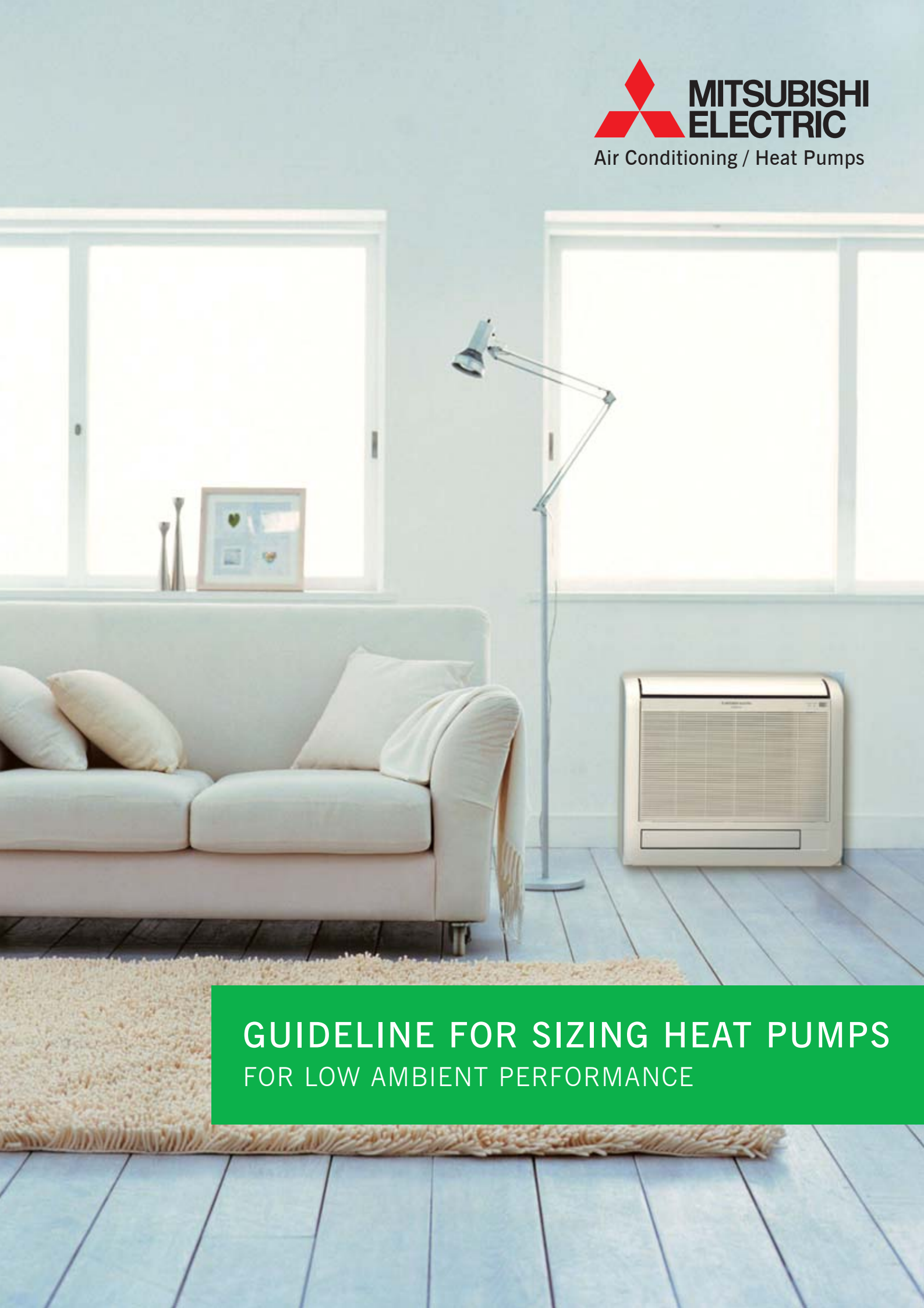

MITSUBISHI ELECTRIC

Air Conditioning / Heat Pumps

GUIDELINE FOR SIZING HEAT PUMPS

FOR LOW AMBIENT PERFORMANCE

sShhhh...

They're very, very quiet.

Quietly Superior

[CONTENTS]

[INTRODUCTION]

The purpose of this guide is to ensure that heat pumps installed primarily for heating purposes in areas subject to low ambient conditions are correctly sized, selected, and applied to ensure heating performance that will satisfy the end users requirements.

On investigation 90% of all end user complaints of excessive defrost and poor low ambient performance on investigation have been due to incorrect application and sizing.

All heat pumps need to defrost. It is simply the laws of physics. Unfortunately in the majority of cases end users have not been advised of this process at the time of sale. Part of the sales process must include educating the end user and ensuring the end user understands how the unit will operate.

Location of both the indoor unit and the outdoor unit is important to ensure optimum low ambient performance. Incorrect outdoor unit location can cause a microclimate around the outdoor unit that will limit the output of the installed system. Incorrect indoor unit location especially with multi room situations where cold air convection draughts will affect return air sensor response, causes poor control and failure to reach set point.

Failure of the installer or end user to realise that a room heat pump is a room heat pump not a whole house or multi room system, especially in low ambient conditions where rapid heat loss through walls is proportional to the total surface area of the wall space is a major cause of performance complaints.

Understanding of the principle that “6 kW heating capacity” heat pump means 6kW per hour input into the heating space less:

- pipe work de rating for pipe length
- capacity loss due to outdoor humidity
- defrost cycle time
- low ambient conditions less than 7°C is an essential step to ensuring correct heat pump selection.

01. HEAT PUMP RATING STANDARDS

All Heat pumps in New Zealand and Australia should be rated to AS/ NZS 3823. This is to ensure the customer can compare different brands on an even basis.

AS/NZS outdoor ambient rating conditions for heating are as follows:

- Indoor 20°C DB Outdoor 7°C DB 6°C WB
- Refrigerant piping length 1 way of 5m

This has been found not to be a practical ambient condition for all of New Zealand especially mid North Island and South Island winter seasons. Some brands design their performance to comply with the 7°C condition and don't take into account the real environment in which these units operate.

02. H2 RATINGS [WHAT ARE THEY?]

H2 ratings are a move towards assisting customers to make more informed decisions on their heat pump unit's performance. The "Voluntary H2" rating scheme has been introduced.

H2 rates heat pump heating performance outputs at 2°C outdoor ambient condition. This is a more real average condition for Southern Australia and some mid and Southern New Zealand locations.

Mitsubishi H2 rating data is available on application.

03. LOW AMBIENT DE RATING FACTORS

As the outdoor ambient reduces below 7°C there is less available heat for an outdoor unit to recover. The ability of an outdoor unit to recover heat in these low ambient conditions varies greatly between brands. Larger out door coil surface area, compressor size, defrost strategy all affect heat recovery capacities at low ambient conditions.

Superior heat pumps will have a lineal capacity decrease as outdoor ambient conditions decrease. Many brands that are primarily designed for cooling have steep performance curve degradation when ambient temperatures reach 0°C or below.

Mitsubishi Electric heat pumps low ambient performance output and COP data is published in sizing and sales guides and in our Service Technical Manuals. This is also available form our website at: http://www.bdt.co.nz

Where ambient conditions are regularly lower than 7°C a design ambient condition should be selected and the low ambient performance guide used for the final unit selection.

For example in Timaru where ambient day and night time temperatures often reach 0°C and below a design condition should be selected. Typically 0°C or –5°C may be selected as a design condition. This ensures that in low ambient conditions the heat pump will deliver performance that will reach set point and satisfy the end users expectations.

A heat pump that is rated at 6kW will not deliver 6kW at –5°C outdoor ambient temperature.

04. LOAD CALCULATIONS

Load calculations are carried out in the same manner as for normal sizing of a room.

Volumetric or Square methods of reaching a heat load are acceptable methods of determining unit capacities for domestic situations. Commercial sites where fresh air load and ventilation rates are required need more complex engineering solutions.

Mitsubishi Electric sizing guides are available for initial unit selections.

Once a unit capacity has been settled on an ambient design condition must be selected.

If we take Timaru for example and we select 0°C as the design condition. A heat load of 5.6 kW was been calculated and the customer has requested either a floor or high wall unit. For our final selection we must refer to the low ambient performance charts.

[IMAGE 001]

[IMAGE 002]

[IMAGE 001]
High Wall Unit

[IMAGE 002]
Floor Console Unit

[HIGH WALL SELECTION]

An MSZ-GB 50VA would be the first selection for this application but at 0°C the performance is only 4.76 kW. An MSZ-GA60VA at 0°C will deliver 5.78 kW and will cope with load at the low ambient condition.

[FLOOR MOUNT SELECTION]

An MFZ-KA50 would be the first selection but at 0°C the performance is only 5.1 kW. As there are no larger floor mount options a floor model is not available for this application.

Final selection in this instance would be an MSZ-GB60VA.

It is extremely important that you don't undersize units in low ambient conditions. This practice causes disgruntled customers and unnecessary hours of engineers time tracing a unit fault that does not exist.

05. DEFROST PERFORMANCE

Defrost performance and frequency is critical to the efficient operation of a heat pump.

The period of time as frost builds on the outdoor coil, during the defrost period and after defrost as the pipe work and indoor coils heat up reduce the hourly heat transfer rate of heat pumps and this affects the units performance. While the unit is defrosting it is not heating.

Many end users are unaware that their units defrost and this is the subject of many calls to our service support centre in Wellington. Part of the sales process must be to advise the customer what to expect from the heat pump and ensure they understand that their unit will defrost.

Mitsubishi Electric heat pumps utilise “Fuzzy Logic” which is a type of artificial intelligence where the unit learns and remembers temperatures and times and makes its decision to optimise defrost start and stop times.

Mitsubishi Electric heat pumps also use a “Dry Fan” sequence at the end of the defrost cycle to remove water and from the outdoor coil fins following completion of the reverse cycle defrost. This ensures that the outdoor coil is dry and free from moisture on resumption of heating.

Undersized units will defrost at regular intervals as low as 30 minutes apart in low ambient conditions when they are struggling to reach set point.

Correctly sized units will have shorter total compressor run times and lower frequency operation speeds. These conditions combine to reduce defrost frequency from the minimum of 30 minutes to up to 120 minutes or not at all depending on the load requirements.

06. OTHER FACTORS THAT AFFECT UNIT PERFORMANCE

1. **Location of Outdoor Unit:** Location of the outdoor unit is essential for low ambient performance. Units located under houses, decking and in areas where airflow is impeded may create their own microclimate and reduce the effective outdoor ambient temperature that the units operates in. Locating the outdoor unit to close to a wall and not observing clearances will also prevent the unit from delivering full output. [See images on following page].

2. **Excessive Pipe Runs:** Excessive pipe run lengths will limit unit output and can cause reduced compressor sub cooling and in certain cases compressor failure. Please respect manufacturers recommended pipe run lengths. Please also remember excessive pipe bends can also reduce unit performance by adding additional refrigerant internal friction losses.

3. **Humidity:** Outdoor humidity also effects heating performance. Areas that have a “dry cold” or low humidity such as “Mount Cook” will perform better at low ambient than say Taupo where ambient conditions can reach zero and “misty” moisture laden air conditions exists. The more moisture in the air the more moisture will freeze on the outdoor coil.

[IMAGE 003]

[IMAGE 004]

[IMAGE 005]

[IMAGE 003]

Insufficient unit clearance to back wall. The tap over the unit is also not required.

[IMAGE 004]

No top clearance for servicing, poor airflow under deck.

[IMAGE 005]

Outdoor unit located enclosed under a house with no airflow is not allowed.

4. **Incorrect Unit Selection:** If a unit is selected that is to small the heat pump will run continuously and never reach set point. This continuous running will increase defrost requirements by reducing the outdoor coil running temperature and driving it into sub zero temperatures for excessive periods. The unit will defrost at the minimum intervals and may never catch up and achieve set point.

5. **Indoor Unit Location:** It is essential the indoor unit is located correctly to make sure the airflow in the heated space is effective. Many indoor units are mounted to close to the ceiling, this causes the unit to short cycle and shut down prematurely. Locating the indoor unit in a corner of a room, across a hallway, or in areas where it will be subject to draughts from other rooms will have adverse effects on performance. High walls units are designed to be located high on the wall as per the installation instructions not low on the wall as some installation companies have been doing. “Low Wall” installations will not be covered by warranty.

6. **Method of Operation:** In lower ambient conditions it is recommended that the heat pump be operated at a setback temperature say (18°C) at night and during the day when the home is unoccupied.

   Many customers have the expectation that in low ambient conditions the heat pump will instantaneously heat the space to set point as soon as the heat pump is turned on. This is an unrealistic expectation, as the heat pump has to overcome the thermal mass of drapes, furniture, carpets wall linings as well as the air temperature and ingress load.

   Operation of the heat pump in this way will ensure carpets; drapes and furniture will last longer. This combined with less demand on the heat pump at occupancy times will allow the heat pump to reach set point sooner and defrost less frequently. It is important that the end user is aware of this principle.

Rough installation unit too close to the ceiling.

[FINAL DESIGN CHECKLIST]

01. Calculate Heat Load kW ☐

02. Select Outdoor Ambient Condition ☐

03. Select Type of Indoor Unit ☐

04. Check Low Ambient Performance ☐

05. Select Model with Correct Capacity ☐

06. Select Indoor Unit Location ☐

07. Select Outdoor Unit Location ☐

08. Final Check
- Pipe Run Length ☐
- Cable Run Switch Board ☐
- Condensate Drain (Pump?) ☐

[HEATING CAPACITY CHARTS]

[HEATING CAPACITY CHART]

INVERTER HIGHWALL

MSZ-GA25VA:MUZ-GA25VA
CAPACITY: 3.2KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-15			-10			-5			0			1			2			3			4			5			10		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	1.50	0.42	**3.57**	1.92	0.53	**3.62**	2.30	0.63	**3.65**	2.72	0.70	**3.89**	2.80	0.71	**3.94**	2.87	0.72	**3.99**	2.95	0.73	**4.04**	3.02	0.74	**4.09**	3.10	0.75	**4.13**	3.52	0.79	**4.46**

MSZ-GA35VA:MUZ-GA35VA
CAPACITY: 4.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-15			-10			-5			0			1			2			3			4			5			10		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	1.88	0.58	**3.22**	2.40	0.74	**3.24**	2.88	0.88	**3.27**	3.40	0.97	**3.51**	3.50	0.98	**3.55**	3.59	1.00	**3.60**	3.69	1.01	**3.64**	3.78	1.03	**3.69**	3.88	1.04	**3.73**	4.40	1.09	**4.04**

MSZ-GB50VA:MUZ-GB50VA
CAPACITY: 5..6KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	3.36	1.19	**2.82**	4.03	1.41	**2.86**	4.76	1.564	**3.05**	4.89	1.59	**3.08**	5.03	1.61	**3.12**	5.16	1.64	**3.16**	5.30	1.66	**3.19**	5.43	1.68	**3.23**	6.16	1.77	**3.48**	6.83	1.82	**3.75**

MSZ-GA60VA:MUZ-GA60VA
CAPACITY: 6.8KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	4.08	1.39	**2.94**	4.90	1.65	**2.97**	5.78	1.83	**3.16**	5.94	1.86	**3.20**	6.11	1.89	**3.24**	6.27	1.91	**3.28**	6.44	1.94	**3.31**	6.60	1.97	**3.35**	7.48	2.07	**3.61**	8.30	2.12	**3.92**

MSZ-GA71VA:MUZ-GA71VA
CAPACITY: 8.1KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	4.86	1.75	**2.78**	5.83	2.07	**2.82**	6.89	2.30	**3.00**	7.08	2.33	**3.04**	7.28	2.37	**3.07**	7.47	2.40	**3.11**	7.67	2.44	**3.15**	7.86	2.47	**3.18**	8.91	2.6	**3.43**	9.88	2.67	**3.70**

MSZ-GA80VA:MUZ-GA80VA
CAPACITY: 9.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	5.40	2.17	**2.49**	6.48	2.57	**2.52**	7.65	2.85	**2.68**	7.87	2.89	**2.72**	8.08	2.94	**2.75**	8.30	2.98	**2.78**	8.51	3.03	**2.81**	8.73	3.07	**2.84**	9.90	3.22	**3.07**	10.98	3.32	**3.31**

[HEATING CAPACITY CHART]

DELUXE INVERTER HIGHWALL

MSZ-FA25VA:MUZ-FA25VA

CAPACITY: 3.2KW - RATED OUTPUT

	OUTDOOR WB (°C)																											
INDOOR	**-15**			**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	1.50	0.41	**3.69**	1.92	0.52	**3.73**	2.30	0.61	**3.77**	2.72	0.68	**4.02**	2.80	0.69	**4.05**	2.87	0.70	**4.10**	2.95	0.71	**4.15**	3.02	0.72	**4.20**	3.10	0.73	**4.26**	3.52	0.76	**4.61**

MSZ-FA35VA:MUZ-FA35VA

CAPACITY: 4.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																											
INDOOR	**-15**			**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	1.88	0.55	**3.41**	2.40	0.70	**3.44**	2.88	0.83	**3.49**	3.40	0.92	**3.72**	3.50	0.93	**3.74**	3.59	0.95	**3.79**	3.69	0.96	**3.83**	3.78	0.98	**3.88**	3.88	0.99	**3.94**	4.40	1.04	**4.25**

INVERTER FLOOR

MFZ-KA25VA:SUZ-KA25VA-H

CAPACITY: 3.4KW - RATED OUTPUT

	OUTDOOR WB (°C)																											
INDOOR	**-15**			**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	1.60	0.46	**3.45**	2.04	0.59	**3.49**	2.45	0.69	**3.54**	2.89	0.77	**3.74**	2.97	0.78	**3.80**	3.05	0.79	**3.85**	3.14	0.81	**3.89**	3.22	0.82	**3.93**	3.30	0.83	**3.99**	3.74	0.87	**4.31**

MFZ-KA35VA:SUZ-KA35VA-H

CAPACITY: 4.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																											
INDOOR	**-15**			**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	1.88	0.61	**3.09**	2.40	0.77	**3.12**	2.88	0.91	**3.15**	3.40	1.01	**3.37**	3.50	1.03	**3.41**	3.59	1.04	**3.45**	3.69	1.06	**3.49**	3.78	1.07	**3.52**	3.88	1.09	**3.56**	4.40	1.14	**3.85**

MFZ-KA50VA:SUZ-KA50VA-H

CAPACITY: 6.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																											
INDOOR	**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**			**15**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	3.60	1.30	**2.76**	4.32	1.54	**2.80**	5.10	1.71	**2.98**	5.24	1.74	**3.02**	5.39	1.76	**3.06**	5.53	1.79	**3.09**	5.68	1.81	**3.13**	5.82	1.84	**3.16**	6.60	1.93	**3.41**	7.32	1.99	**3.68**

[HEATING CAPACITY CHART]

INVERTER CASSETTE

SLZ-KA25VA(L):SUZ-KA25VA
CAPACITY: 3.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-15			-10			-5			0			1			2			3			4			5			10		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	1.41	0.46	**3.07**	1.80	0.58	**3.10**	2.16	0.69	**3.14**	2.55	0.76	**3.34**	2.62	0.78	**3.38**	2.69	0.79	**3.42**	2.77	0.80	**3.46**	2.84	0.81	**3.50**	2.91	0.82	**3.54**	3.30	0.86	**3.82**

SLZ-KA35VA(L):SUZ-KA35VA
CAPACITY: 4.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-15			-10			-5			0			1			2			3			4			5			10		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	1.88	0.61	**3.09**	2.40	0.77	**3.12**	2.88	0.91	**3.15**	3.40	1.01	**3.36**	3.50	1.03	**3.40**	3.59	1.04	**3.44**	3.69	1.06	**3.49**	3.78	1.07	**3.52**	3.88	1.09	**3.56**	4.40	1.14	**3.85**

SLZ-KA50VA(L):SUZ-KA50VA
CAPACITY: 5.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	3.00	1.09	**2.76**	3.60	1.29	**2.79**	4.25	1.43	**2.98**	4.37	1.45	**3.02**	4.49	1.47	**3.06**	4.61	1.49	**3.09**	4.73	1.51	**3.13**	4.85	1.54	**3.15**	5.50	1.61	**3.41**	6.10	1.66	**3.67**

INVERTER CEILING CONCEALED

SEZ-KA35VA:SUZ-KA35VA
CAPACITY: 4.0KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-15			-10			-5			0			1			2			3			4			5			10		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	1.88	0.61	**3.09**	2.40	0.77	**3.12**	2.88	0.91	**3.15**	3.40	1.01	**3.36**	3.50	1.03	**3.40**	3.59	1.04	**3.44**	3.69	1.06	**3.49**	3.78	1.07	**3.52**	3.88	1.09	**3.56**	4.40	1.14	**3.85**

SEZ-KA50VA:SUZ-KA50VA
CAPACITY: 5.9KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	3.54	1.29	**2.75**	4.25	1.53	**2.78**	5.02	1.69	**2.97**	5.16	1.72	**3.00**	5.30	1.74	**3.04**	5.44	1.77	**3.07**	5.58	1.80	**3.11**	5.72	1.82	**3.14**	6.49	1.91	**3.39**	7.20	1.97	**3.66**

SEZ-KA60VA:SUZ-KA60VA
CAPACITY: 6.9KW - RATED OUTPUT

	OUTDOOR WB (°C)																													
INDOOR	-10			-5			0			1			2			3			4			5			10			15		
DB(°C)	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP	Output	INPUT	COP
21	4.14	1.72	**2.41**	4.97	2.03	**2.44**	5.87	2.25	**2.60**	6.03	2.29	**2.64**	6.20	2.32	**2.67**	6.36	2.36	**2.70**	6.53	2.39	**2.73**	6.69	2.42	**2.76**	7.59	2.55	**2.98**	8.42	2.62	**3.21**

[HEATING CAPACITY CHART]

FIXED SPEED

MSC-GA25VB:MUH-GA25VB
CAPACITY: 2.8KW

	OUTDOOR WB (°C)																													
INDOOR	**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**			**15**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	1.68	0.53	**3.16**	2.02	0.63	**3.20**	2.38	0.70	**3.40**	2.45	0.71	**3.45**	2.52	0.72	**3.49**	2.58	0.73	**3.54**	2.65	0.74	**3.58**	2.72	0.75	**3.62**	3.08	0.79	**3.90**	3.42	0.81	**4.21**

MSC-GA35VB:MUH-GA35VB
CAPACITY: 3.8KW

	OUTDOOR WB (°C)																													
INDOOR	**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**			**15**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	2.28	0.72	**3.17**	2.74	0.86	**3.20**	3.23	0.95	**3.41**	3.32	0.96	**3.45**	3.41	0.98	**3.49**	3.51	0.99	**3.53**	3.60	1.01	**3.58**	3.69	1.02	**3.62**	4.18	1.07	**3.91**	4.64	1.10	**4.21**

MSH-GA50VB:MUH-GA50VB
CAPACITY: 5.3KW

	OUTDOOR WB (°C)																													
INDOOR	**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**			**15**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	3.18	1.12	**2.84**	3.82	1.33	**2.87**	4.51	1.47	**3.07**	4.64	1.49	**3.11**	4.76	1.51	**3.15**	4.89	1.54	**3.18**	5.01	1.56	**3.22**	5.14	1.58	**3.25**	5.83	1.66	**3.51**	6.47	1.71	**3.78**

MSH-GA60VB:MUH-GA60VB
CAPACITY: 7.0KW

	OUTDOOR WB (°C)																													
INDOOR	**-10**			**-5**			**0**			**1**			**2**			**3**			**4**			**5**			**10**			**15**		
DB(°C)	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**	Output	INPUT	**COP**
21	4.20	1.50	**2.80**	5.04	1.79	**2.82**	5.95	1.98	**3.01**	6.12	2.01	**3.04**	6.29	2.04	**3.08**	6.45	2.07	**3.12**	6.62	2.10	**3.15**	6.79	2.13	**3.19**	7.70	2.24	**3.44**	8.54	2.3	**3.71**

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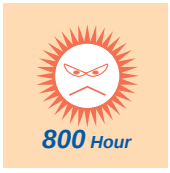

Heat stress test

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