# Calculation and Selection Result

## A.Project Overview

| Project Name | USC Płock |
| --- | --- |
| Country | Poland |
| City | Gdańsk |
| Address |  |
| Client Name |  |
| Client Address |  |
| Reference |  |
| Revision |  |
| Project Date | 9 / 18 / 2019 |
| Altitude | m |
| Cooling Condition: Indoor Dry-bulb | 27.0 °C |
| Cooling Condition: Indoor Wet-bulb | 19.0 °C |
| Cooling Condition: Outdoor Dry-bulb | 28.0 °C |
| Cooling condition: Outdoor wet bulb | 25.0 °C |
| Heating Condition: Indoor Dry-bulb | 20.0 °C |
| Heating Condition: Outdoor Dry-bulb | -16.0 °C |
| Heating Condition: Outdoor Wet-bulb | -16.3 °C |

## B.Material List

| **Model** | **Quantity** | **Description** |
| --- | --- | --- |
| MDV-V120W/DRN1 | 1 | All DC Inverter Mini VRF (380V) |
| MI2-36GDN1 | 6 | Wall\_mounted (2nd DC IDU) |
| MI2-56GDN1 | 7 | Wall\_mounted (2nd DC IDU) |
| MDV-V260W/DRN1 | 2 | DC Inverter Individual VRF (380V 20-45kW) |
| FQZHN-01D | 8 | Branch Joint |
| FQZHN-02D | 2 | Branch Joint |
| Ø22.2 | 25.0 m | Copper Pipe |
| Ø19.1 | 6.0 m | Copper Pipe |
| Ø15.9 | 48.5 m | Copper Pipe |
| Ø12.7 | 18.5 m | Copper Pipe |
| Ø9.53 | 79.5 m | Copper Pipe |
| Ø6.35 | 18.5 m | Copper Pipe |
| WDC-86E/KD | 13 | 2nd generation wired controller |

## System1

## 1.1 Material List

| **Model** | **Quantity** | **Description** |
| --- | --- | --- |
| MDV-V120W/DRN1 | 1 | All DC Inverter Mini VRF (380V) |
| MI2-36GDN1 | 2 | Wall\_mounted (2nd DC IDU) |
| MI2-56GDN1 | 1 | Wall\_mounted (2nd DC IDU) |
| FQZHN-01D | 2 | Branch Joint |
| WDC-86E/KD | 3 | 2nd generation wired controller |
| Ø15.9 | 24.5 m | Copper Pipe |
| Ø12.7 | 9.5 m | Copper Pipe |
| Ø9.53 | 24.5 m | Copper Pipe |
| Ø6.35 | 9.5 m | Copper Pipe |

## 1.2 Indoor Unit Specifications

| **IDU Name** | **Model** | **Sound (dB(A))** | **Weight(kg)** | **Dimension(mm)**  **W x H x D** | **Power Supply** | **Rated Power(W)** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0-24 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |
| 0-27 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 0-28 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |

| **IDU Name** | **Model** | **Cooling AT**  **(°C)** | **Req.TC**  **(kW)** | **TC**  **(kW)** | **Req.SC**  **(kW)** | **SC**  **(kW)** | **Heating AT**  **(°C)** | **Req.HC**  **(kW)** | **HC**  **(kW)** | **Air flow**  **(m^3/h)** | **ESP**  **(Pa)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0-24 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.49 | 0.00 | 2.32 | 20.0 | 0.00 | 2.49 | 656(SSH) | N/A |
| 0-27 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.43 | 0.00 | 3.30 | 20.0 | 0.00 | 3.92 | 747(SSH) | N/A |
| 0-28 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.49 | 0.00 | 2.32 | 20.0 | 0.00 | 2.49 | 656(SSH) | N/A |

## 1.3 Outdoor Unit Specifications

| **Name** | **Model** | **Module** | **Dimension(mm)** | **Weight(kg)** | **Base refr(kg)** | **Add refr(kg)** | **Power Supply** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU1 | MDV-V120W/DRN1 | MDV-V120W/DRN1 | 900\*1327\*400 | 95.00 | 3.30 | 1.81 | 380~415V~50Hz~3ph | N/A | N/A |

| **Name** | **Model** | **CR%** | **Temp(°C)** | **CC(kW)** | **Req CC(kW)** | **Temp(H/RH)(°C)** | **HC(kW)** | **Req HC(kW)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU1 | MDV-V120W/DRN1 | 104.07 | 28.0 | 12.43 | 0.00 | -16.0/86% | 8.91 | 0.00 |

| **Name** | **Model** | **EER** | **COP** | **Cooling Power(kW)** | **Heating Power(kW)** |
| --- | --- | --- | --- | --- | --- |
| ODU1 | MDV-V120W/DRN1 | 4.68 | 2.58 | 2.71 | 3.48 |

Req.TC: Required Total Cooling Capacity

Req.SC: Required Sensible Cooling Capacity

Req.HC: Required Total Heating Capacity

TC: Available Total Cooling Capacity

SC: Available Sensible Cooling Capacity

HC: Available Total Heating Capacity

AT: Ambient Temperature

ESP: External Static Pressure

Req.CC: Required Cooling Capacity

CC: Available Cooling Capacity

## 1.4 Piping and Mode Selection Devices

| IDU Quantity | 3/6 |
| --- | --- |
| Combination Ratio | 104.07% |
| Additional refrigerant charge | 1.81 kg  = 9.50(6.35) \* 0.022 + 24.50(9.53) \* 0.057 + 2 \* 0.1 |
| Factory refrigerant charge | 3.30 kg |
| Total refrigerant charge | 5.11 kg |
| Total Pipe Length | 35 m / 100 m |
| Furthest Actual | 28 m / 60 m |
| Furthest Equivalent | 29 m / 70 m |
| Furthest Equivalent from First Branch to IDU | 8.5 m / 20 m |
| Drop Height between IDU and IDU | 0 m / 8 m |
| Drop height between IDU and ODU(Below ODU) | 3 m / 30 m |
| Available Capacity Cooling | 12.43 kW |
| Available Capacity Heating | 8.91 kW |

Note:

1.The equivalent length of each branch joint is 0.5m.

Pipe

| **No.** | **Length** | **Gas Pipe** | **Liquid Pipe** |
| --- | --- | --- | --- |
| (1) | 20.0 m | Ø15.9 | Ø9.53 |
| (2) | 2.0 m | Ø12.7 | Ø6.35 |
| (3) | 0.5 m | Ø15.9 | Ø9.53 |
| (4) | 4.0 m | Ø15.9 | Ø9.53 |
| (5) | 7.5 m | Ø12.7 | Ø6.35 |

Branch Joint

| **No.** | **Load kW** | **Model** |
| --- | --- | --- |
| (1) | 12.80 | FQZHN-01D |
| (2) | 9.20 | FQZHN-01D |

## 1.5 Piping Diagram



## 1.6 Wiring Diagram



## System2

## 2.1 Material List

| **Model** | **Quantity** | **Description** |
| --- | --- | --- |
| MDV-V260W/DRN1 | 1 | DC Inverter Individual VRF (380V 20-45kW) |
| MI2-56GDN1 | 3 | Wall\_mounted (2nd DC IDU) |
| MI2-36GDN1 | 2 | Wall\_mounted (2nd DC IDU) |
| FQZHN-02D | 1 | Branch Joint |
| FQZHN-01D | 3 | Branch Joint |
| WDC-86E/KD | 5 | 2nd generation wired controller |
| Ø22.2 | 6.0 m | Copper Pipe |
| Ø19.1 | 3.0 m | Copper Pipe |
| Ø15.9 | 12.0 m | Copper Pipe |
| Ø12.7 | 4.5 m | Copper Pipe |
| Ø9.53 | 21.0 m | Copper Pipe |
| Ø6.35 | 4.5 m | Copper Pipe |

## 2.2 Indoor Unit Specifications

| **IDU Name** | **Model** | **Sound (dB(A))** | **Weight(kg)** | **Dimension(mm)**  **W x H x D** | **Power Supply** | **Rated Power(W)** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-16 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 1-16 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 1-17 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 1-18 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |
| 1-19 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |

| **IDU Name** | **Model** | **Cooling AT**  **(°C)** | **Req.TC**  **(kW)** | **TC**  **(kW)** | **Req.SC**  **(kW)** | **SC**  **(kW)** | **Heating AT**  **(°C)** | **Req.HC**  **(kW)** | **HC**  **(kW)** | **Air flow**  **(m^3/h)** | **ESP**  **(Pa)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-16 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.50 | 0.00 | 3.34 | 20.0 | 0.00 | 4.60 | 747(SSH) | N/A |
| 1-16 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.50 | 0.00 | 3.34 | 20.0 | 0.00 | 4.60 | 747(SSH) | N/A |
| 1-17 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.48 | 0.00 | 3.33 | 20.0 | 0.00 | 4.57 | 747(SSH) | N/A |
| 1-18 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.51 | 0.00 | 2.34 | 20.0 | 0.00 | 2.88 | 656(SSH) | N/A |
| 1-19 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.49 | 0.00 | 2.32 | 20.0 | 0.00 | 2.87 | 656(SSH) | N/A |

## 2.3 Outdoor Unit Specifications

| **Name** | **Model** | **Module** | **Dimension(mm)** | **Weight(kg)** | **Base refr(kg)** | **Add refr(kg)** | **Power Supply** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU2 | MDV-V260W/DRN1 | MDV-V260W/DRN1 | 1120\*1558\*528 | 147.00 | 6.20 | 1.41 | 380-415V-3ph-50Hz | N/A | N/A |

| **Name** | **Model** | **CR%** | **Temp(°C)** | **CC(kW)** | **Req CC(kW)** | **Temp(H/RH)(°C)** | **HC(kW)** | **Req HC(kW)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU2 | MDV-V260W/DRN1 | 92.31 | 28.0 | 25.58 | 0.00 | -16.0/86% | 19.69 | 0.00 |

| **Name** | **Model** | **EER** | **COP** | **Cooling Power(kW)** | **Heating Power(kW)** |
| --- | --- | --- | --- | --- | --- |
| ODU2 | MDV-V260W/DRN1 | 4.45 | 2.68 | 5.39 | 7.38 |

Req.TC: Required Total Cooling Capacity

Req.SC: Required Sensible Cooling Capacity

Req.HC: Required Total Heating Capacity

TC: Available Total Cooling Capacity

SC: Available Sensible Cooling Capacity

HC: Available Total Heating Capacity

AT: Ambient Temperature

ESP: External Static Pressure

Req.CC: Required Cooling Capacity

CC: Available Cooling Capacity

## 2.4 Piping and Mode Selection Devices

| IDU Quantity | 5/12 |
| --- | --- |
| Combination Ratio | 92.31% |
| Additional refrigerant charge | 1.41 kg  = 4.50(6.35) \* 0.022 + 23.00(9.53) \* 0.057 |
| Factory refrigerant charge | 6.20 kg |
| Total refrigerant charge | 7.61 kg |
| Total Pipe Length | 27.5 m / 120 m |
| Furthest Actual | 23.5 m / 60 m |
| Furthest Equivalent | 25.5 m / 70 m |
| Furthest Equivalent from First Branch to IDU | 19 m / 20(40) m |
| Drop Height between IDU and IDU | 0 m / 8 m |
| Drop height between IDU and ODU(Below ODU) | 3 m / 30 m |
| Available Capacity Cooling | 23.61 kW |
| Available Capacity Heating | 19.66 kW |

Note:

1.The equivalent length of each branch joint is 0.5m.

Pipe

| **No.** | **Length** | **Gas Pipe** | **Liquid Pipe** |
| --- | --- | --- | --- |
| (1) | 6.0 m | Ø22.2 | Ø9.53 |
| (2) | 3.0 m | Ø19.1 | Ø9.53 |
| (3) | 8.0 m | Ø15.9 | Ø9.53 |
| (4) | 2.5 m | Ø15.9 | Ø9.53 |
| (5) | 0.5 m | Ø15.9 | Ø9.53 |
| (6) | 0.5 m | Ø15.9 | Ø9.53 |
| (7) | 0.5 m | Ø15.9 | Ø9.53 |
| (8) | 0.5 m | Ø12.7 | Ø6.35 |
| (9) | 4.0 m | Ø12.7 | Ø6.35 |

Branch Joint

| **No.** | **Load kW** | **Model** |
| --- | --- | --- |
| (1) | 24.00 | FQZHN-02D |
| (2) | 18.40 | FQZHN-01D |
| (3) | 12.80 | FQZHN-01D |
| (4) | 7.20 | FQZHN-01D |

## 2.5 Piping Diagram



## 2.6 Wiring Diagram



## System3

## 3.1 Material List

| **Model** | **Quantity** | **Description** |
| --- | --- | --- |
| MDV-V260W/DRN1 | 1 | DC Inverter Individual VRF (380V 20-45kW) |
| MI2-36GDN1 | 2 | Wall\_mounted (2nd DC IDU) |
| MI2-56GDN1 | 3 | Wall\_mounted (2nd DC IDU) |
| FQZHN-02D | 1 | Branch Joint |
| FQZHN-01D | 3 | Branch Joint |
| WDC-86E/KD | 5 | 2nd generation wired controller |
| Ø22.2 | 19.0 m | Copper Pipe |
| Ø19.1 | 3.0 m | Copper Pipe |
| Ø15.9 | 12.0 m | Copper Pipe |
| Ø12.7 | 4.5 m | Copper Pipe |
| Ø9.53 | 34.0 m | Copper Pipe |
| Ø6.35 | 4.5 m | Copper Pipe |

## 3.2 Indoor Unit Specifications

| **IDU Name** | **Model** | **Sound (dB(A))** | **Weight(kg)** | **Dimension(mm)**  **W x H x D** | **Power Supply** | **Rated Power(W)** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2-19 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |
| 2-18 | MI2-36GDN1 | 33(SSH) | 11.40 | 990\*315\*223 | 220-240,50,1 | 30 | N/A | N/A |
| 2-17 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 2-16 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |
| 2-16 | MI2-56GDN1 | 38(SSH) | 12.80 | 990\*315\*223 | 220-240,50,1 | 45 | N/A | N/A |

| **IDU Name** | **Model** | **Cooling AT**  **(°C)** | **Req.TC**  **(kW)** | **TC**  **(kW)** | **Req.SC**  **(kW)** | **SC**  **(kW)** | **Heating AT**  **(°C)** | **Req.HC**  **(kW)** | **HC**  **(kW)** | **Air flow**  **(m^3/h)** | **ESP**  **(Pa)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2-19 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.44 | 0.00 | 2.29 | 20.0 | 0.00 | 2.85 | 656(SSH) | N/A |
| 2-18 | MI2-36GDN1 | 27.0/19.0 | 0.00 | 3.46 | 0.00 | 2.31 | 20.0 | 0.00 | 2.86 | 656(SSH) | N/A |
| 2-17 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.42 | 0.00 | 3.29 | 20.0 | 0.00 | 4.55 | 747(SSH) | N/A |
| 2-16 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.44 | 0.00 | 3.30 | 20.0 | 0.00 | 4.58 | 747(SSH) | N/A |
| 2-16 | MI2-56GDN1 | 27.0/19.0 | 0.00 | 5.44 | 0.00 | 3.30 | 20.0 | 0.00 | 4.58 | 747(SSH) | N/A |

## 3.3 Outdoor Unit Specifications

| **Name** | **Model** | **Module** | **Dimension(mm)** | **Weight(kg)** | **Base refr(kg)** | **Add refr(kg)** | **Power Supply** | **MCA(A)** | **MFA(A)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU3 | MDV-V260W/DRN1 | MDV-V260W/DRN1 | 1120\*1558\*528 | 147.00 | 6.20 | 2.15 | 380-415V-3ph-50Hz | N/A | N/A |

| **Name** | **Model** | **CR%** | **Temp(°C)** | **CC(kW)** | **Req CC(kW)** | **Temp(H/RH)(°C)** | **HC(kW)** | **Req HC(kW)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ODU3 | MDV-V260W/DRN1 | 92.31 | 28.0 | 25.26 | 0.00 | -16.0/86% | 19.58 | 0.00 |

| **Name** | **Model** | **EER** | **COP** | **Cooling Power(kW)** | **Heating Power(kW)** |
| --- | --- | --- | --- | --- | --- |
| ODU3 | MDV-V260W/DRN1 | 4.45 | 2.68 | 5.39 | 7.38 |

Req.TC: Required Total Cooling Capacity

Req.SC: Required Sensible Cooling Capacity

Req.HC: Required Total Heating Capacity

TC: Available Total Cooling Capacity

SC: Available Sensible Cooling Capacity

HC: Available Total Heating Capacity

AT: Ambient Temperature

ESP: External Static Pressure

Req.CC: Required Cooling Capacity

CC: Available Cooling Capacity

## 3.4 Piping and Mode Selection Devices

| IDU Quantity | 5/12 |
| --- | --- |
| Combination Ratio | 92.31% |
| Additional refrigerant charge | 2.15 kg  = 4.50(6.35) \* 0.022 + 36.00(9.53) \* 0.057 |
| Factory refrigerant charge | 6.20 kg |
| Total refrigerant charge | 8.35 kg |
| Total Pipe Length | 40.5 m / 120 m |
| Furthest Actual | 36.5 m / 60 m |
| Furthest Equivalent | 38.5 m / 70 m |
| Furthest Equivalent from First Branch to IDU | 19 m / 20(40) m |
| Drop Height between IDU and IDU | 0 m / 8 m |
| Drop height between IDU and ODU(Below ODU) | 3 m / 30 m |
| Available Capacity Cooling | 23.32 kW |
| Available Capacity Heating | 19.56 kW |

Note:

1.The equivalent length of each branch joint is 0.5m.

Pipe

| **No.** | **Length** | **Gas Pipe** | **Liquid Pipe** |
| --- | --- | --- | --- |
| (1) | 19.0 m | Ø22.2 | Ø9.53 |
| (2) | 3.0 m | Ø19.1 | Ø9.53 |
| (3) | 8.0 m | Ø15.9 | Ø9.53 |
| (4) | 2.5 m | Ø15.9 | Ø9.53 |
| (5) | 4.0 m | Ø12.7 | Ø6.35 |
| (6) | 0.5 m | Ø12.7 | Ø6.35 |
| (7) | 0.5 m | Ø15.9 | Ø9.53 |
| (8) | 0.5 m | Ø15.9 | Ø9.53 |
| (9) | 0.5 m | Ø15.9 | Ø9.53 |

Branch Joint

| **No.** | **Load kW** | **Model** |
| --- | --- | --- |
| (1) | 24.00 | FQZHN-02D |
| (2) | 18.40 | FQZHN-01D |
| (3) | 12.80 | FQZHN-01D |
| (4) | 7.20 | FQZHN-01D |

## 3.5 Piping Diagram



## 3.6 Wiring Diagram

