



FairHeat

Low Temperature VVART Calculation for Frese HIU

Primary flow temperature = 60°C, DHW set point = 50°C, Space heating temperatures = 45°C/35°C

Test carried out by RISE between February 2017 and March 2017, Test Reference 7P01636

Manufacturer: Fortes Import Installatie Agenturen B.V.; Model: Arctic Twin Plate 420; Serial number: A727-20174-20194; Year of manufacture: 2017

VVART calculation prepared by Tom Naughton of FairHeat Ltd on 25 April 2017

| | VVART (°C) | Volume (m ³) |
|---------------|------------|--------------------------|
| DHW | 20.9 | 33.85 |
| Keep warm | 44.7 | 65.28 |
| Space heating | 35.2 | 53.02 |

| VVART with keep warm active | | |
|-----------------------------|-------------|--------|
| Period | VVART (°C) | % Time |
| No heating | 36.6 | 93% |
| Heating | 35.4 | 7% |
| Overall | 36.5 | |

| VVART with keep warm inactive * | | |
|---------------------------------|-------------|--------|
| Period | VVART (°C) | % Time |
| No heating | 20.9 | 93% |
| Heating | 34.6 | 7% |
| Overall | 21.8 | |

* HIU has ability to deactivate keep warm function

| | DHW draw test results | | | Post DHW draw (60 seconds) | |
|--------|-----------------------|-----------------------------------|------------------|-----------------------------------|------------------|
| | Power (W) | Primary flow (m ³ /hr) | Return temp (°C) | Primary flow (m ³ /hr) | Return temp (°C) |
| Low | 9855 | 0.203 | 19.76 | 0.017 | 18.8 |
| Medium | 13092 | 0.286 | 20.65 | 0.022 | 20.2 |
| High | 21253 | 0.488 | 22.86 | 0.040 | 22.8 |

| DHW draw volumes per annum | | |
|----------------------------|--------------|--------------------------|
| Energy (kWh) | Time (hours) | Volume (m ³) |
| 729 | 73.97 | 15.026 |
| 297 | 22.69 | 6.483 |
| 444 | 20.89 | 10.184 |

| Post DHW draw volumes per annum | | |
|---------------------------------|------------------------|--------------------------|
| Events | Avg duration (seconds) | Volume (m ³) |
| 10000 | 30 | 1.378 |
| 660 | 75 | 0.297 |
| 300 | 145 | 0.486 |

| Keep warm test results | |
|-----------------------------------|------------------|
| Primary flow (m ³ /hr) | Return temp (°C) |
| 0.008 | 44.7 |

| Keep warm volumes per annum | |
|-----------------------------|--------------------------|
| Time (hours) | Volume (m ³) |
| 8044 | 65.284 |

| | Space heating test results | | |
|------|----------------------------|-----------------------------------|------------------|
| | Power (W) | Primary flow (m ³ /hr) | Return temp (°C) |
| 1 kW | 1020 | 0.038 | 34.8 |
| 2 kW | 2155 | 0.078 | 35.1 |
| 4 kW | 4122 | 0.152 | 35.5 |

| Space heating volumes per annum | | |
|---------------------------------|--------------|--------------------------|
| Energy (kWh) | Time (hours) | Volume (m ³) |
| 98 | 96.10 | 3.637 |
| 787 | 365.22 | 28.591 |
| 565 | 137.07 | 20.795 |