CHIGO

CENTRAL AIR-CONDITIONING

CMV MINI VRF System

Units Selection

Technical Support Division

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1. Selection procedure

1.1 General selection procedure

Select the model and calculate the capacity for each refrigerant system according to the procedure below.

- Calculation of the indoor air-conditioning load, calculate the maximum air-conditioning load for each room or zone.
- Selection of an air conditioning system
- Select the ideal air conditioning system for air conditioning of each room or zone
- Design of the control system
- Design a suitable control system for the selected air conditioning system
- Preliminary selection of indoor and outdoor units
- Make preliminary selections that are within the allowable range for the system
- Check of the tubing length and elevation difference
- Check that the length of refrigerant tubing and the elevation difference are within the allowable ranges
- Calculation of the corrected outdoor unit capacity
- Capacity correction coefficient for model, outdoor temperature conditions, tubing length and elevation difference
- Calculation of the actual capacity for each indoor unit
- Calculate the corrected indoor/outdoor capacity ratio, based on the corrected outdoor unit capacity and the total corrected capacity of all indoor units in the same system
- Recheck of the actual capacity for each indoor unit
- If the capacity is inadequate, reexamine the unit combinations.

1.2 Indoor unit selection

- Refer to **INDOOR UNIT CAPACITY TABLES** at given indoor and outdoor temperature. Select the unit that the capacity is the nearest to and greater than given load.
- Individual indoor unit capacity is subject to change by the combination.

1.2.1 Calculation of actual capacity of indoor unit

1) Because the capacity of a multi air-conditioner changes according to the temperature conditions, tubing length, elevation difference and other factors, select the correct model after taking into account the various correction values. When selecting the model, calculate the corrected capacities of the outdoor unit and each indoor unit. Use the corrected outdoor unit capacity and the total corrected capacity of all the indoor units to calculate the actual final capacity of each indoor unit.

2) Find the indoor unit capacity correction coefficient for the following items

   - Capacity correction for the indoor unit temperature conditions
     From the graph of capacity characteristics, use the indoor temperature to find the capacity correction coefficient.
   - Capacity distribution ratio based on the indoor unit tubing length and elevation difference.
     First, in the same way as for the outdoor unit, use the tubing length and elevation difference for each indoor unit to find the correction coefficient from the graph of capacity change characteristics

$$\textbf{Capacity distribution ratio for each indoor unit} = \frac{\textbf{Correction coefficient of indoor unit}}{\textbf{Correction coefficientof outdoor unit}}$$

1.3 Outdoor Unit Selection

In general, outdoor unit can be selected as follows though the location of the unit, zoning and usage of the rooms may be considered.

The indoor and outdoor unit combination is determined that the sum of indoor unit capacity index is nearest to and smaller than the capacity index at 100% combination ratio of each outdoor unit. Up to 6~8 indoor units can be connected to one outdoor unit. It is recommended to choose a larger outdoor unit if the installation space is large enough.

If the combination ratio is greater than 100%, the indoor unit selection shall be reviewed by using actual capacity of each indoor unit.

OUTDOOR UNIT CAPACITY INDEX TABLE

Outdoor Unit	Indoor unit combination ratio (kW)								
	130%	120%	110%	100%	90%	80%	70%	60%	50%
12.5KW	16.25	15	13.75	**12.5**	11.25	10	8.75	7.5	6.25
14KW	18.2	16.8	15.4	**14**	12.6	11.2	9.8	8.4	7
16KW	20.8	19.2	17.6	**16**	14.4	12.8	11.2	9.6	8
18KW	23.4	21.6	19.8	**18**	16.2	14.4	12.6	10.8	9
22.4KW	29.12	26.88	24.64	**22.4**	20.16	17.92	15.68	13.44	11.2
26KW	33.8	31.2	28.6	**26**	23.4	20.8	18.2	15.6	13
28KW	36.4	33.6	30.8	**28**	25.2	22.4	19.6	16.8	14
33.5KW	43.55	40.2	36.85	**33.5**	30.15	26.8	23.45	20.1	16.75

1.4 Actual performance data

1) Check **OUTDOOR UNIT CAPACITY TABLES**.

2) Determine correct table according to the outdoor unit model and combination ratio.

3) Enter the table at given indoor and outdoor temperature and find the outdoor unit capacity and power input. The individual indoor unit capacity (power input) can by calculated as follows.

IUC = OUC × INX/TNX

Where,

IUC: Each indoor unit capacity

OUC: Outdoors unit capacity

INX: Each indoor unit capacity index

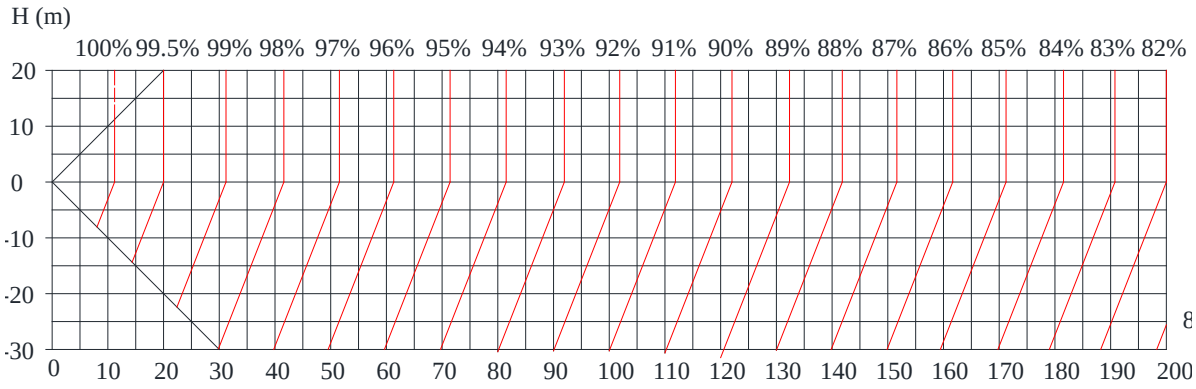
TNX: Total capacity index

4) Then, correct the indoor unit capacity according to the piping length.

5) If the corrected capacity is smaller than the load, the size of indoor unit has to be increased and repeat the same selection procedure.

1.5 Variation in capacity in accordance with the length of refrigerant pipe

1.5.1 Cooling capacity modification coefficient of the length and high difference of refrigerant pipe.



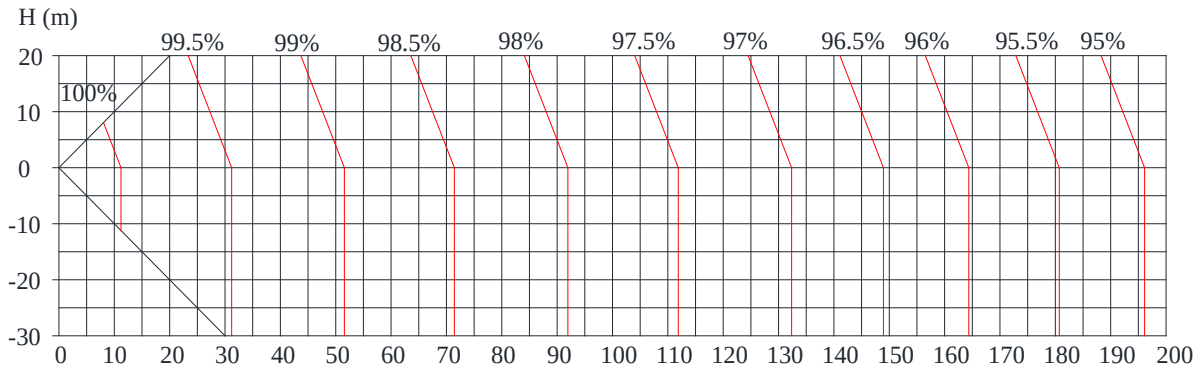
Notes:

1) H: Height difference between outdoor units and lowest indoor units.

- *Positive number indicates outdoor units are higher than indoor units.*
- *Negative number indicates outdoor units are lower than indoor units.*

2) L: Equivalent pipe length

1.5.2 Heating capacity modification coefficient of the length and high difference of refrigerant pipe.



Notes:

1) H: Height difference between outdoor units and lowest indoor units.

- *Positive number indicates outdoor units are higher than indoor units.*
- *Negative number indicates outdoor units are lower than indoor units.*

2) L: Equivalent pipe length

2. Selection example (Based on cooling load)

2.1 Given condition

1) Design condition

Cooling: Indoor 28°C (DB), 20°C (WB), Outdoor 35°C (DB)

2) Cooling load

Location	Room A	Room B	Room C	Room D	Room E	Room F
Load (kW)	2.1	2.8	2.2	2.1	3.6	2.1

3) Power supply unit: Outdoor 220~240V-1Ph-50Hz, Indoor 220~240V-1Ph-50Hz.

4) Pipe length: 50m

5) Height difference: 30m

2.2 Indoor unit selection

Select the suitable capacity for condition of 'Indoor 28°C (DB), 20°C (WB), Outdoor 35°C (DB)' using indoor unit capacity table. The selected result is as follows. (Assuming the indoor unit type is ducted type)

Location	**Room A**	**Room B**	**Room C**	**Room D**	**Room E**	**Room F**
Load (kW)	2.1	2.8	2.2	2.1	3.6	2.1
Unit size (kW)	2.2	2.8	2.2	2.2	3.6	2.2
Capacity (kW)	2.3	2.9	2.3	2.3	3.7	2.3

2.3 Outdoor unit selection

2.3.1 Assume the indoor unit and outdoor unit combination as follows

1) Calculate the total nominal capacity of indoor units in the combination according to the above table:

$$2.2 \times 4 + 2.8 \times 1 + 3.6 \times 1 = 15.2\text{kW}$$

2) Select outdoor unit: CMV-V160W/R1 which has nominal cooling capacity: 16kW.

3) Calculate the proportion between 1) and 2): 15.2/16.0= 95%

2.3.2 Result : Because the proportion is within 50～130%, this selection is go, we can go to next step.

2.3.3 Real operation data with indoor unit combination

1) For the 95% combination, calculate the cooling capacity of outdoor unit (CMV-V160W/R1).

   15.3KW ←90% (Indoor temperature: WB 20°C, Outdoor temperature: DB 35°C)

   16.2KW ←100% (Indoor temperature: WB 20°C, Outdoor temperature: DB 35°C)

   Then calculated the outdoor capacity in 92% combination index:

   Therefore: 15.3+ {(16.2-15.3)/ 10} ×5= 15.75;

2) Outdoor unit (CMV-V160W/R1) cooling temperature: DB 35°C

3) Capacity modification coefficient with pipe length (50m) and height difference (30m): 0.972

4) Each indoor unit cooling capacity

   CMV-V22TA/HR1-B: 15.75 × 2.2/15.2 × 0.972 = 2.22 (kW)

   CMV-V28TA/HR1-B: 15.75 × 2.8/15.2 × 0.972 = 2.81 (kW)

   CMV-V22TA/HR1-B: 15.75 × 2.2/15.2 × 0.972 = 2.22 (kW)

   CMV-V22TA/HR1-B: 15.75 × 2.2/15.2 × 0.972 = 2.22 (kW)

   CMV-V36TA/HR1-B: 15.72 × 3.6/15.2 × 0.972 = 3.62 (kW)

   CMV-V22TA/HR1-B: 15.75 × 2.2/15.2 × 0.972 = 2.22 (kW)

Location	Room A	Room B	Room C	Room D	Room E	Room F
Load (kW)	2.1	2.8	2.2	2.1	3.6	2.1
Unit size (kW)	2.2	2.8	2.2	2.2	3.6	2.2
Capacity (kW)	2.22	2.81	2.22	2.22	3.62	2.22

2.4 Selection result

- Outdoor unit:

  CMV-V160W/ZR1 *1

- Indoor units:

  CMV-V22TA/HR1-B *4

  CMV-V28TA/HR1-B *1

  CMV-V36TA/HR1-B *1

2.5 For more details about the effect factor such as outside ambient/inside ambient DB/WD, please refer to the performance table of indoor and outdoor units.