

Climate Control Products

Enclosure Climate Control

Heat producing components currently widely used in electronic and industrial equipment enclosures present the problem of dissipating the heat generated before damage can occur to heat-sensitive parts. In many cases, the problem can be solved by ventilation, using simple air moving devices. However, in more and more applications the available ambient air is too warm or too contaminated to be used for the safe dissipation of the unwanted heat. Under those conditions, the life expectancy and performance of sensitive components may be adversely affected, often causing equipment malfunctions, slowdowns or failures.

In forced convection cooling of enclosures, cooler ambient air is drawn or forced through the components in an enclosure and discharged. When electronic/electrical enclosures are sealed to keep out moisture, dust, dirt and other contaminants, the heat generated by the components is trapped and closed-loop cooling (air conditioner or heat exchanger) is needed to maintain the optimum environment for the components.

*Our product offerings include an extensive array of units for virtually every type of application which customers can select from to address their enclosure ventilation or cooling requirement.

COOLING PRODUCT SELECTION

Our philosophy is to specify the smallest, least complex cooling device that will satisfy the requirements of the application.

Forced Ventilation Air Cooling

In clean, non-hazardous environments with acceptable ambient temperatures, a simple forced-air cooling system utilizing ambient air is usually adequate. Combined with a low-cost air filter, such devices generally meet the heat removal needs of typical electronic and electrical equipment.

Closed-Loop Cooling

In harsh environments involving high temperatures, heavy particulates, oil, or chemicals capable of damaging components, ambient air must be kept out of the enclosure. Sealed enclosures are generally used, with closed-loop cooling consisting of two separate circulation systems in a single unit. One system, sealed against the ambient air, cools and recirculates the clean cool air throughout the enclosure. The second system uses ambient air or water to remove and discharge the heat.

General Specifications for all Air Conditioners

CLOSED-LOOP COOLING: The enclosure interior airflow system is isolated from the ambient airflow system. No ambient air can invade the cool, dehumidified, sensitive component compartment.

BALL-BEARING MOTORS: All blower motors are UL/CSA Recognized and include automatic-reset thermal overload protection and double-sealed or double-shielded precision ball bearings. Special permanent lubricants perform over a broad temperature range: -20°F (-29°C) to 250°F (121°C). Tube axial fans are rated to perform at 14°F (-10°C) to 158°F (70°C) and are designed to meet UL, CSA and VDE.

BLOWERS: All centrifugal blowers are designed and built to provide optimum airflow and pressure for each air conditioner design.

RUGGED CONSTRUCTION: Precision-engineered heavy gauge steel construction of all shells and blowers ensures air conditioners will stand up under tough applications.*

BAKED POWDER FINISH: Durable, baked-on powder finish is standard. Other finishes are available.*

POWER: Units are available in 115 VAC, 230 VAC or 480 Volt.

REFRIGERANTS: CFC-free R134a Refrigerant is used in all air conditioners for which compatible compressors are available. All others contain Zero Ozone Depleting Potential (ODP) R410a Refrigerant. The model number reflects the refrigerant. A 4 between the A and C signifies R134a; a 6 signifies R410a.

FILTERS: Multi-layer grid of sturdy, corrugated aluminum in an aluminum frame. May be reused after washing off accumulations and spraying with A-16 Recoating Adhesive. Filters must be kept free of accumulations to prevent reduction or loss of performance and/or damage to equipment. Filters are not required on water-cooled models.

CONDENSATE DISPOSAL: Condensate drain fitting and hose are included. Built-in Condensate Evaporators are standard in many models. (See Series sections)

POWER CORD: All models have 3-wire power cords. 480 Volt models are supplied with an external junction box for permanent wiring as a Standard Feature. Single phase UL listed units are supplied with a plug.

INSULATION: All cold components, lines and the evaporator compartment are insulated with high-performance insulation for maximum efficiency.

GASKETING: All units are fully gasketed for tight, leakproof installation in compliance with the NEMA 12, 3R or 4/4X Enclosure Ratings.

QUALITY ASSURANCE: Refrigeration system components are kept sealed until charged with refrigerant; all brazed joints are thoroughly leak-tested; each unit is functionally tested before shipment.

INSTALLATION: Installation instructions, including mounting plan drawings, are included with each unit.

* See Guardian, Guardian 480 Volt for different specifications applicable.

Guardian Series, SlimKool Series, Compact Series, Compact Plus Series, and Advantage Series are brand names of KOOLTRONIC, Inc., Pennington, NJ

Air Conditioner Sizing and Selection

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Cooling Electronic Control Cabinets

Most electronic control systems generate a substantial amount of heat during operation. This heat factor is intensified as electronic controls are made more compact, perform more functions and are placed in confined areas. Additional problems are encountered when the electronic process control system is located on-line in an industrial setting, rather than in a clean computer room. The factory environment can be hostile to the point that performance and effective life of the electronic components are materially reduced or the control system fails completely. Ambient temperature might be excessively high, as that found in a steel mill. Moisture-laden air and airborne particulate matter might be present to adversely affect the electronic components, as in the paper manufacturing industry. Air conditioners are designed to perform reliably under many of these harsh conditions and to provide the cooling and environmental protection required by sensitive electronic production control systems.

Factors Affecting Model Selection

This section is presented as a basic outline or checklist of the various application conditions to be considered when choosing a cooling unit. These are the factors which must be considered when selecting a cooling unit:

Internal Heat Load

This is the heat dissipated by the electronic controls. It is expressed in watts. One WATT equals 3.413 BTU/HR. Thus, to obtain the approximate cooling capacity required to remove a specific heat load, the following formula can be used: Watts x 3.413 = BTU/HR. For example, a heat load of 800 watts, require an air conditioner capable of removing at least 2,730 BTU/HR.

Resistance to Airflow in the Enclosure

Airflow is measured in cubic feet per minute (CFM). To create an air flow of any desired velocity requires that pressure be produced by the blower. Resistance to this blower-produced air flow is created by obstructions within the cabinet in the air flow path. The resistance itself is called static pressure (SP) and is measured in inches of water column. The effect of significant restrictions in the cabinet air flow path are as follows:

- the obstructions cause static pressure.
- static pressure results in a pressure drop, or differential, from the air velocity produced by the blower.
- this reduction in cool air flow will decrease the effective capacity of the cooling unit. Allowance must be made for static pressure.

Heat Load from the Surroundings

Ambient conditions can cause a heat gain in the enclosure. The rated capacity of the cooling unit must be sufficient to handle this heat gain. When evaluating the additional heat load gained from the surroundings there are two possible conditions:

- the cabinet is insulated and well sealed
- the cabinet is not insulated.

Cabinet Insulated - Normally, well-insulated cabinets do not gain sufficient heat from the surroundings to affect the air conditioner operation. BTU/HR ratings for Kooltronic air conditioners have been established at the maximum ambient operating temperature of 125°F. A substantial improvement in heat removal occurs when operating in ambient temperatures below 125°F.

Cabinet Not Insulated - Obviously, this design places more of a burden on the cooling unit. Heat is conducted to the cool side. Thus, high ambient heat will be readily transmitted into the cooler enclosure. To determine the additional capacity required of an air conditioner installed in an uninsulated cabinet, the surface area of the enclosure must be calculated to obtain the total effective heat transfer area. For this calculation, use the surface area of the sides, plus the area of the top and omit the bottom area of the cabinet.

Air movement outside the uninsulated cabinet will increase the heat conducted from the ambient into the enclosure. When there is little or no air circulation outside the cabinet, the layer of air immediately adjacent to the exterior cabinet walls acts as an insulating film. Exterior air movement dissipates this insulating layer of air in proportion to the velocity of the air flow. Substantial ambient air circulation will increase the transmitted heat load imposed on the cooling unit. If the cabinet being cooled is not air tight, high ambient relative humidity will adversely affect the cooling effectiveness of the air conditioner. When humid air infiltrates a poorly sealed enclosure, the air conditioner is required to use up valuable capacity just to condense the moisture from the internal air. Conversely, if the cabinet is well sealed, high ambient relative humidity has very little effect on the rated capacity of the air conditioner.

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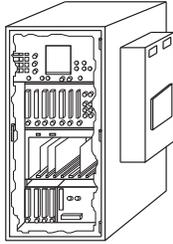
Air Conditioners Sizing & Selection Climate Control

The proper selection of an air conditioner is determined by the following criteria:

- 1) Required cooling capacity BTU/HR.
- 2) Mounting requirements (top, side or internal mounting)
- 3) Dimensions of air conditioner & enclosure

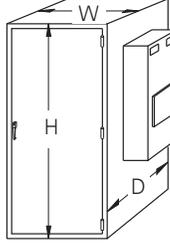
To determine air conditioner capacity required:

First



1 Watt = 3.413 BTU/HR
Determine the internal Watts of heat to be dissipated.

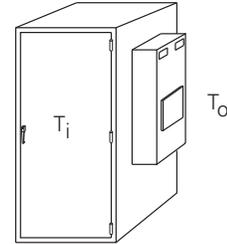
Second



1 M² = 10.76 ft²
Calculate the area of the enclosure which is exposed to the ambient air:

$$\frac{2H''(W'' + D'') + (D'' \times W'')}{144} = \text{Area (ft}^2\text{)}$$

Third



1°C Δ T = 1.8°F Δ T
Determine the temperature differential Δ T (° F) by subtracting the maximum allowable internal cabinet temperature (T_i) from the maximum ambient temperature outside of the enclosure (T_o): T_o - T_i = Δ T

Fourth: (Watts x 3.413) + [1.25 x Area ft.² x Δ T (°F)] = BTU/HR.

Air Conditioner Accessories and Options Climate Control

Factory Installed Options

Accessories & Options

- Adapter Plates
- Compressor Heater
- Condensate Evaporator Kit
- Deep Drain Pan Kit
- Enclosure Heater
- Filter Recoating Adhesive
- Internal Corrosion Protection
- Lifting Eyes
- Low Airflow Detector
- Low Ambient Kit
- Mounting Hinge
- Programmable Thermostat
- Replacement Filters
- Short Cycle Protector
- Special Motors, Line Cords, or Connectors
- Special Materials or Finishes
- Stainless or Aluminum Cabinet
- Temperature Alarm
- Weather Protection Kit

Some options may not be available on selected models.
Some options are available as standard features on selected models.

Notes: Data subject to change without notice. Consult factory for special requirements.