

To the Stage of Control Panel Coolers

# The Advent of the Next-Generation, Intellignet FA Coolers

To improve your factory environment, visit us at:

<http://www.apiste.co.jp>

APISTE Homepage delivering the latest information (English version)



Automatic calorific calculation

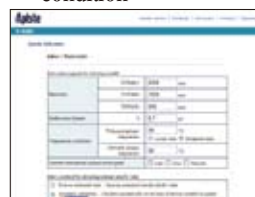
[ Quick Selection ]

Entering installation condition, it calculates the calorific value automatically.  
It recommends the best model.

- 1 Entering the actual usage
- 2 Entering the installation condition
- 3 Automatic calorific calculation of control panel
- 4 Recommendation sheet
- 5 More information



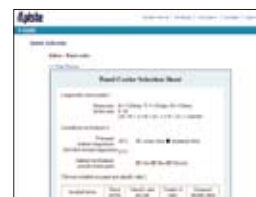
Before starting Quick Selection, please select the usage.  
--- panel cooler or heat exchanger, indoor panel or outdoor panel



Please enter the panel condition.  
You can select the calorific calculation among three ways.



Please enter the device and its rated power.



Calculating the total calorific value and select the best model.



Providing more information and advise about the selected model.

## EX-series

ENC-AR310EX  
ENC-AR320EX  
ENC-AR510EX  
ENC-AR520EX  
ENC-AR710EX  
ENC-AR720EX  
ENC-AR11110EX  
ENC-AR11120EX  
ENC-AR1652EX  
ENC-AR2200EX  
ENC-AR2900EX

## L-series

ENC-AR310L  
ENC-AR320L  
ENC-AR451S  
ENC-AR452S  
ENC-AR610L  
ENC-AR620L  
ENC-AR1110L  
ENC-AR1120L  
ENC-AR1651L  
ENC-AR1652L  
ENC-AR2200L  
ENC-AR2900L



The ENC Series, the No.1 delivering  
control panel cooler, has been redesigned completely!

<http://www.apiste.co.jp>



# Apiste “ENC series”

Protect control panels from break down and troubles!

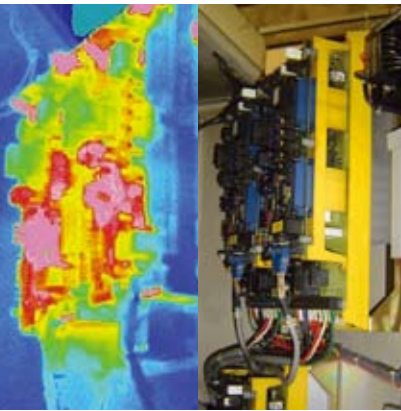


Entrust Apiste whenever, wherever!



## What’s the problem of control panels?

### Heat



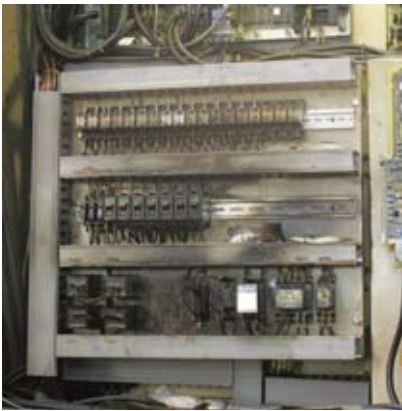
By temperature rising, electric devices are deteriorated and broken down.

### Moisture



Moisture brings corrosion, rust, insulation deterioration and a short circuit accident.

### Dust Particle



Fire, operation deterioration and insulation deterioration are occurred by particles and oil mist.

Electric devices and controllers are facing severe condition

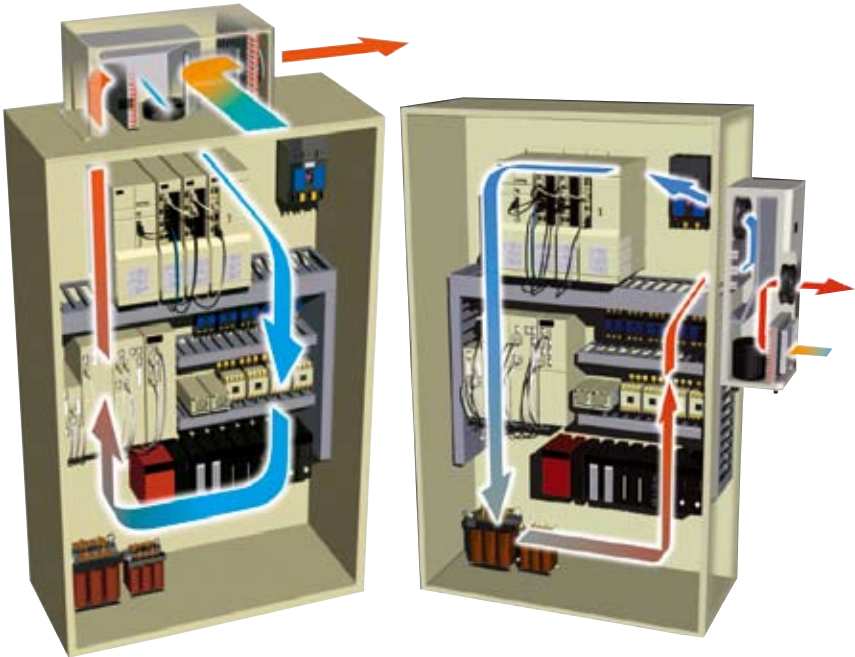
## What’s Apiste’s Panel Cooler “ENC series”?

### •Effect

Cooling	by Internal Air- Circulation
& Dehumidification	
& Dust Prevention	

### •Digist Features

Direct easy mounting	Automatic temperature humidity control	Mild cooling without condensation	Easy maintenance Diagnosis function
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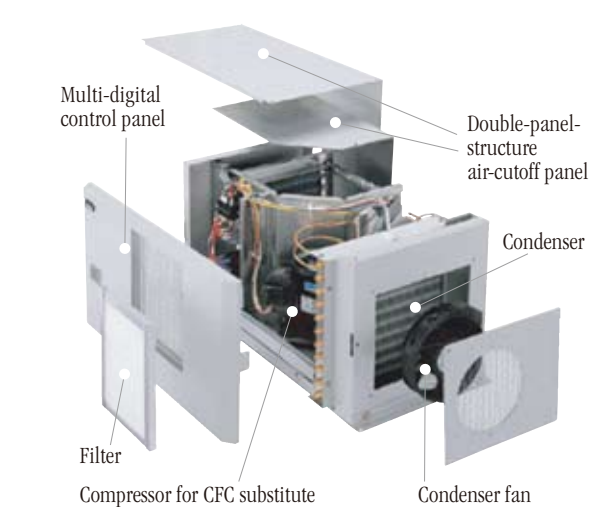


EX-series ( Top mount )

L-series ( Side mount )

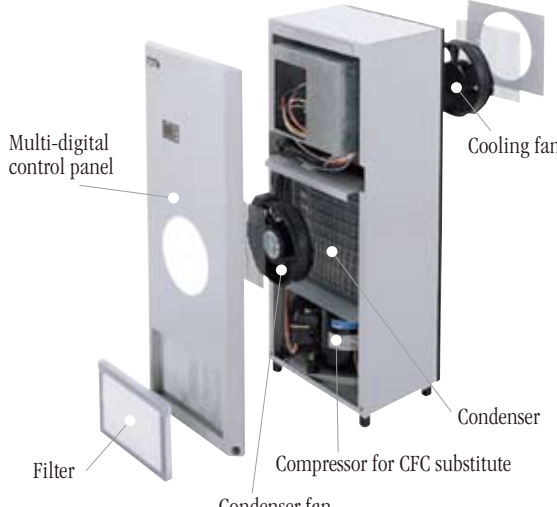
## Design

### EX-series ( Top mount )



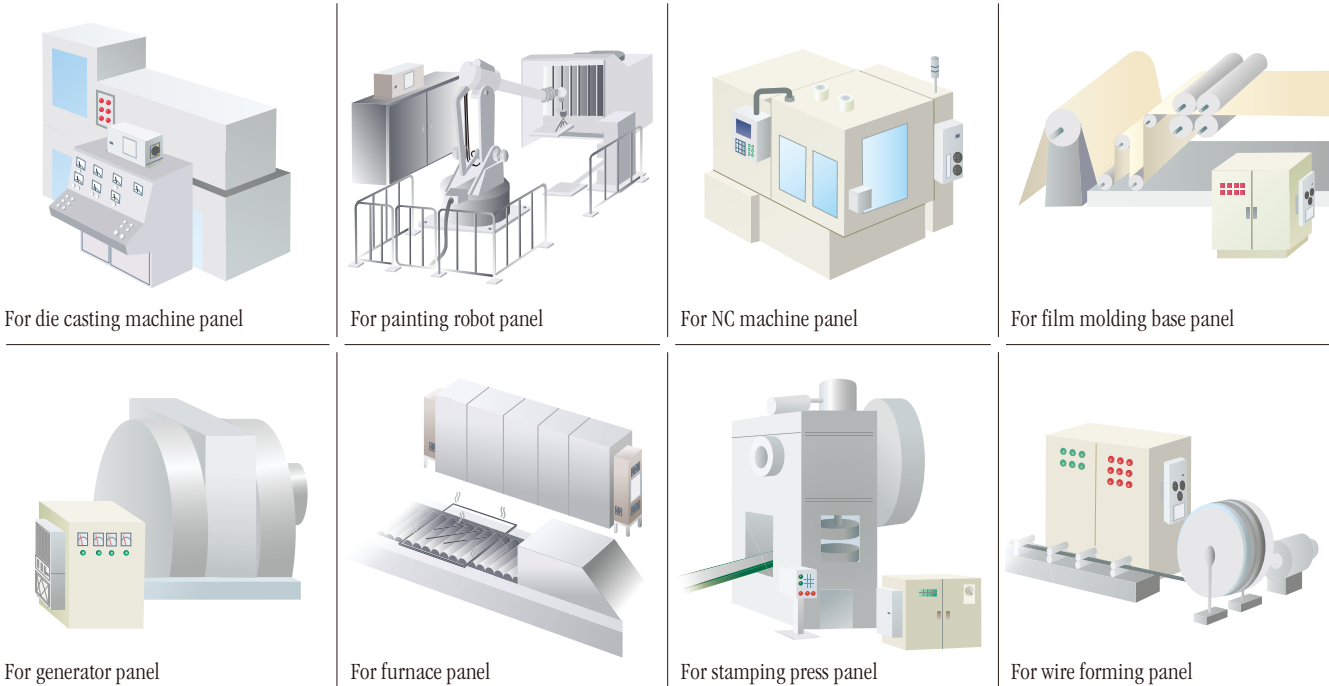
Note: This is a composite photograph.  
Some parts may differ one an actual machine.

### L-series ( Side mount )



Note: This is a composite photograph.  
Some parts may differ one an actual machine.

## Application



# The FA Cooler Evolving Continuously

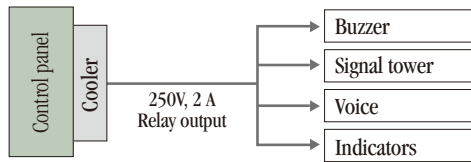
## Self-diagnosis Function for Ultimate Safety

Apiste's FA coolers are designed to provide doubled or tripled safety measures all of the time. They conduct continuous self-diagnosis and monitor cooling operations in real time.

### Self-diagnosis for proper operation

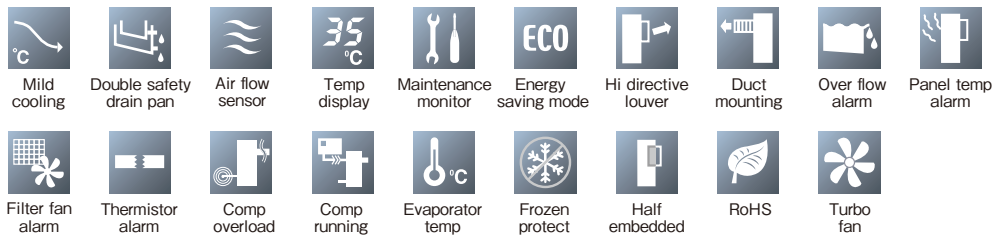
#### Alarm display & External output

Apiste's cooler's self-diagnosis function not only detects clogged filters but also checks various points. The safety-conscious design monitors operation in real time and provides alarm display and external output when an abnormal condition is detected. Coolers that only cool are behind the times now.



\* The alarm for the abnormal drain water level is available with the EX type only.

Alarm display & External output notifying abnormal conditions

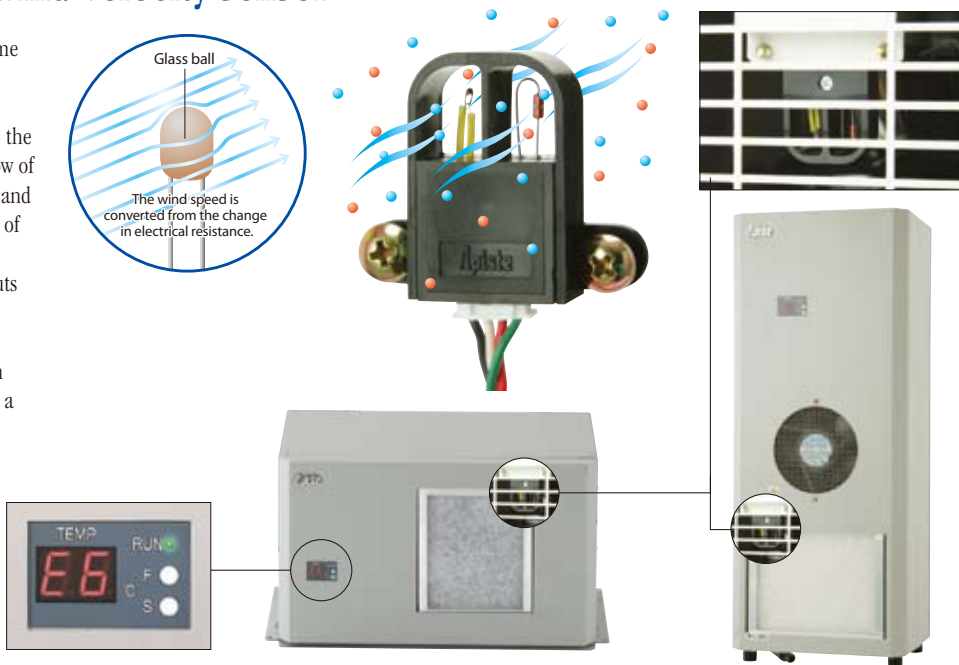


### Monitoring clogged filters

#### Newly-developed the wind velocity sensor

The decrease in the heat radiation air volume due to clogged filters causes lower cooling ability and a shorter operating life. The ENC-AR series features Apiste's original the wind velocity sensor, which monitors the flow of heat-dissipating air sent from the condenser and conducts self-diagnosis of the heat exchange of the cooler.

When the air flow decreases, the cooler outputs an alarm signal, allowing a significant reduction of man-hours for inspection. The next-generation self-diagnosis function ensures stable cooling ability and promotes a longer operating life for the cooler.

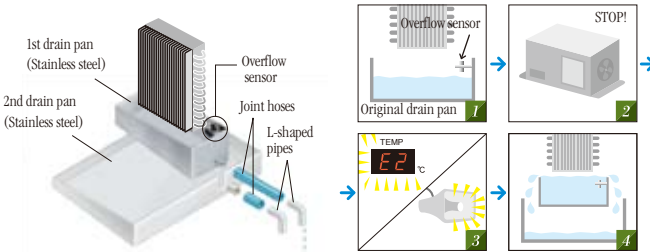


With the rapidly growing globalization of the marketplace and the necessity for worldwide cost competitiveness, it is urgent to improve production efficiency in factories or to establish an automation system. Apiste's idea is that it is also a new age for control panel coolers, which are indispensable for such sophisticated production systems. Witness the advent of the next-generation control panel cooler, offering unprecedented safety and reliability.

### Safety design preventing water leakage

#### Overflow sensor + Double drain pan

The top-mount type coolers have a well designed draining structure. With the reliable double drain pan structure, if water leakage from the first drain pan, the second drain pan holds and drains the water. Moreover, an overflow sensor is mounted inside the first drain pan and activates the protection circuit if the drain water level becomes abnormally high. An alarm sign is displayed, an external output is provided, and the cooling operation is forced to stop. As a result, a water leakage can be prevented reliably.

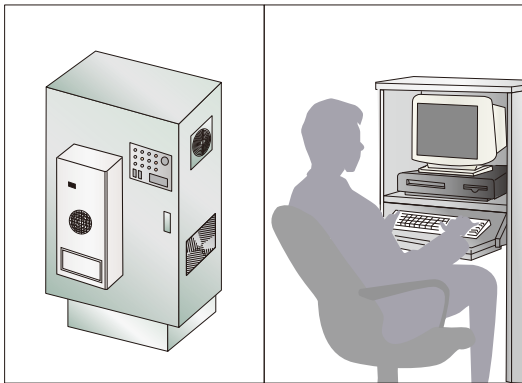


Note: The joint hoses and L-shaped pipes are included as standard accessories.

### Industry-first remote monitoring

#### Monitoring compressor operation

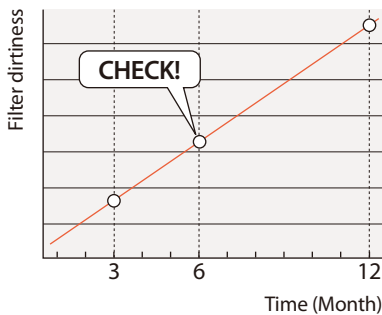
The ENC-AR series features a cooling operation confirmation output as standard. The operating status of the cooler's compressor can be monitored continuously. Using this output together with various diagnosis functions also enables advanced inspection and maintenance.



### Industry-first function to prevent inspection from being overlooked

#### Maintenance notification

For every product, regular maintenance is effective for long time use. The ENC-AR series features a function to calculate its operating period and automatically notifies users of the time for inspection. This function is useful to prevent inspections from being overlooked.



### Reduction of running cost

#### Energy-saving operation mode

In today's environment even control panel coolers must be conscious of ecology.

Unlike conventional coolers which operate ventilating fans continuously, the new ENC-AR series offers an energy-saving mode to operate the fan according to the compressor operation. You can save electricity as compared to coolers whose fans operate all of the time and even during winter.

The energy-saving mode also offers periodic ventilation during a cooling operation. This reduces current consumption and makes the ENC-AR series fully compliant with the Revised Energy Conservation Law of Japan.





# The FA Cooler Evolving Continuously

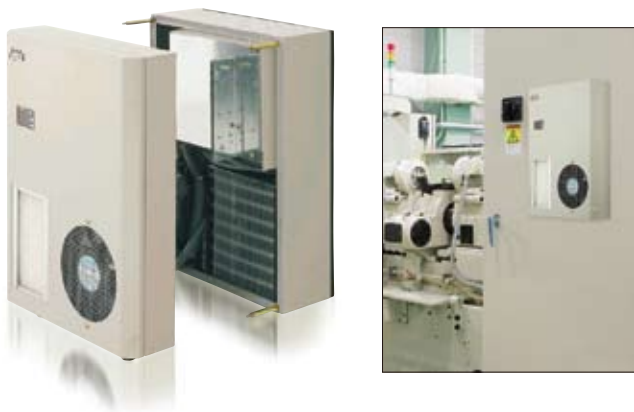
## No need for additional options

### Half embedded-mounting supported as standard

Conventional lateral-mount type coolers may not be mounted properly due to their thickness when there are obstacles around or when the control panel faces a passage.

The lateral-mount type of the ENC-AR Series(\*) has adopted a separate body to allow neat half embedded-mounting without requiring additional options.

\* The ENC-AR610L/AR620L/AR1110L/AR1120L only.



## A concept, constant, manufacturing field-oriented

### Usable design for maintenance efficiency

The filter can be replaced by simply detaching it from the aluminum frame. The fan can also be replaced easily by removing the front panel. The separate body structure makes inspection of main parts easier. The ENC-AR Series has achieved high maintenance efficiency.

## A concept profoundly customer-oriented

### Outer and panel cutout dimensions unchanged from conventional models (\*)

Apiste's redesigned coolers are compatible with conventional models in terms of outer and panel cutout dimensions. There is no need to worry about replacing old coolers.

\* Some models have additional dimensions for half embedded mounting.

## Earth-friendly design

### Lead-free control PWB

It is said that the 21st century is the age of the environment. Apiste took an early lead in working on the global environment issues that have been receiving attention in recent years. The "lead-free" control PWB of the ENC-AR series is the outcome of such efforts.

The ENC Series will continue constant evolution with the aim of being an earth-friendly product.



## Highly rugged design as defense against harsh environments

### Special fan against oil mist (Optional)

Most FA coolers are installed in harsh environments, and the ENC-AR Series has a long-established reputation for its high durability. Now, Apiste has developed an original oil-resistant fan in order to ensure a longer life in environments with a lot of oil mist (Optional accessory). The fan can be attached not only to new cooler models but also to conventional, existing coolers.



\* For delivery time, contact Apiste.



\* This picture is for illustration only.  
The actual product may differ from this.

Even with abundant functions, a "hard-to-use" machine is out of the question.

The ENC-AR series was designed with uppermost awareness of not only visible items but also invisible issues such as operability and maintainability.

## Safety-conscious design

### Compliance with Electrical Appliance and Material Safety Law



#### Electrical Appliance and Material Safety Law

The Electrical Appliance and Material Safety Law was revised from the former Electrical Appliance and Material Control Law (DENTORI HO) and went into effect in April 2001. This includes the regulations to ensure the safety of electrical appliances and to prevent the danger and problems resulting from them. It is mandatory that manufacturers of electrical appliances subject to the law report their products to the Ministry of Economy, Trade and Industry, inspect their conformance to the relevant technical standards, and apply the PSE label on their products. Selling products without the PSE label may be restricted.

\* For details of the UL version models, contact an Apiste Head Office.

The public announcement of the Ministry of Economy, Trade and Industry of Japan, which was issued in July 2003, stipulated that control panel coolers are also categorized as products subject to the Electrical Appliance and Material Safety Law. Apiste immediately focused attention on the change in the market and introduced the ENC-AR Series as the industry's first compliant product.

Moreover, among control panel coolers manufacturers in Japan, the ENC-AR Series has the industry-first UL-listed version(\*). It is only Apiste, a specialist in FA coolers, that can establish such high reliability.

(Category of electrical appliance: Electric cooler for control panels (cubicles))

## Safety-conscious design

### Compliance with Electrical Appliance and Material Safety Law

#### ENC-CCC model (all 6 models)

Apiste is now releasing the China Compulsory Certificatio models (called CCC) as the industry first standard product lineup, to meet the needs of many customers.

Apiste proposes the ENC-CCC Series is the most appropriate product series for the Chinese market. The ENC-CCC Series meets the two requirements, "Safety" and "EMC" under the CCC certifications; based on the favorably-received ENC-A Series that gathers our individual control panel cooling technologies that we have accumulated for many years as a manufacturer specialized in control panel coolers.

#### ENC-CU model (all 12 models)

With the release of the ENC-CU Series, Apiste has become the first Japanese domestic manufacturer to release control panel coolers with full certification for both the CE marking and the UL standard at the same time. The ENC-CU lineup consists of twelve coolers: six ceiling-mount and six lateral-mount type models.

Naturally, the lineup is environmentally-friendly, being RoHS Directive compliant.

In this new release, Apiste has not only given consideration to the control panel installation environment, but also to the natural environment. The ENC-CU Series thus represents the first step in Apiste's challenge to become a company with global standards and also marks the beginning of a series of product releases that reflect Apiste's commitment to achieving this goal.



#### Unification of safety standards

The CE marking is the safety mark that must be compulsorily applied to specific products for marking in the EU area. Conventionally, the scope and level of safety requirements in the EU area were different by country. Therefore, manufacturers need to modify their product specifications depending on the standard of each country.

The CE marking was started in order to eliminate the country-specific standards that are troublesome and to establish a uniform standard in the EU area, aiming to ensure free distribution and build a huge economic bloc.

#### Acquisition of the highest authority's certification

In U.S.A., the UL standard prepared by UL (a private party in U.S.A.) is socially trusted as the highest authority of safety standard. The UL standard is recognized as the safety standard by municipal ordinances of each state and city. Consumers have made it practice to check for the UL mark to verify product safety. Thus, the UL mark serves as an index for product selection. For example, people who see a ruler with the JIS mark think that it is a high-precision product. As with the JIS mark, the UL mark is recognized as a high-safety product.

#### Environmental consideration

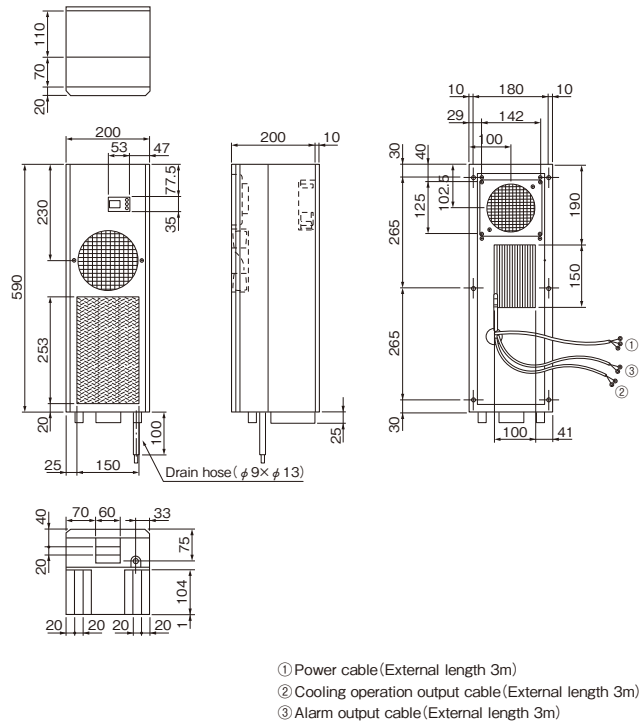
The RoHS Directive was enacted on July 1, 2006 by EU (European Union).

"RoHS" is an abbreviation for "Restriction of the Use of Certain Hazardous Substance in Electrical and Electronic Equipment", which means that electrical and electronic equipment are prohibited from containing specific hazardous substances. There are six substances subjected to control which were agreed upon at the EU Mediation Committee in November 2002.

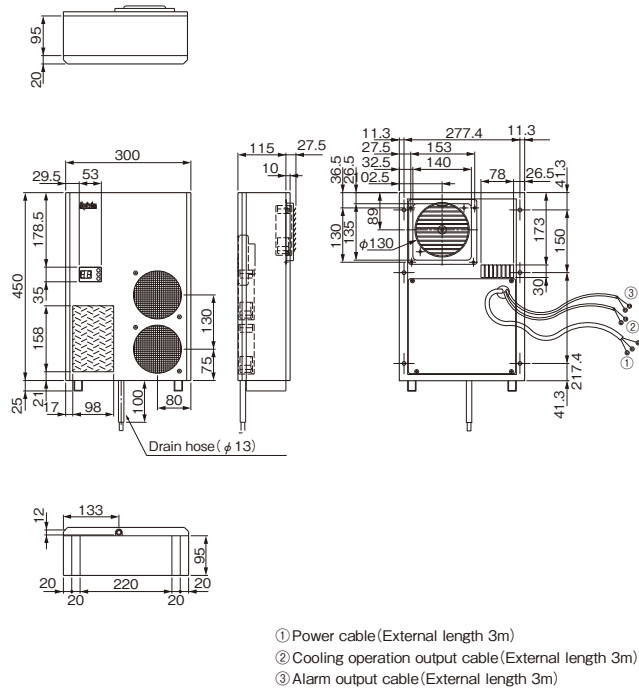
# Outer Dimensions (unit : mm)

## L-series

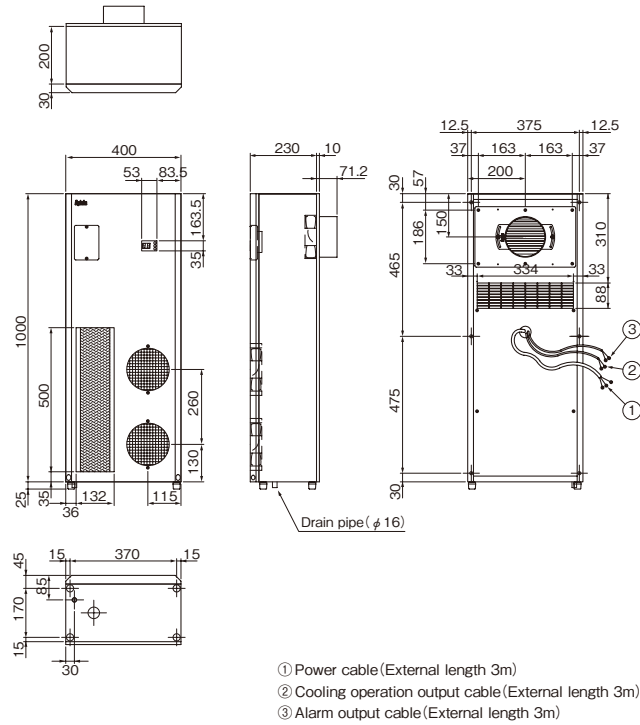
ENC-AR310L / AR320L



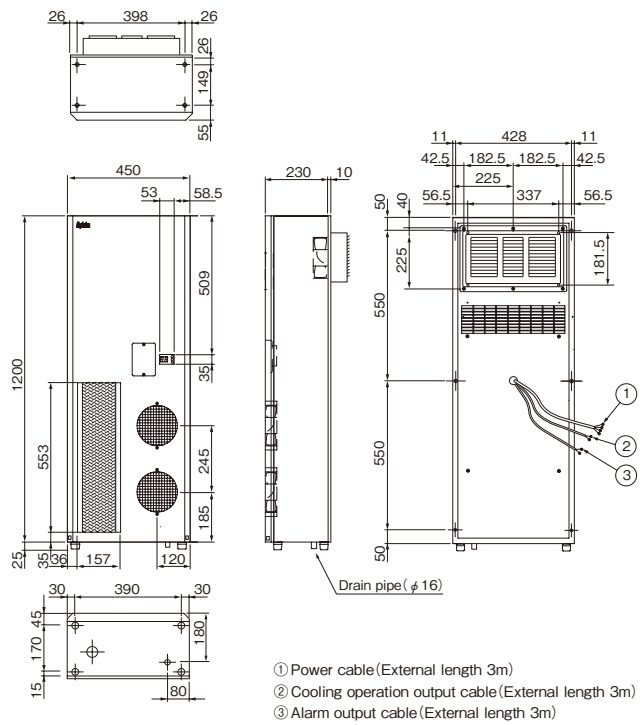
ENC-AR451S / AR452S



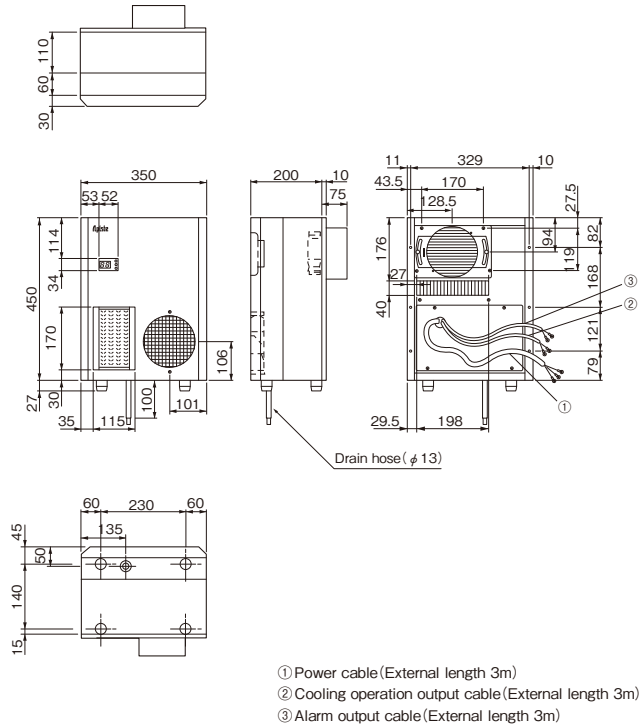
ENC-AR1651L / AR1652L



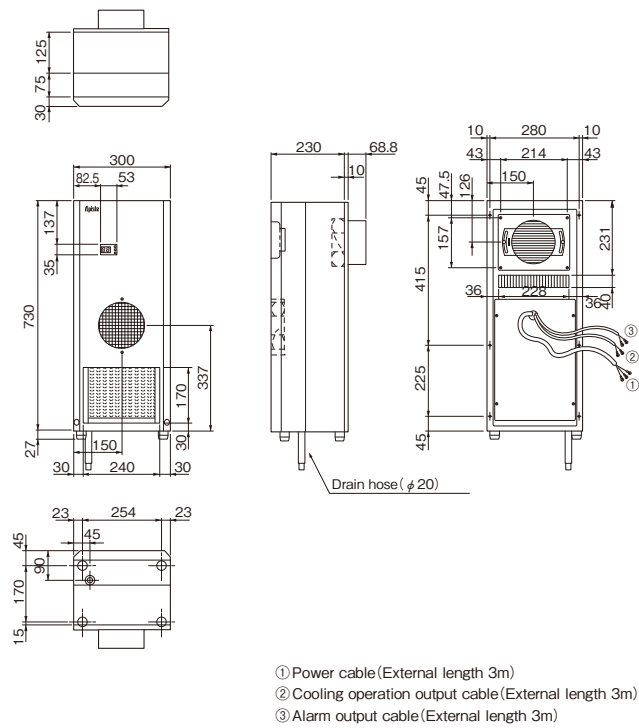
ENC-AR2200L



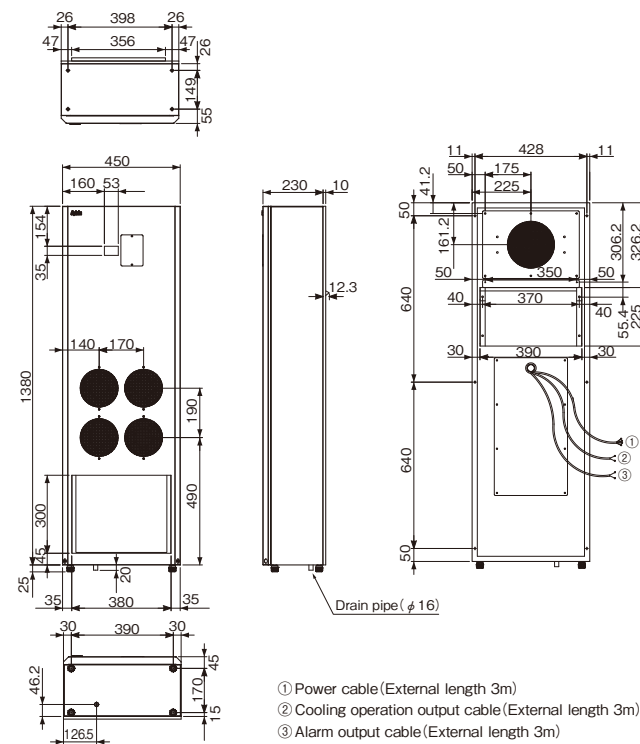
ENC-AR610L / AR620L



ENC-AR1110L / AR1120L



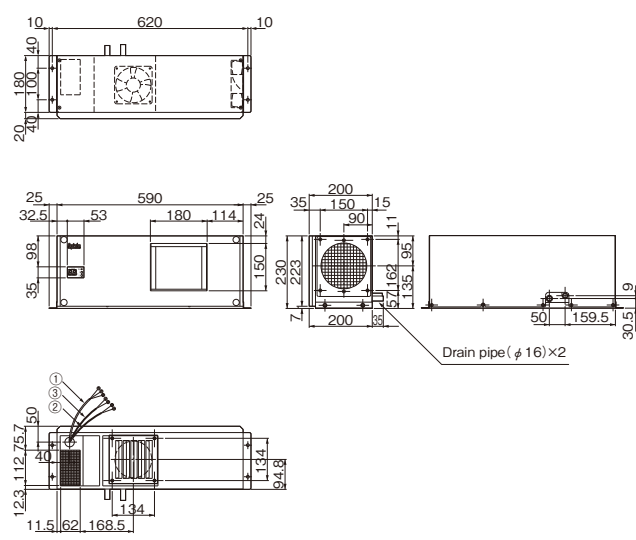
ENC-AR2900L



# Outer Dimensions (unit : mm)

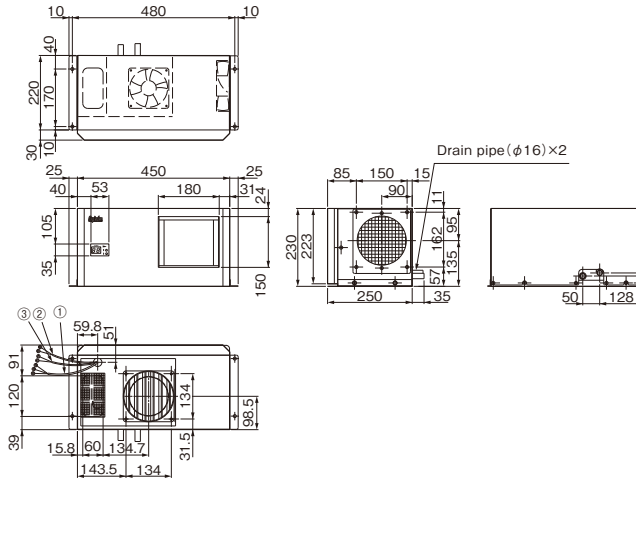
## EX-series

### ENC-AR310EX / AR320EX



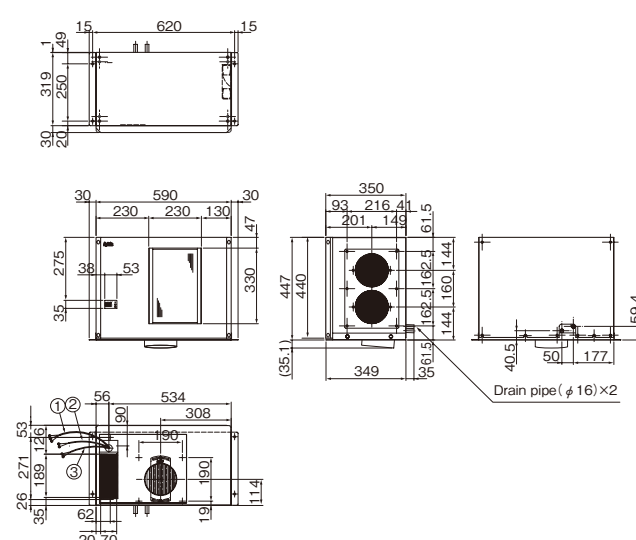
- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR510EX / AR520EX



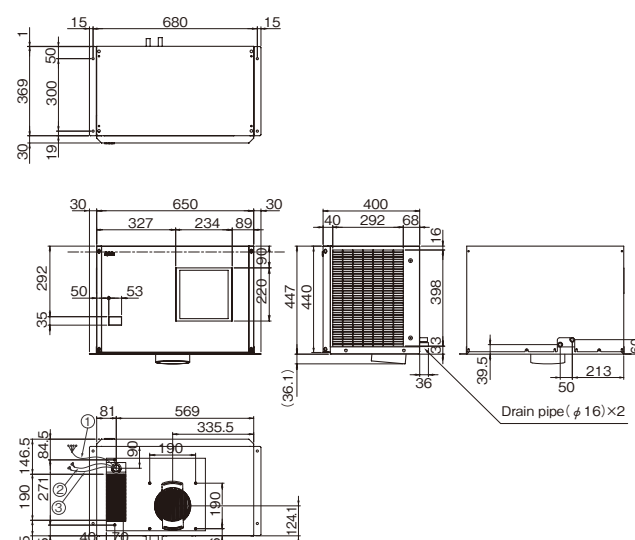
- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR1652EX



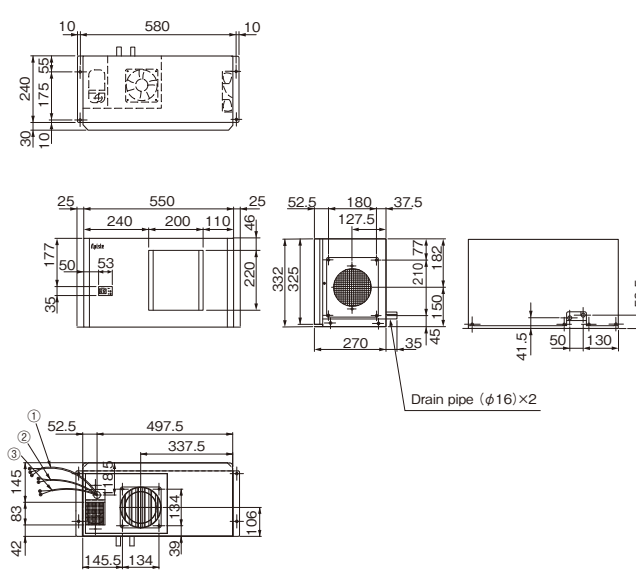
- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR2200EX



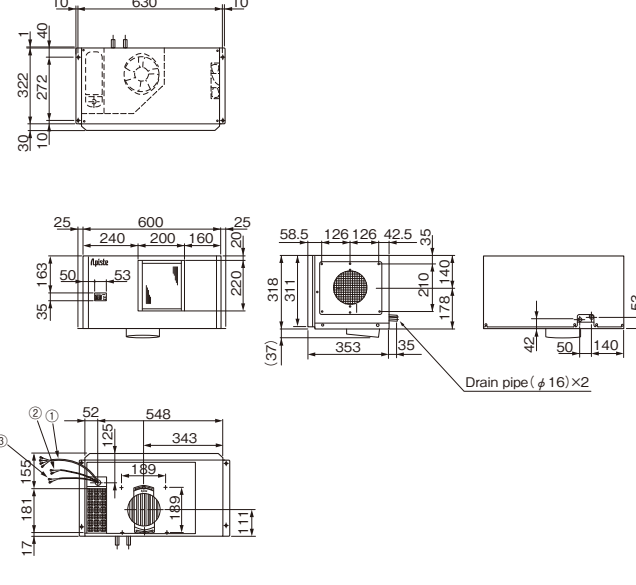
- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR710EX / AR720EX



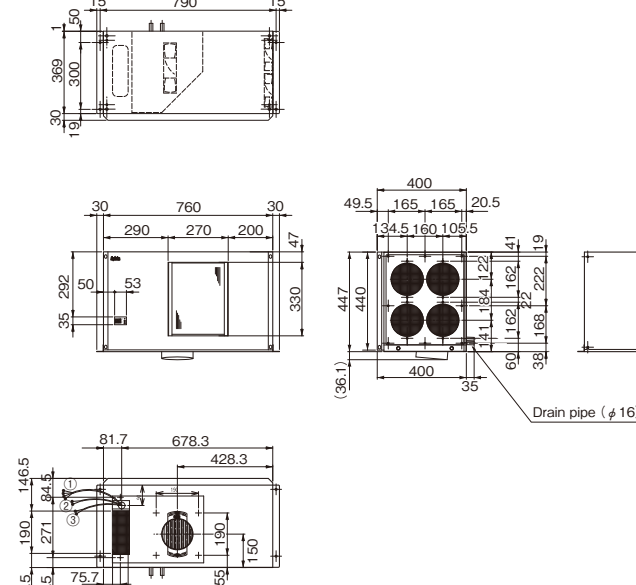
- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR1110EX / AR1120EX



- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

### ENC-AR2900EX

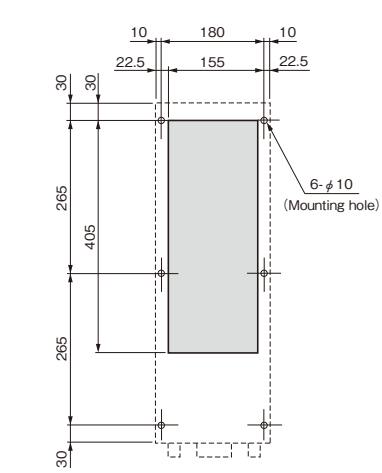


- ① Power cable (External length 3m)
- ② Cooling operation output cable (External length 3m)
- ③ Alarm output cable (External length 3m)

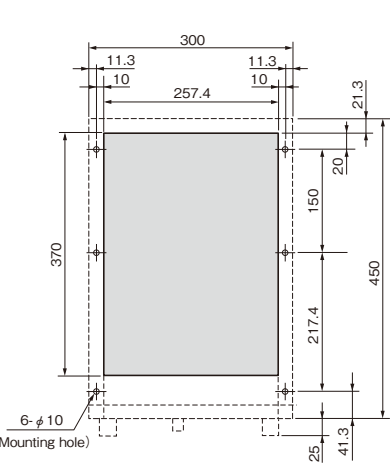
# Diagram of Panel Cutout (unit : mm)

## L-series

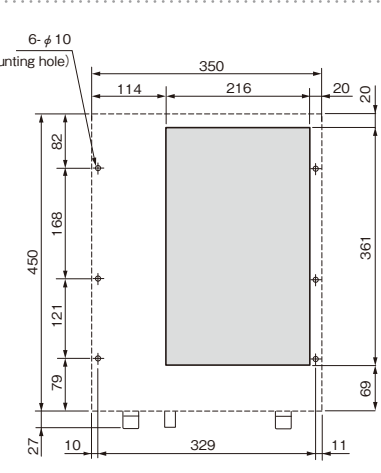
ENC-AR310L / AR320L



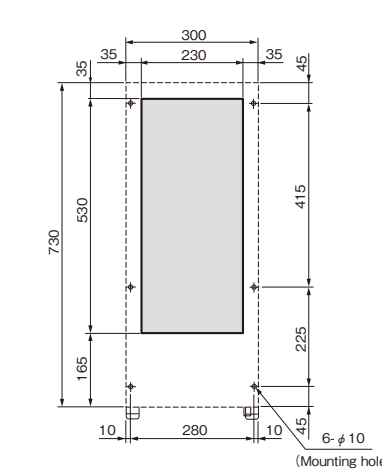
ENC-AR451S / AR452S



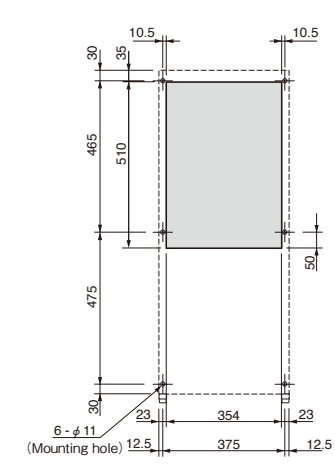
ENC-AR610L / AR620L



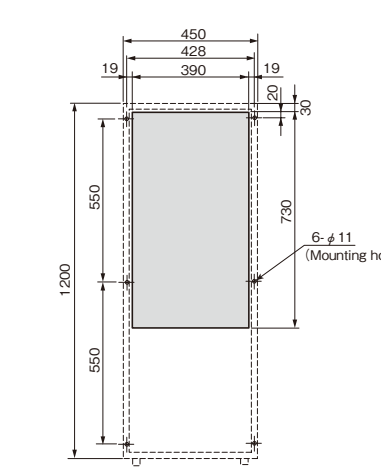
ENC-AR1110L / AR1120L



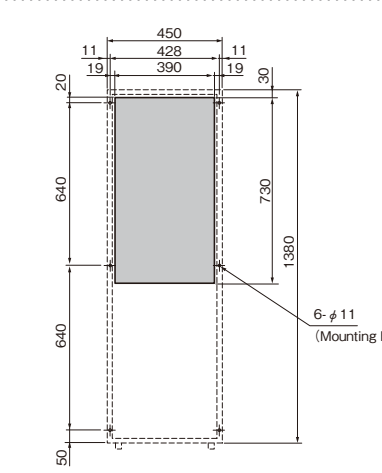
ENC-AR1651L / AR1652L



ENC-AR2200L

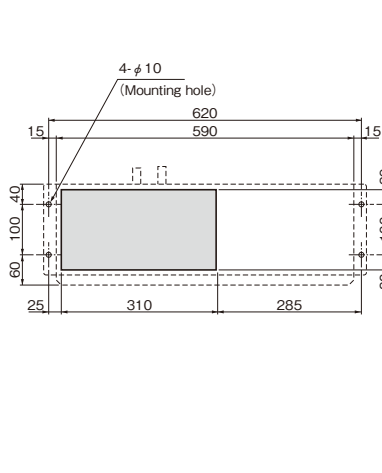


ENC-AR2900L

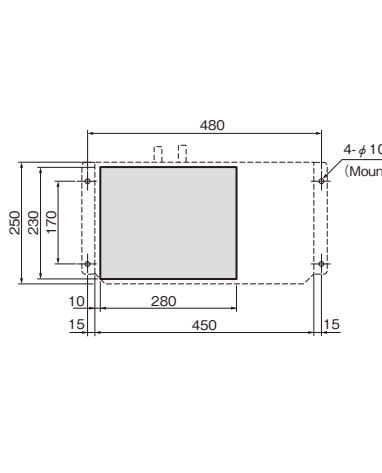


## EX-series

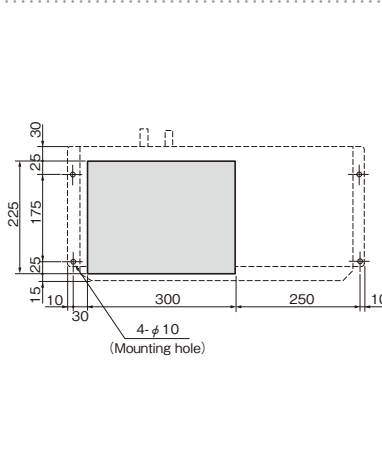
ENC-AR310EX / AR320EX



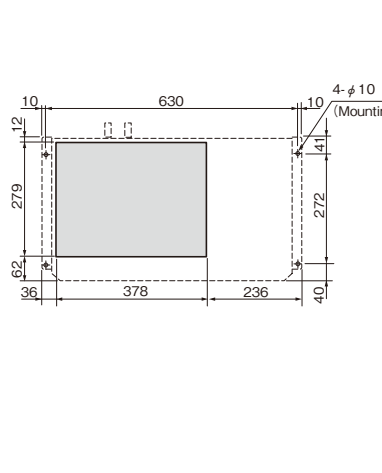
ENC-AR510EX / AR520EX



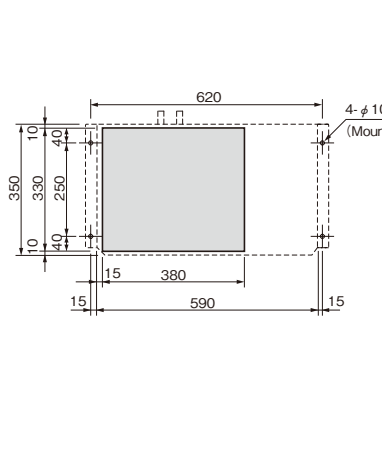
ENC-AR710EX / AR720EX



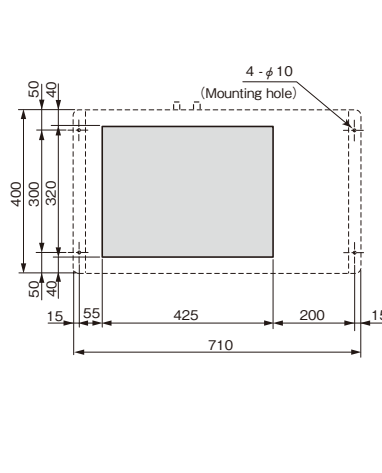
ENC-AR1110EX / AR1120EX



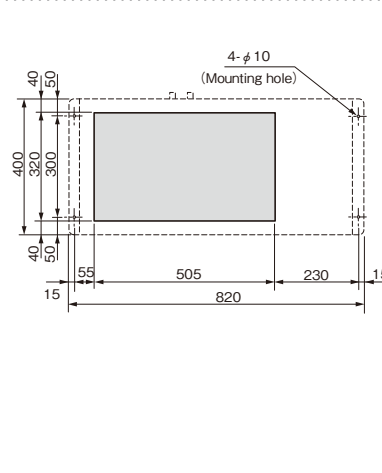
ENC-AR1652EX



ENC-AR2200EX



ENC-AR2900EX

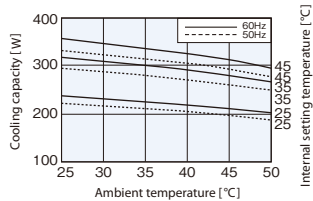




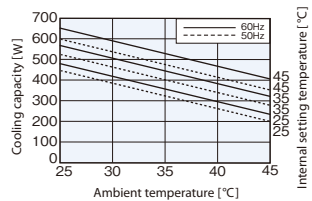
# Diagram of Cooling Characteristics (unit : mm)

## L-series

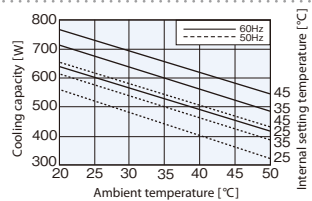
ENC-AR310L / AR320L



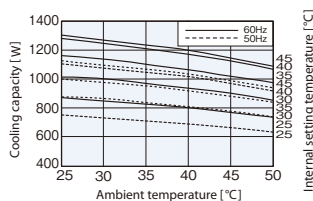
ENC-AR451S / AR452S



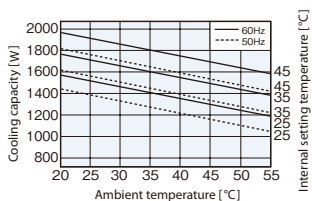
ENC-AR610L / AR620L



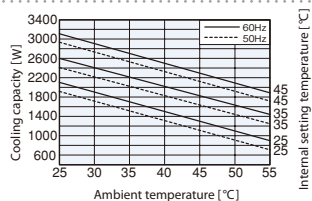
ENC-AR1110L / AR1120L



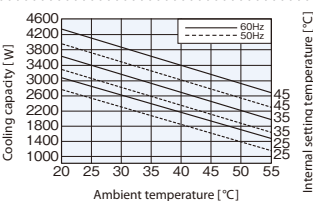
ENC-AR1651L / AR1652L



ENC-AR2200L



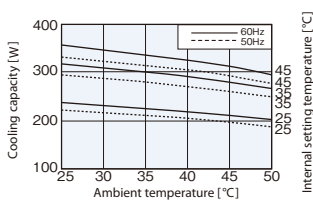
ENC-AR2900L



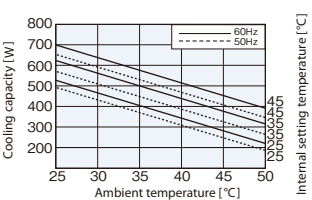
In addition to the cooling capacity calculation with the cooling capacity characteristic chart, it is necessary to carry out the selection procedure when using the FA cooler at an almost upper limit ambient temperature. For further information, contact Apiste sales representatives.

## EX-series

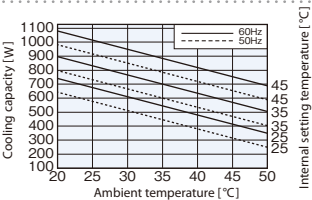
ENC-AR310EX / AR320EX



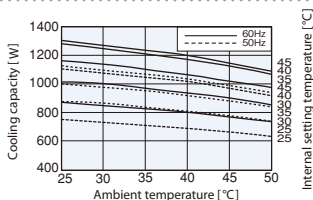
ENC-AR510EX / AR520EX



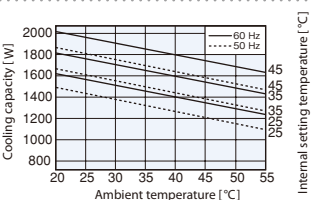
ENC-AR710EX / AR720EX



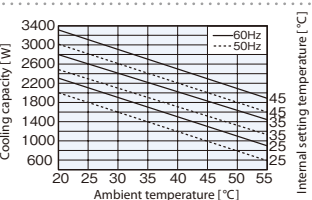
ENC-AR1110EX / AR1120EX



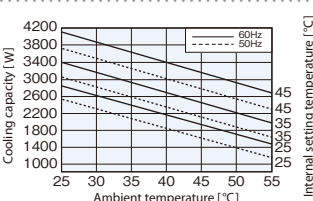
ENC-AR1652EX



ENC-AR2200EX



ENC-AR2900EX



In addition to the cooling capacity calculation with the cooling capacity characteristic chart, it is necessary to carry out the selection procedure when using the FA cooler at an almost upper limit ambient temperature. For further information, contact Apiste sales representatives.

# Consideration for the global environment

### Completely eliminating hazardous chemical substances from the standard models

The ENC-CCC Series' standard models are completely free from the six hazardous chemical substances subjected to control in EU, and made only of materials friendly to the global environment.  
The display substrate is also lead-free. Thereby, the ENC-CCC Series is made entirely of environmental-friendly materials.

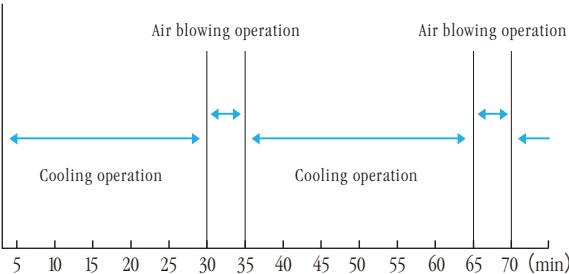
#### Hazardous chemical substances

- Lead (Pb)
- Hexavalent chromium (Cr<sup>6+</sup>)
- Cadmium (Cd)
- Polybrominated Biphenyl (PBB)
- Mercury (Hg)
- Polybrominated diphenyl ether (PBDE)

\* The ENC-CCC Series conforms to the RoHS Directive, but is not a CE certified product.

### Operation in energy-saving mode

The ENC-CCC Series provides the intermittent operation mode that conducts air blowing operation at regular intervals, to ensure energy conservation.  
The fan also provides the energy-saving mode that runs in synchronization with compressor operation. Thereby the ENC-CCC Series' models are designed with consideration for the global environment.



### Commitment to greenhouse gas reduction

CFC gas is required for coolers.  
Apiste uses R-134a, because it is not subjected to control and has been proven in handling reliability and safety.  
“CFC Collection and Destruction Law” was reformed on October 1, 2007.  
Apiste intends to make efforts to reduce impact on global environment, in compliance with relevant laws and ordinances.

Refrigerant	Ozone depletion coefficient	Greenhouse coefficient (Note)	Application
<b>R-407c</b>	0	0.4	Recently approved new refrigerant. At present, R-207c is mainly used for large-size air conditioners with 2 horsepower or more.
<b>R-134a</b>	0	0.25	Mainly used for automotive air conditioners. R-134a is frequently used as refrigerant for refrigerators, in substitution for R-12.
<b>R-22</b>	0.055	0.36	There are wide applications in various fields. However, the complete elimination of R-22 before 2020 has been decided, and is being reduced now.
<b>R-12</b>	1	0.79	Production of R-12 was prohibited at the end of 1995, as an ozone layer depletion factor.

(Note: When CFC=1)



# Specifications

## EX-series

Type		Top-mount Type					
Model		ENC-AR310EX	ENC-AR320EX	ENC-AR510EX	ENC-AR520EX	ENC-AR710EX	ENC-AR720EX
Cooling capacity*1		280／300 (50/60 Hz)		450／500 (50/60Hz)		600／700 (50/60Hz)	
Power supply		Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz
Consumption current (A)	Rating	3.4／3.2	1.8／1.5	3.3／3.0	1.9／1.4	3.2／3.3	1.9／1.4
	MAX	4.0／4.2	1.9／1.7	3.6／3.9	2.0／1.8	3.9／4.1	2.0／1.8
Starting current		7.4／7.7	4.0／4.2	7.4／7.7	4.0／4.2	7.4／7.7	4.0／4.2
Power consumption (MAX)*2	Rating	290／310	280／265	270／280	280／260	250／300	285／265
	MAX	360／410	340／330	320／360	360／320	350／390	340／350
Ambient temperature		20 to 50°C					
Ambient humidity		10 to 85% (No condensation)					
Coolant		HFC-134a (Non-regulated CFC)					
Preset temperature range		25 to 45°C					
No. of fan		2					
Output		Cooling operation output (Rated voltage, normally open: 250 VAC 2 A), Alarm output (Rated voltage, normally open: 250 VAC 2 A)					
Display		Panel internal temperature indicator (Also used as error display), RUN LED					
Noise immunity*3		Level 4 in the fast transient/burst immunity test					
Noise		Approx. 62/65 dB		Approx. 60/65 dB			
Vibration resistance		Total amplitude: 20 mm, Frequency: 300 CPM					
Paint color		Munsell 5Y 7/1 Equivalent color of light beige					
Outer dimensions		H230×W590×D200		H230×W450×D250		H333×W550×D270	
Weight		16kg		15kg		22kg	

Type		Top-mount Type				
Model		ENC-AR1110EX	ENC-AR1120EX	ENC-AR1652EX	ENC-AR2200EX	ENC-AR2900EX
Cooling capacity* <sup>1</sup>		950／1100(50/60 Hz)		1500／1650(50/60 Hz)	1900／2200(50/60 Hz)	2600／2900(50/60 Hz)
Power supply		Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Three-phase 200V±10% 50/60Hz	Three-phase 200V±10% 50/60Hz
Consumption current (A)	Rating	5.4／4.8	2.7／2.4	3.4／3.5	3.3／3.2	4.8／4.7
	MAX	6.3／6.6	3.2／3.3	4.4／4.5	4.2／4.1	5.7／5.8
Starting current		15.6／14.7	7.5／7.1	12.7／11.6	27／25	31／30
Power consumption (MAX)* <sup>2</sup>	Rating	440／470	440／470	610／690	850／1050	1270／1450
	MAX	570／630	570／630	810／890	1050／1250	1700／1900
Ambient temperature		20 to 50℃		20 to 55℃		
Ambient humidity		10 to 85% (No condensation)				
Coolant		HFC-134a (Non-regulated CFC)		R-407C (Non-regulated CFC)	HFC-134a (Non-regulated CFC)	
Preset temperature range		25 to 45℃				
No. of fan		2		3	2	5
Output		Cooling operation output (Rated voltage, normally open: 250 VAC 2 A), Alarm output (Rated voltage, normally open: 250 VAC 2 A)				
Display		Panel internal temperature indicator (Also used as error display), RUN LED				
Noise immunity* <sup>3</sup>		Level 4 in the fast transient/burst immunity test				
Noise		Approx. 60/65 dB		Approx. 65/68 dB	Approx. 70/71 dB	Approx. 72/73 dB
Vibration resistance		Total amplitude: 20 mm, Frequency: 300 CPM				
Paint color		Munsell 5Y 7/1 Equivalent color of light beige				
Outer dimensions		H318×W600×D353		H448×W590×D350	H447×W650×D400	H447×W760×D400
Weight		27kg		33kg	48kg	57kg

\*1: The rated capacity value with an ambient temperature of 35°C and a preset panel internal temperature of 35°C.  
(Measurement condition: JIS-C-9612 air-enthalpy method)

\*2: The rated value is measured under an ambient temperature of 35°C and an ambient humidity of 40%. The maximum value is measured under the highest allowable ambient temperature and an ambient humidity of 40%.

\*3: Determined by the standards of the control PCB.

## L-series

Type		Lateral-mount Type					
Model		ENC-AR310L	ENC-AR320L	ENC-AR451S	ENC-AR452S	ENC-AR610L	ENC-AR620L
Cooling capacity*1		280/300W (50/60Hz)		400/450W (50/60Hz)		500/600W (50/60Hz)	
Power supply		Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz
Consumption current (A)	Rating	3.4／3.2	1.8／1.5	3.4／3.2	1.8／1.5	3.3／3.2	1.8／1.6
	MAX	3.7／3.8	2.0／1.8	3.6／3.7	2.0／1.8	3.9／4.1	2.1／1.9
Starting current		7.4／7.7	4.0／4.2	7.4／7.7	4.0／4.2	7.4／7.7	4.0／4.2
Power consumption (MAX)*2	Rating	290／310	280／260	280／300	280／260	270／310	280／270
	MAX	330／370	340／320	320／360	340／320	340／370	370／360
Ambient temperature		20 to 50°C		25 to 45°C		20 to 50°C	
Ambient humidity		10 to 85% (No condensation)					
Coolant		HFC-134a (Non-regulated CFC)					
Preset temperature range		25～45					
No. of fan		2		3		2	
Output		Cooling operation output (Rated voltage, normally open: 250 VAC 2 A), Alarm output (Rated voltage, normally open: 250 VAC 2 A)					
Display		Panel internal temperature indicator (Also used as error display), RUN LED					
Noise immunity*3		Level 4 in the fast transient/burst immunity test					
Noise		Approx. 65/68 dB		Approx. 59/61.5 dB		Approx. 63/67 dB	
Vibration resistance		Total amplitude: 20 mm, Frequency: 300 CPM					
Paint color		Munsell 5Y 7/1 Equivalent color of light beige					
Outer dimensions		H590×W200×D200		H450×W300×D115		H450×W350×D200	
Weight		15kg		13kg		16kg	

Type		Lateral-mount Type					
Model		ENC-AR1110L	ENC-AR1120L	ENC-AR1651L	ENC-AR1652L	ENC-AR2200L	ENC-AR2900L
Cooling capacity <sup>a1</sup>		950/1100W (50/60Hz)		1450/1650W (50/60Hz)		2000/2200W (50/60 Hz)	2600/2900W (50/60Hz)
Power supply		Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Single-phase 100V±10% 50/60Hz	Single-phase 200V±10% 50/60Hz	Three-phase 200V±10% 50/60Hz	Three-phase 200V±10% 50/60Hz
Consumption current (A)	Rating	5.5／4.8	2.6／2.4	7.6／7.4	3.4／3.6	3.4／3.2	4.9／4.6
	MAX	6.7／6.8	3.1／3.2	9.0／9.9	4.3／4.6	4.4／4.1	5.7／5.8
Starting current		15.6／14.7	7.5／7.1	22.3／20.5	12.7／11.6	27.0／25.0	31／30
Power consumption (MAX) <sup>a2</sup>	Rating	450／470	440／460	630／715	630／720	815／950	1230／1430
	MAX	620／680	560／570	840／970	810／910	1100／1200	1570／1780
Ambient temperature		20 to 50℃		20 to 55℃			
Ambient humidity		10 to 85% (No condensation)					
Coolant		HFC-134a (Non-regulated CFC)		R-407C (Non-regulated CFC)		HFC-134a (Non-regulated CFC)	
Preset temperature range		25 to 45℃					
No. of fan		2		3		4	5
Output		Cooling operation output (Rated voltage, normally open: 250 VAC 2 A), Alarm output (Rated voltage, normally open: 250 VAC 2 A)					
Display		Panel internal temperature indicator (Also used as error display), RUN LED					
Noise immunity <sup>a3</sup>		Level 4 in the fast transient/burst immunity test					
Noise		Approx. 64/68 dB		Approx. 68/72 dB			Approx. 70/73 dB
Vibration resistance		Total amplitude: 20 mm, Frequency: 300 CPM					
Paint color		Munsell 5Y 7/1 Equivalent color of light beige					
Outer dimensions		H730×W300×D230		H1000×W400×D230		H1200×W450×D230	H1380×W450×D230
Weight		23kg		38kg		48kg	57kg

\*1: The rated capacity value with an ambient temperature of 35°C and a preset panel internal temperature of 35°C.  
(Measurement condition: JIS-C-9612 air-enthalpy method)

\*2: The rated value is measured under an ambient temperature of 35°C and an ambient humidity of 40%. The maximum value is measured under the highest allowable ambient temperature and an ambient humidity of 40%.

\*3: Determined by the standards of the control PCB.

# Panel air-conditioners are rapidly becoming widespread.

# The reason why required...

## 1 Advancement of Factory Automation and control devices

As automation advances, FA\* has contributed to a sophisticated production system that deals with diversification and customization, which are the demands of the time. As a result, the concept of control has also greatly changed.

### Advanced automation and the increase in control devices

The phenomenon called "3K alienation" (trend in the labor market in Japan in which people do not want to do jobs that can be characterized by three Japanese words starting with "k": "kiken (danger)", "kitanai (dirty)", and "kitsui (hard)") is continuing even today when job shortages are a societal concern. In order to solve this problem, factories promote the automation of the production process by using robots or automatic

machinery, resulting in a steady increase in the use of control devices. Consequently, in more and more cases, a centralized control system is established on a mezzanine added to the factory, from which workers manage a control panel consisting of several control devices.

### Proliferation of integrated production line and advanced control systems

In the past, there were several factories (processes) specializing in a certain process, such as heat treatment, working, or assembly. In new FA systems, however, these factories (processes) are integrated into a single production line system including upstream and downstream processes. Production systems, such as FMS\*, have become more advanced. It is natural that people will request a flexible and intelligent control system with advanced, multi-functional control devices.

The advancement of FA promotes an increase in control devices and sophisticated control. It can be said that the development of FA was achieved by increased dependence on control systems.

\*FA: Factory Automation  
\*FMS: Flexible Manufacturing System

## 2 Increased dependence on control systems and more expense for control devices

When FA increases dependence on control systems, other challenges arise. The first is that the environment of control devices becomes more important for risk management in the factory. The second contradicts the above issue that the current FA environment is not suitable for control devices.

### Tendency to suffer greater damage from the failure of control devices

The integrated production line and highly systematized production in a factory involves the risk of a failure or breakdown of a single process affecting the operation of the entire factory. Since the control system is a vital part of FA, even the breakdown of a single control device may cause

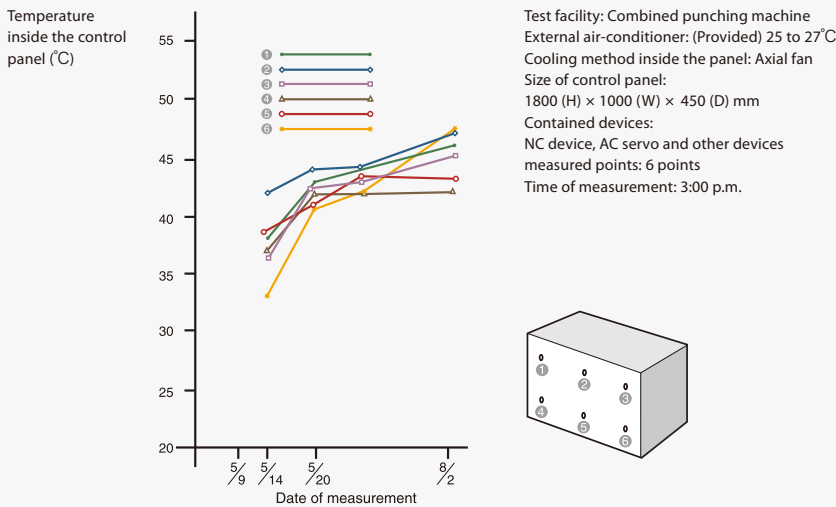
significant damage. In other words, we must understand that the reliability of the control devices is an extremely important issue.

### Factory environment unsuitable for control devices

Furthermore, the advancement of the integrated production line results in an environment hostile to certain devices such as an assembly robot operating near a heat-treatment process. Such factory environments are detrimental to multi-functional, sophisticated control devices. Semicon-

ductor and electronics components used as the core of those control devices are easily affected by heat, moisture and dust.

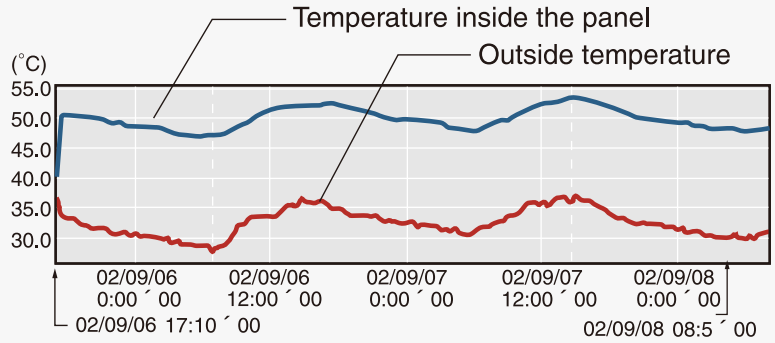
### Temperature inside the control panel for a metal working line of an automotive manufacturer (From spring to summer)



## 3 Semiconductor / electronics components are easily affected by heat, moisture and dust.

Data has proven that heat and moisture greatly increase the failure rate of semiconductor and electronics components and shorten their operating life.

### Temperature inside and outside the power control panel of an automotive manufacturer

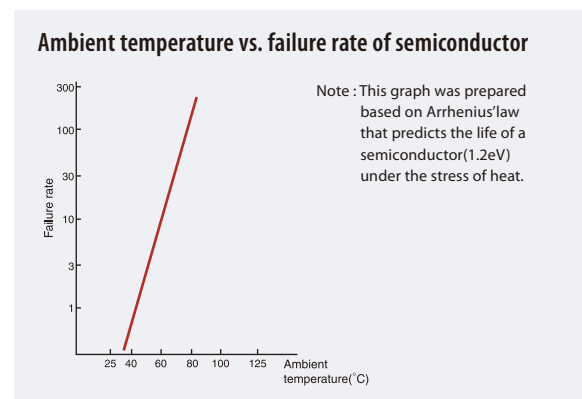


Test facility: Metal working line for automotive parts  
External air-conditioner: Not provided  
Cooling method inside the panel: General-purpose heat exchanger  
Size of control panel: 2000 (H) × 1000 (W) × 500 (D) mm  
Contained devices: 3-axis AC servo and other devices  
Measured points: 1 point at the center of the panel



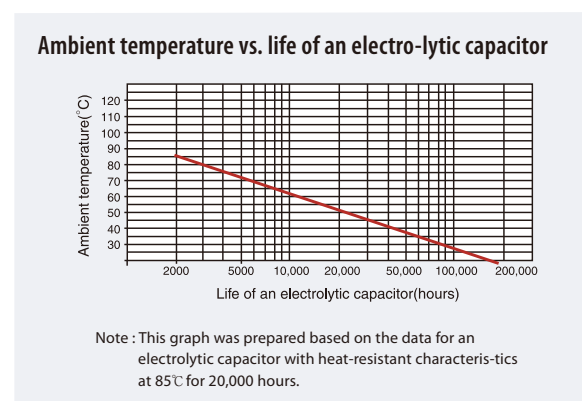
## Heat accelerates the failure rate of semiconductor / electronics components

The graph on the right shows 'the relationship between the temperature and acceleration of semiconductor failure\*. The Y axis shows the acceleration of the failure. At a temperature of 25°C, the failure rate is less than 0. At 40°C, the failure rate is 1. The ratio, however, increases to 10 to 30 times at 60°C, and jumps to 100 to 300 times at 80°C. This graph clearly shows that an increase in temperature greatly affects the failure rate of semiconductor/electronics components.



## Heat dramatically shortens the life of semiconductor / electronics components

The next graph shows "the relationship between the temperature and the life of a capacitor". At a temperature of 30°C, the life of a capacitor is about 80,000 hours. At 40°C, the life becomes 40,000 hours, it means about half the life at 30°C: At 60°C, the life is further shortened to about 10,000 hours. Heat also greatly affects the life of semiconductor/electronics components.

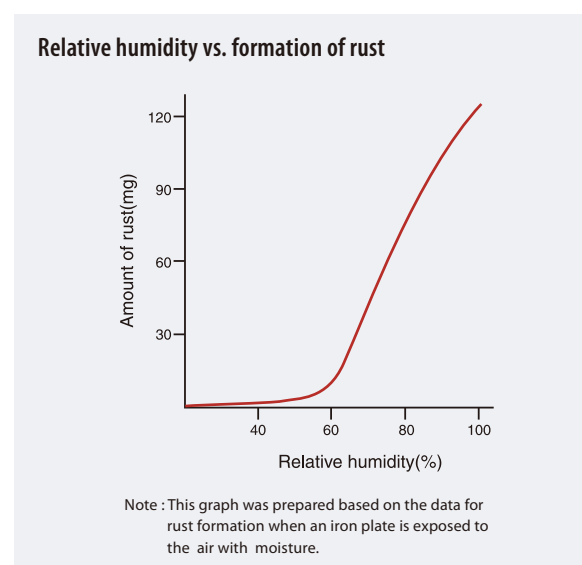


## Destructive influence of moisture on control devices

Control devices have a lot of joints and moisture is one of the greatest enemies of these joints. The graph on the right shows "the relationship between corrosion and relative humidity". You can see that corrosion rapidly advances when humidity exceeds 60%. Since humidity around 70% is a normal level in Japan, measures against moisture are crucial for control devices. Furthermore, corrosion advances more rapidly at higher temperatures, so the measures against moisture must be considered along with the measures against heat.

In conclusion, we should review the approach to the environment for control devices from the beginning. For example, when a control panel is installed on the mezzanine of the factory as described earlier, the temperature on the mezzanine is usually higher than the ground surface by 5°C. In summer in particular, the temperature becomes extremely high due to the heat from the factory roof.

Needless to say, such an environment is the worst for control devices using many semiconductor/electronics components. Although the manufacturers of control devices continue efforts to enhance the heat resistance of their products, there is a limit. You require drastic measures to solve the problem. In addition to temperature and moisture, dust and oil mist are also known as serious problems to control devices. In some cases, chemical absorption agents are installed in the control panels, but these are only a band-aid-like solution. This problem must be taken seriously along with the measures against heat and moisture.



## 4 Influence of control device breakdown

What happens to the production activity when control devices suffer a breakdown? Possible results are as follows:

### Tremendous loss of time

Assume that one control panel suffers a breakdown. Even if the breakdown lasts for only 30 minutes, the previous and next production processes also stop because of interlocks of the integrated and systematized production line. If a device such as a furnace stops, It takes at least one or two hours to

recover normal operation. As a result, the failure of a single control panel will stop the operation of the previous and next lines, resulting in a time loss of about two hours.

### Significant loss of cost

The cost of replacing an inverter is expected to be about ¥300,000 for a 30 kW inverter. Replacing only a PC board will cost about ¥60,000. Moreover, ordering a necessary part requires at least two to three weeks. If you plan to have the inverter in stock, another ¥300,000 is required. Assigning maintenance staff to find failures at an early stage requires the cost of "(Hourly-wage) × (Working hours) × (No. of people)". At any rate, you have to be

prepared to pay a considerable cost.

What is the best way to solve these problems at their source? After all, these problems can be considered to be an environmental problem of the integrated control devices or control panel.

## 5 Conventional measures for maintaining the proper environment for a control panel

In production sites, various measures have been taken against these problems for a long time. Such measures, however, were insufficient to solve these problems at their source. The following is a brief explanation and the drawbacks of such measures

### Axial fan

Axial fans are often installed inside control panels to prevent control devices from heating up. This is, however, far from an ideal solution. Since axial fans take in outside air indirectly, they cannot prevent the ingress of oil mist

or dust in the factory air. The cooling ability may be totally insufficient because it depends on the temperature of the outside air.

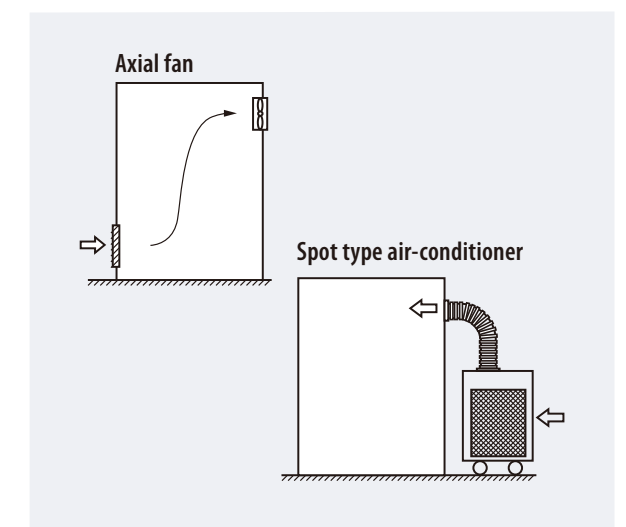
### Spot type air-conditioner

Spot type air-conditioners are also often used as a method to cool the inside of control panels. They are, however, originally designed for home use, not for the control panels in factories. Therefore, the air is not completely separated from outside air, resulting in contamination with oil mist or dust. Spot type air-conditioners are not suitable for cooling the inside of control panels either.

### Air-conditioned control room

Another method is to install several control panels in a control room with an air-conditioner. The potential problems are: It is difficult to find the space for the room; construction requires considerable cost; and it is difficult to change the layout when the production system is changed. Dust may be another problem because many people go in/out of the room.

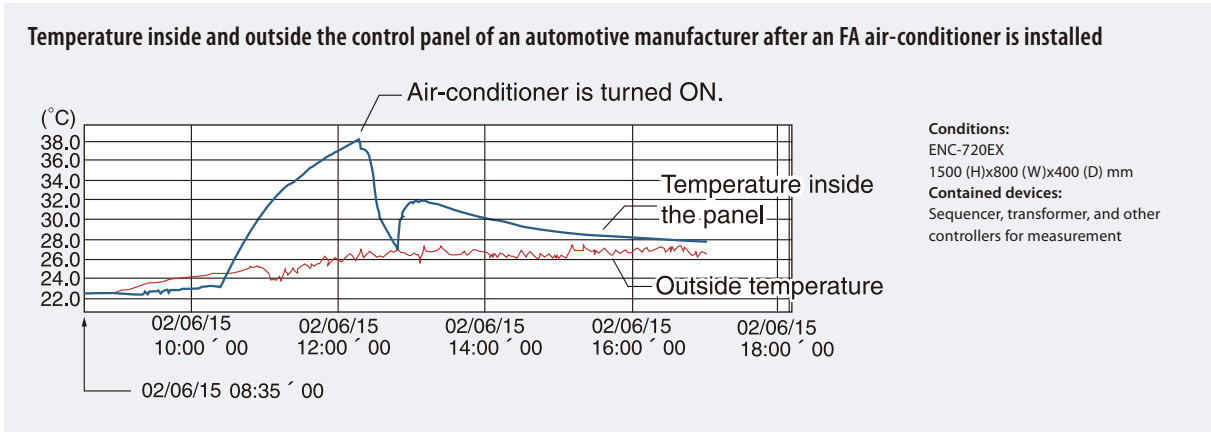
After reviewing these issues, the best measure for maintaining the proper environment for control panels is finally found: a panel air-conditioner, or an air-conditioner specially designed for a control panel. Apiste and some innovative. FA-related parties are the first to focus attention on such air-conditioners.



# Panel air-conditioner providing measures against "heat", "moisture", and "dust"

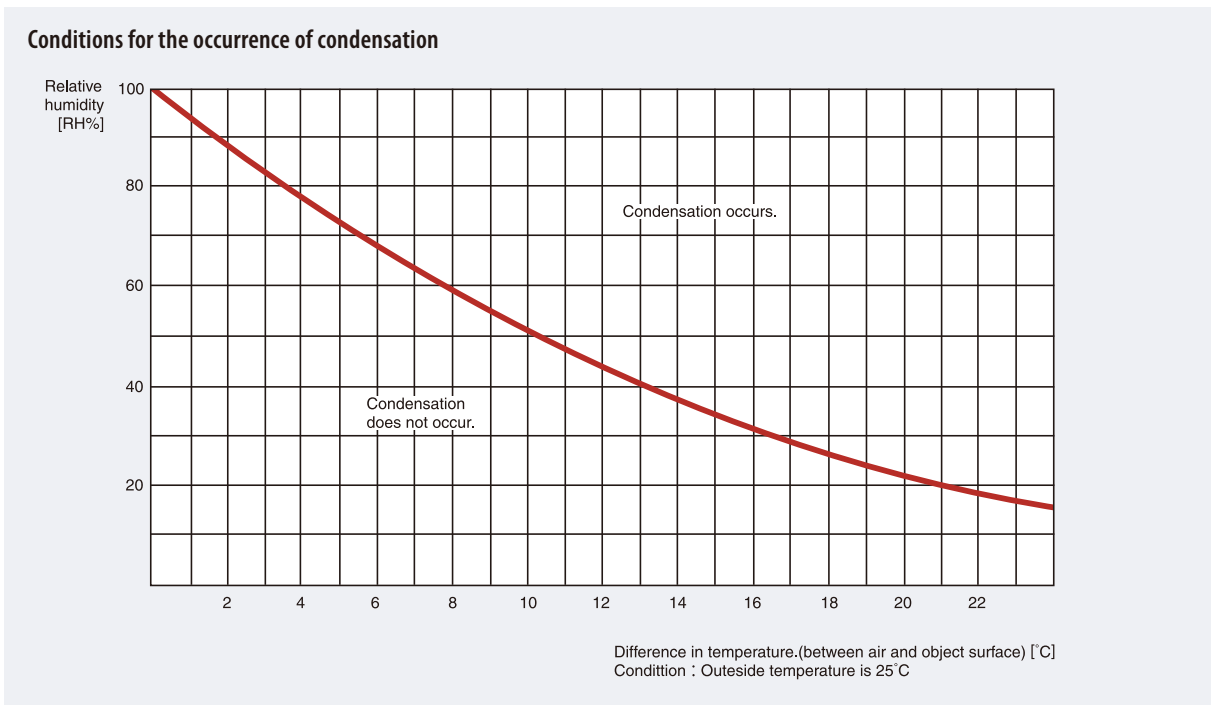
## 1 Against heat — Keeping the temperature inside the control panel constant

Apiste is a manufacturer specializing in panel air-conditioners. We have been working to understand the realities of production sites and the environment of control devices, and to identify problems and solutions from the standpoint of specialists. These efforts have led to the development of various Apiste panel air-conditioners, of which details are provided in this catalog. The basic concept is to provide measures against "heat", "moisture", and "dust".

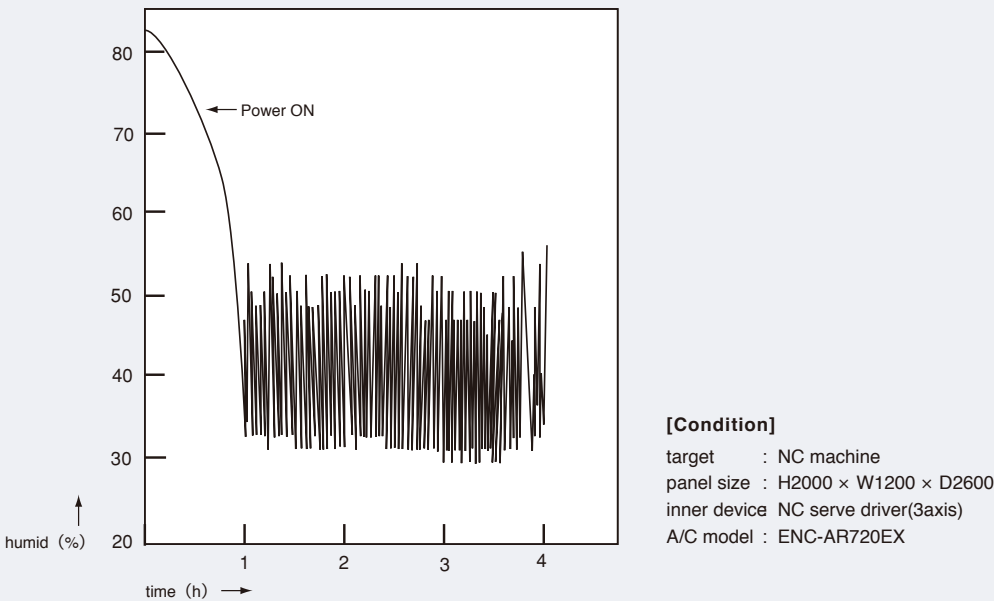


## 2 Against moisture — Dehumidification to prevent condensation

Panel air-conditioners feature various measures against moisture and condensation as well as gradual cooling.



Humidity trend after installation of panel air-conditioner

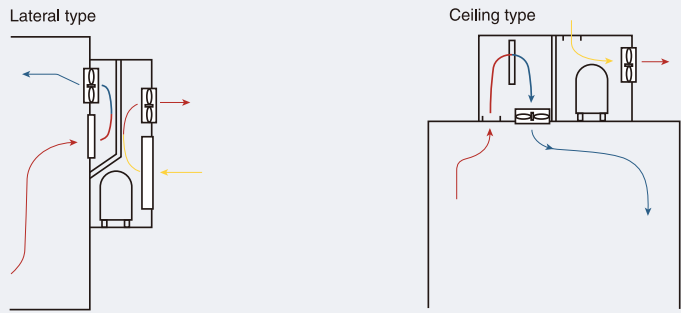


## 3 Against dust — Separate air circulation shutting the outside air out of the panel

Panel air-conditioners have a separate air circulation structure to prevent oil mist or dust in a factory from entering the control panel. Their internal air circulation system circulates air only inside the control panel for cooling and dehumidifying the air.

### Structure of FA air-conditioners

Structure of FA air-conditioners offer various functions in addition to cooling the air.



They actively cool and dehumidify the air and prevent dust from entering the control panel by establishing independent air circulation inside the control panel. Thus, all measures against heat, moisture, and dust are implemented. This is the first achievement of an ideal environment for control devices using semiconductor/electronics components in a hostile

production atmosphere. This fact has become the focus of attention of FA-related parties. Panel air-conditioners are being recognized as necessities in the FA environment.



# Selection of indoor panel air-conditioner

### 1) to 6) Determine the numeric values used for calculation.

- **Estimated heat generation inside a control panel: P(w)**
  - Determine the heat generation for each device installed inside the control panel according to the "List of heat generation from devices inside a control panel".
  - Obtain the sum of the heat generation.
  - As for a power control panel, correct the value to practical heat generation by multiplying the value by its load ratio.
- **Surface area of control panel cabinet: S (m<sup>2</sup>)**
  - For a freestanding type, subtract the bottom area.
- **Operating power frequency: F (Hz)**
  - Used as a guide to select cooling ability.
- **Maximum outside temperature: T1 (°C)**
- **Target temperature inside control panel: Tz(°C)**
  - The recommended setting temperature is between 35°C and 45°C.

### 7) Compare the maximum outside temperature and the target temperature inside the control panel, then go to the next step.

- **When the maximum outside temperature is lower than the target temperature**
  - Use calculation 8) "To set the target temperature higher than the maximum outside temperature".
- **When the maximum outside temperature is higher than the target temperature**
  - Use calculation 9) "To set the target temperature lower than the maximum outside temperature".

### 8) or 9) → 10) Substitute the values above into the appropriate calculation to obtain required cooling capacity.

#### 8) To set the target temperature higher than the maximum outside temperature

Required cooling capacity (w)=  
 $P \cdot S \times 5$  (Overall heat transfer rate)w/ (m<sup>2</sup>·k) × (T2-T1)

#### 9) To set the target temperature lower than the maximum outside temperature

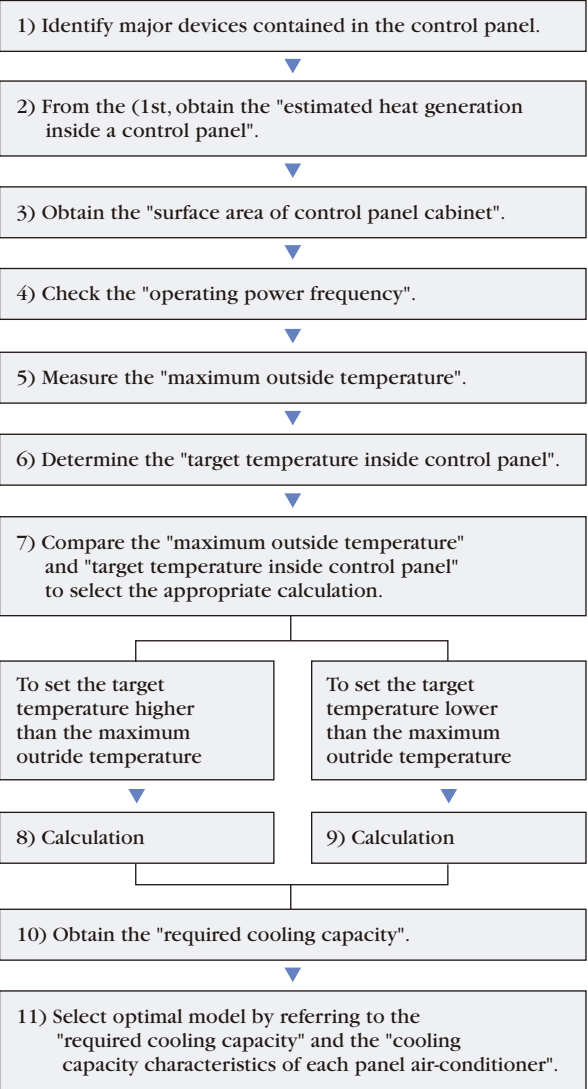
Required cooling capacity (w)=  
 $P + S \times 5$  (Overall heat transfer rate)w/ (m<sup>2</sup>·k) × (T1-T2)

\* Overall heat transfer rate for typical control panels is normally 5.0 to 6.0.

### 11) Select an optimal air-conditioner model by referring to the required cooling capacity and the cooling capacity characteristics of each panel air-conditioner.

- **Check the cooling capacity**
  - See product catalog.
- **Select the model that has a higher cooling capacity than the required cooling capacity.**

### Model selection flow



### ⚠ CAUTION

#### Precautions on selection

1. Note that the heat generation of a power control device (inverter) greatly varies depending on the usage or motor torque.
2. As for inverters of 50 kW or more output power, heat generation greatly varies according to the manufacturers. Contact the respective manufacturer for precise values.
3. The selection plan created by Aplste applies to Apiste products only. The plan may be inappropriate with products of other companies.
4. If any difference arises after the installation, while following Apiste's selection plan, we will discuss a solution.
5. Provide sufficient allowance for model selection. Expected capacity may not be obtainable due to the closeness of the control unit, the position of heat-generating objects, or dirty filters.
6. Note that the formulas above are used only as a guide; they do not indicate universal values.

## List of heat generation from devices inside a control panel

### 1. Power supply/transformer

Device inside a control panel	Heat generation (referential value)		Remark
Small transformer	Rated capacity: 10 VA or less : Approx. 50% 100 VA or less : Approx. 20% 1 kVA or less : Approx. 6% 3 kVA or less : Approx. 3 to 5%		• Smaller device shows higher heat generation ratio.
Large transformer (oil-filled transformer)		50Hz 60Hz	• Values show heat generation in a unit of W.
	1-phase, 10kVA	193 184	
	1-phase, 20kVA	352 339	
	1-phase, 30kVA	473 455	
	1-phase, 50kVA	718 718	
	1-phase, 75kVA	1075 1049	
	1-phase, 100kVA	1419 1380	
	1-phase, 150kVA	1840 1797	
	1-phase, 200kVA	2429 2369	
	1-phase, 300kVA	3526 3551	
	3-phase, 20kVA	438 408	
	3-phase, 30kVA	606 589	
	3-phase, 50kVA	924 907	
	3-phase, 75kVA	1294 1255	
	3-phase, 100kVA	1689 1664	
	3-phase, 150kVA	2390 2373	
	3-phase, 200kVA	3035 3027	
	3-phase, 300kVA	4153 4011	
	3-phase, 500kVA	6170 6063	
Voltage regulator	Approx. 10% of the rated capacity		
Large resistor	Approx. one-third of the rated capacity		
Constant-voltage power supply	Approx. 10 to 15% of the rated capacity		
Uninterruptible power supply (UPS)	Rated capacity: 1 to 5 kVA: Approx. 35% 20 kVA or less: Approx. 25%		• Smaller device shows higher heat generation ratio. • The listed heat generation is the value when the storage battery is fully charged. • Constant inverter feeding type
DC regulated power supply (switching regulator)	Approx. 30 to 55% of the rated power output (W)		• Heat generation at the rated power output of 100% • Smaller device shows higher heat generation ratio. • Example: At 100 mA and 24 V: 0.1 A x 24V = 0.24W (rated power output)
Low-voltage capacitor	Approx. 0.2 % of the rated capacity (kVA)		• Rated capacity is expressed in kVA. • Reference: 1kVA = 253.3 μF

### 2. Amplifiers

Device inside a control panel	Heat generation (referential value)			Remark
AC servo amplifier	Rated capacity : 0.1 kW or less : Approx. 50% 0.5 kW or less : Approx. 15% 1 kW or less : Approx. 10% 3 kW or less : Approx. 7% 5.5 kW or less : Approx. 5% 11kW or less : Approx. 4% 22 kW or less : Approx. 3.5%			• Heat generation when the rated power output is 100% per amplifier. • Smaller device shows higher heat generation ratio.
Inverter	0.4 kW or less : Approx. 12.5% 0.75 kW or less : Approx. 11% 1.5 kW or less : Approx. 7.5% 2.2 kW or less : Approx. 6% 3.7 to 15 kW : Approx. 5% 18.5 to 22 kW : Approx. 4.5% 30 kW or more : Approx. 4% 60 kW or more : Ask the manufacturer			• Heat generation at the rated power output of 100% • Smaller device shows higher heat generation ratio. • At constant rated power output for the heat generation of a large inverter of 60 kW or more capacity, ask the manufacturer.
Thyristor (APR-G)	Rated current	Single-phase	3-phase	• Values show heat generation. • Three-phase thyristor produces more heat.
	20A	53W	115W min.	
	45A	81W	210W min.	
	60A	104W	265W min.	
	100A	160W	410W min.	
	150A	220W	575W min.	
	250A	265W	795W min.	
	450A	503W	1435W min.	
	600A	666W	1980W min.	
Power unit (for servo amplifier)	Approx. 3 to 5% of the rated power output (kW)			• Heat generation at the rated current of 100%

### 3. Wiring devices

Device inside a control panel	Heat generation (referential value)	Remark
Molded case circuit breaker (MCCB) Ground leakage circuit breaker (ELCB)	Rated current of MCCB : 20 A or less : Approx. 5W 50 A or less : Approx. 15W 100A or less : Approx. 35W 225 A or less : Approx. 55W 400 A or less : Approx. 85W ELCB Heat generation of MCCB+ Approx. 5 to 20 W (From ground leakage electronic circuit section, etc.)	• Heat generation at the rated current of 100% *kVA=1kW
Electromagnetic contactor	Rated capacity : 4 kW or less : Approx. 10W 7.5 kW or less : Approx. 20W 22 kW or less : Approx. 55W 30 kW or less : Approx. 110W	• Heat generation at the rated current of 100%
Thermal overload relay	Rated current : 35 A or less : Approx. 4W/pole 100 A or less : Approx. 8W/pole 150 A or less : Approx. 10W/pole	• Heat generation when the maximum setting current is passed
Electromagnetic relay	Approx. 5W	• Heat generation at the rated current of 100%

4. Control devices

Device inside a control panel	Heat generation (referential value)	Remark
Small relay	Approx. 1 W to 2 W/device	
Solid-state relay (SSC, SSR)	Approx. [Operating current × 1.5(W)]	
Temperature regulator	Size 48 × 96: Approx. 5 W Size 96 × 96: Approx. 10 W	
Sequencer	Approx. 3% of current consumption	

5. Computer-related devices

Device inside a control panel	Heat generation (referential value)	Remark
Personal computer (factory computer)	100 W to 300 W/device	
CRT (Monitor)	Approx. 60 W to 130 W/device	• Large-size monitor (more inches) generates more heat.
Floppy disk drive	Drive for two 3.5- or 5 1/4-Inch floppy disks: Approx. 20 W	
Hard disk drive	10 to 20 MB: Approx. 100 W	• Including the power supply unit

6. Other

Device inside a control panel	Heat generation (referential value)	Remark
Fan motor	Size 90 × 90: Approx. 10 W Size 120 × 120: Approx. 15 to 20 W Size 160 × 160: Approx. 40 to 50 W	• General- purpose AC axial flow motor

7. Motor control devices — ①

Contained devices	Heat generation (referential value)	Remark
200 V-class, large AC servo amplifier	Rated capacity: 22 kW: 742 W 30 kW: 1052W 37 kW: 1820W	• Typical value Ask respective manufacturer for details.
400 V-class, large AC servo amplifier	Rated capacity: 22 kW: 770W 30 kW: 1090W 37 kW: 1260 W 45 kW: 1560W 55 kW: 1840W	

7. Motor control devices — ②

Contained devices	Heat generation (referential value)	Remark
200 V-class, Device Including Inverter Control resistor Control unit	Rated capacity: 3.7kW : 0.19 kW 5.5kW : 0.28 kW 7.5kW : 0.38 kW 11 kW : 0.55 kW 15kW : 0.75 kW 18kW : 0.93 kW 22kW : 1.1 kW 30kW : 1.5 kW 37kW : 1.9 kW 45kW : 2.3 kW 55kW : 2.8 kW 75kW : 3.8 kW 90kW : 4.5 kW 110kW : 5.5 kW	• At 100% control torque and 5% brake frequency Mainly used as a brake for a motor
400 V-class, Device Including Inverter Control resistor Control unit	Rated capacity: 3.7kW : 0.19 kW 5.5kW : 0.28 kW 7.5kW : 0.38 kW 11 kW : 0.55 kW 15kW : 0.75 kW 18kW : 0.93 kW 22kW : 1.1 kW 30kW : 1.5 kW 37kW : 1.9 kW 45kW : 2.3 kW 55kW : 2.8 kW 75kW : 3.8 kW 90kW : 4.5 kW 110kW : 5.5 kW	• At 100% control torque and 5% brake frequency Mainly used as a brake for a motor

\*Ask respective manufacturer for details of an inverter.

7. Motor control devices — ③

Contained devices	Heat generation (referential value)	Remark
400 V-class, large inverter	Rated capacity: 30kW : 1.3kW 37kW : 1.6kW 45kW : 2.0kW 55kW : 2.3kW 75kW : 3.1kW 90kW : 3.7kW 110kW : 4.4kW	• At 100% control torque and 5% brake frequency Mainly used as a brake for a motor
400 V-class, Device Including Inverter Control resistor Control unit	Rated capacity: 30kW : 1.2kW 37kW : 1.4kW 45kW : 1.7kW 55kW : 1.9kW 75kW : 2.6kW 90kW : 3.0kW 110kW : 3.3kW 132kW : 4.1kW 160kW : 5.0kW 200kW : 6.0kW 220kW : 6.8kW 280kW : 8.2kW	• At 100% control torque and 5% brake frequency Mainly used as a brake for a motor

7. Motor control devices — ④

Contained devices	Heat generation (referential value)	Remark
200 V-class, AC reactor	3.7 kW: 10.1 W 5.5 kW: 17.2 W 7.5 kW: 18.8 W 11 kW: 20.2 W 15 kW: 28.6 W 22 kW: 33.3 W 30 kW: 39.3 W 37 kW: 70.8 W 45 kW: 47.1 W 55 kW: 55.1 W 75 kW: 65.1 W 90 kW: 75.5 W 110kW: 83.4 W	• Input voltage: 50 Hz Voltage balance: 0% Motor toad: 100% Typical value
400 V-class, AC reactor	3.7 kW: 7.6 W 5.5 kW: 10.9 W 17.5 kW: 12.8 W 11 kW: 14.3W 15 kW: 18.5W 18.5kW: 26.9 W 22 kW: 35.6W 30 kW: 38.9 W 37 kW: 50.2 W 45 kW: 55.7 W 55 kW: 66.3 W 75 kW: 70.7 W 90 kW: 85.5 W 110 kW: 93.5W 132 kW: 119W 160kW: 135W 200kW: 155W 220kW: 170W 280kW: 210W	• Input voltage: 50 Hz Voltage balance: 0% Motor load: 100% Generation loss may vary depending on the capacity and torque of power supply. According to G7/P7 inverter manufactured by FUJI DENKI. Typical value

\*Ask respective manufacturer for other devices.

Note: This material is prepared by adding Apiste's original research results to the material provided by the technical study group of heat-related devices for control panels.  
The heat generation values described here are typical values.  
Ask respective manufacturers for precise values.

Selecting a breaker

Use the following table to select the breaker capacity

Power Supply	Applicable capacity of a breaker (Unit: A)
Single-phase, 100 V	More than the maximum current consumption of the panel air-conditioner to be used
Single-phase, 200 V	More than the maximum current consumption of the panel air-conditioner to be used
3-phase, 200 V	More than the maximum current consumption of the panel air-conditioner to be used

Selecting a transformer

When using an air-conditioner with a 400V power supply, use the following table to select the capacity of a transformer

Power Supply	Calculation to obtain the capacity of a transformer(Unlt: VA)
Single-phase, 100 V	100 V x [Starting current of the panel air-conditioner (A)]
Single-phase, 200 V	100 V x [Starting current of the panel air-conditioner (A)]
3-phase, 200 V	100 V x [Starting current of the panel-air conditioner (A)]

\*Note: √3=1.732