDT.
Assumptions and warnings

While FanTestic software may calculate air leakage results based on user input, use of this software does not in any way guarantee these results.
Building Information

Building Measurements

Building Volume \([m^3]\): 247

Envelope Area \((A_1) [m^2]\): 245.3

Building Height (from ground to top) [m]: 0

Heating/Ventilation System

HVAC Systems Present:

None

Pictures

Test Method

Carried out in accordance with the following standards:

- ATTMA TS1 Issue 2 – Measuring Air Permeability of Building Envelopes
- BS EN13829:2001 Thermal Performance of Buildings
- BINDT – Quality Procedures and Explanatory Notes for Air Tightness Testing

The building was tested using the equipment listed in the equipment appendix.

Openings and Temporary Sealing

cellar

Deviations from Standard Methods:

none

Large Building Setup Notes:

Tester Complaints:

House 1

Discussion of Results

Combined Test Data (Tested in one direction only)

<table>
<thead>
<tr>
<th>Results</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air flow at 50 Pa, (Q_{50}) [(m^3/h)]</td>
<td>1044.5</td>
</tr>
<tr>
<td>Air changes, (n_{50})</td>
<td>4.23</td>
</tr>
<tr>
<td>Equivalent leakage area at 50 Pa ([cm^2])</td>
<td>198.0</td>
</tr>
<tr>
<td>Permeability at 50 Pa ([m^3/h/m^2])</td>
<td>4.259</td>
</tr>
</tbody>
</table>
Air Leakage Test Data Appendix–

Depressurize Data Set

Test Dataset Date: 2019-10-14
Start time: 12:06:00

Test was carried out under Method B (method A, B or C).

(Add notes here)

<table>
<thead>
<tr>
<th>Environmental Conditions</th>
<th>Wind speed: 0 from the</th>
<th>Operator Location: Inside the building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Bias Pressure:</td>
<td>0.16 Pa</td>
<td>Final Bias Pressure: 0.16 Pa</td>
</tr>
<tr>
<td>Average Bias Pressure:</td>
<td>0.16 Pa</td>
<td></td>
</tr>
<tr>
<td>Initial Temperature:</td>
<td>indoors: 15 C</td>
<td>Final Temperature: outdoors: 13 C</td>
</tr>
<tr>
<td>Barometric Pressure:</td>
<td>98 kPa</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Analysis</th>
<th>Coefficient of Determination, $r^2$: 0.9944</th>
<th>95% confidence limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope, $n$:</td>
<td>0.719</td>
<td>0.65680</td>
</tr>
<tr>
<td>Intercept, $C_{int}$ [m³/h/Pa⁻¹]:</td>
<td>62.884</td>
<td>50.07</td>
</tr>
</tbody>
</table>

Results | Uncertainty
---|---
Air flow at 50 Pa, $Q_{50}$ [m³/h]: | 1044.6 | +/-2.3% |
Air changes, $\Delta Q_{50}$: | 4.229 | +/-2.3% |
Equivalent leakage area at 50 Pa [cm²]: | 197.8 | +/-2.3% |
Permeability at 50 Pa, $AP_{50}$ [m³/h/m²]: | 4.2593 | +/-2.3% |

<table>
<thead>
<tr>
<th>Measured pressure [Pa]</th>
<th>-25.0</th>
<th>-30.0</th>
<th>-35.0</th>
<th>-40.0</th>
<th>-45.0</th>
<th>-50.0</th>
<th>-55.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induced Pressure [Pa]</td>
<td>-25.2</td>
<td>-30.2</td>
<td>-35.2</td>
<td>-40.2</td>
<td>-45.2</td>
<td>-50.2</td>
<td>-55.2</td>
</tr>
<tr>
<td>#1, Range C4 Fan Pressure [Pa]</td>
<td>73.0</td>
<td>99.0</td>
<td>120.0</td>
<td>149.0</td>
<td>175.0</td>
<td>196.0</td>
<td>215.0</td>
</tr>
<tr>
<td>Flow [m³/h]</td>
<td>623.0</td>
<td>729.6</td>
<td>806.1</td>
<td>901.9</td>
<td>980.4</td>
<td>1040</td>
<td>1091</td>
</tr>
<tr>
<td>Total Flow, $Q_c$ [m³/h]</td>
<td>622.965</td>
<td>729.593</td>
<td>806.134</td>
<td>901.900</td>
<td>980.356</td>
<td>1039.70</td>
<td>1090.80</td>
</tr>
<tr>
<td>Corrected</td>
<td>627.790</td>
<td>735.245</td>
<td>812.379</td>
<td>908.887</td>
<td>987.950</td>
<td>1047.75</td>
<td>1099.25</td>
</tr>
</tbody>
</table>
Flow, $Q_{\text{avg}}$ [m³/h]

| Error [%] | -1.8% | 1.0% | 0.0% | 1.6% | 1.5% | -0.1% | -2.2% |

11 induced pressures each taken for 0 of the required 20 seconds.

12 baseline pressures each taken for 0 of required 10 seconds.

Average Baseline, $\Delta P$: 0.16 Pa

<table>
<thead>
<tr>
<th>Static Pressure Averages:</th>
<th>$\Delta P$ 0.16</th>
<th>$\Delta P01-0.00$</th>
<th>$\Delta P01+0.16$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Baseline [Pa]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>initial [Pa]</td>
<td>$\Delta P01$ 0.16</td>
<td>$\Delta P02$ 0.00</td>
<td>$\Delta P02+0.16$</td>
</tr>
<tr>
<td>final [Pa]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Baseline, initial [Pa]

0.20 0.10 0.20 0.20 0.10 0.20 0.20 0.10 0.10 0.30

Baseline, final [Pa]

0.10 0.20 0.10 0.20 0.10 0.30 0.10 0.20 0.10 0.20

Flow vs Induced Pressure (Depressurize Set)
### Test Equipment

The following test equipment was used in the performance of the air leakage tests.

<table>
<thead>
<tr>
<th></th>
<th>Fan</th>
<th>Fan serial</th>
<th>Fan location</th>
<th>Gauge</th>
<th>Gauge serial</th>
<th>Gauge Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Retrotec 1000</td>
<td>1fn002401</td>
<td></td>
<td>DM32</td>
<td>401293</td>
<td></td>
</tr>
</tbody>
</table>

### Fan Calibration Certificate Retrotec 1000:

<table>
<thead>
<tr>
<th>Range</th>
<th>n</th>
<th>K</th>
<th>K1</th>
<th>K2</th>
<th>K3</th>
<th>K4</th>
<th>Mf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open[22]</td>
<td>0.512</td>
<td>0.2486</td>
<td>0</td>
<td>0.8</td>
<td>0</td>
<td>1</td>
<td>8.6</td>
</tr>
<tr>
<td>A</td>
<td>0.5016</td>
<td>0.1302</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>B</td>
<td>0.4841</td>
<td>0.0853</td>
<td>0</td>
<td>0.3</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C8</td>
<td>0.5085</td>
<td>0.0368</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C6</td>
<td>0.5071</td>
<td>0.0282</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C4</td>
<td>0.5186</td>
<td>0.0187</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C2</td>
<td>0.5085</td>
<td>0.0103</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C1</td>
<td>0.5472</td>
<td>0.0047</td>
<td>0</td>
<td>0.4</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>L4</td>
<td>0.48</td>
<td>0.00193475</td>
<td>0.003</td>
<td>1</td>
<td>0.00000019</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>L2</td>
<td>0.502</td>
<td>0.00097589</td>
<td>0</td>
<td>0.5</td>
<td>0.00000005</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>L1</td>
<td>0.4925</td>
<td>0.00054812</td>
<td>0.1</td>
<td>0.5</td>
<td>0.00000005</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

Fan Pressure (FP) is the measured fan pressure when using a self-referenced fan or when Room Pressure (RP) is negative. If using a fan which is not self-referenced, and Room Pressure is positive, Fan Pressure is calculated by subtracting the measured Room Pressure from the Absolute Value of the Fan Pressure.

If PrA>0 and fan is not self-referencing: FP = |PrB| - PrA
If PrA<0 or fan is self-referencing: FP = PrB
Flow calculations are not valid if Fan Pressure is less than either MF or \((K2 \times |RP|)\).

Flow in m\(^3\)/s using the above coefficients is calculated as follows for standard Ranges:

\[
flow = (FP - (|RP| \times K1))^N + (K + (K3 \times FP))
\]
About DNV GL

DNV GL is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.