

R-134a

PACV-S Series

Packaged Air Conditioners



Range 7 TR to 137 TR
(26 kW to 481 kW)



*you name it
we cool it*



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Quality
Management
Systems
CERTIFIED

ISO 14001
Environmental
Management
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SKM Packaged Air Conditioning Units PACV Series - R-134a

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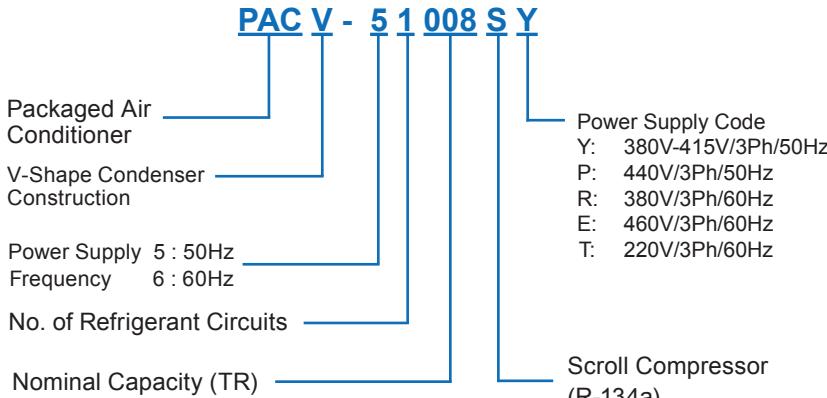
Legend

The following abbreviations are used throughout this manual:

BPF By-pass Factor
cfm Cubic feet per minute
EER Energy Efficiency Ratio
Hz Hertz
in.wg inches of water gauge
kW Kilowatt
kg Kilogram
lbs Pounds weight (British units)
L/S Liters per second

MBh BTUH x 1000
Ph Phase
Pa Pascal
PD Pressure Drop
PI Power Input
RPM.....Revolutions per Minute
TR Tons of Refrigeration = 3.517 kw
V Volts
FPI..... Fins per Inch

Nomenclature



Introduction

SKM **PACV-S** series Packaged Air Conditioners are designed and manufactured to meet the requirements of the Gulf's severe climatic conditions and are built specifically for outdoor installations, either on ground or roof level.

The **PACV-S** Packaged Air Conditioners are ideal for warehouses, large halls, schools, mosques, or wherever the requirement is for a heavy duty unit with a hermetic scroll compressor.

PACV-S Series Air cooled package (hermetic scroll) are available in 52 models covering nominal capacity ranges from 7 TR – 137 TR (**26 kW to 481 kW**) in 50Hz and 60Hz.

PACV-S units are designed to operate in a wide ambient temperature range from 50°F(**10°C**) to 120°F(**48.9°C**) and even lower if an optional head pressure control system is provided.

PACV-S series Packaged Air Conditioners are self contained units consisting of individual or tandem hermetic compressor(s), condenser coil(s), evaporator coil, expansion valve(s), connecting piping and all necessary liquid line accessories & safety controls.

PACV-S units are designed and rated in accordance with AHRI-210/240 and 340/360 standards.

PACV-S Series Packaged Air Conditioners are completely assembled, internally wired, charged with R-134a refrigerant at factory, tested before despatch and ready for installation. All that is required on site is connecting ducting and power supply. This greatly reduces installation work and costs. They are designed for ducted systems which will enable them to be installed on roof tops or on the ground.

SKM provides qualified service and stock of replacement parts in all major cities of the G.C.C. countries, Egypt, Jordan, and Pakistan. See back cover for details or call SKM.

SKM Air Conditioning LLC



You name it.....We cool it



SKM reserves the right to change, in part or in whole the specifications of its Air Conditioning Equipment at any time in order to add the latest technology. Therefore, the enclosed information may change without any prior notice.

SKM Packaged Air Conditioning Units

PACV Series - R-134a

General Features

The **PACV-S** Series Packaged Air Conditioners is yet another unique series from SKM incorporating a high efficiency cooling coil, heavy duty evaporator blower and motor resulting in an extremely rugged, long-life, energy efficient, self-contained unit that will provide cooling at higher efficiency over a long and extended life. Compared to the traditional units available in the market, the **PACV-S** series packaged units are very low in energy consumption.

The flexibility of the **PACV-S** series is ideal for consideration on special applications including:

- High efficiency totally sealed hermetic scroll compressor.
- Totally enclosed, Class F insulated, IP55 protected condenser and evaporator fan motors.
- Heavy duty condenser and evaporator coils optimised in design for long-life maintenance free operation.
- Cabinet construction specifically designed for Gulf climates.
- IP 54 Electrical panel.
- Factory installed, advanced and user friendly microprocessor based control system.
- Interface capability with major BMS protocols (option).

All of these flexibilities cannot be cataloged nor all the possible options listed. They are available and SKM has over 38 years of experience in designing and building such units to meet the most stringent requirements of most applications. For your special requirements please consult SKM.

Component Features

Compressor

Compressors used in **PACV-S** packaged unit series are hermetically sealed, compact scroll with the following features:

- High Efficiency.
- Quite operation, Low Sound levels.
- Compact and light .
- Limited wear.
- 70% fewer moving parts than comparably sized reciprocating compressors
- Unique ability to handle liquid refrigerant.
- Suction gas motor cooling.
- Centrifugal oil pumps with filter and magnet.
- Brazed fittings or Rotalock as options.
- Two refrigerant circuits on larger units provides efficient part load.

Parallel Operation

A parallel compressors installation, with common suction line and common discharge line, gives a reduced operating cost through greater control of capacity and power consumption. This is achieved by staggering compressor switch-on sequences that allow the parallel system to match its power with the capacity needed. By switching-off individual compressor from parallel installation, while other compressor is operating 100%, the improved part load efficiency can be achieved. The specially developed and adopted oil equalization system ensures correct compressors operation, oil balancing between compressors and reliability.

Condensers

Condenser coils are manufactured of seamless copper tubes mechanically bonded to aluminum fins to ensure optimum heat transfer.



Condenser Coil

All coils are tested against leakage by air pressure of 450 psig (**3100 kPa**) under water. All standard coils are 2,3 or 4 rows/14 FPI, 3/8" (9.5 mm) O.D. tubes. An integral subcooling circuit is provided to increase the cooling capacity, without additional operating cost.

For different application requirements, other optional condenser fin materials are available:

- Copper fins.
- Electrotinned Copper Fins.
- Copper finned coils with electro-tinned after manufacturing.
- Precoated Aluminum fins
The pre-coated is hydrophobic polyurethane resin. This option provides substantial corrosion protection beyond standard coil construction.
- Aeris Guard Coil Coating.
The Aeris Guard Coil is a self etching high performance modified epoxy finish that is specifically designed to coat and protect Aluminum and Copper surfaces. In addition, the coating is ideal for the protection of ferrous and non ferrous materials.

SKM **PACV-S** series, all models, are restricted to a 14FPI (**1.8 mm**) fin spacing condenser coil. Gulf dust storms and the general level of available maintenance in Gulf countries ensures this condenser coil design shall provide long life and maintenance-free operation with the least possibility operational blockage on the condenser. Ample condenser surface and sensible air flow across the condenser ensures a low temperature differential between condensing temperature and the high Gulf ambients making the **PACV-S** packaged unit perform efficiently and durably.

SKM Packaged Air Conditioning Units PACV Series - R-134a

Condenser Fans

Condenser fans are propeller type, aluminium alloy blades, directly driven by electric motors.

Motors are Totally Enclosed Air Over (TEAO) six pole with class 'F' insulation and minimum IP55 protection.



Condenser Fan Motor

The TEAO and class 'F' insulation features ensure long life and are unique for SKM. The motors are factory wired, using wires specially selected for high ambient operation, to unit control panel where the motor contactors are located to control the operation of these motors.

The condenser fans are individually statically and dynamically balanced at the factory. Complete fan assembly is provided with suitable acrylic coated fan guard.

Evaporator

Evaporator coils are manufactured of seamless copper tubes mechanically bonded to aluminium fins to ensure optimum heat transfer. All evaporator coils are tested against leakage by air pressure of 300 psig (2068 kPa) under water. The DX evaporator coils are complete with headers of seamless copper tubing. Supply headers incorporate a correctly sized distributor. For different application requirements, other evaporator coil material and/or treatment are available on request.

- Copper fins.
- Electrotinned Copper fins.
- Copper finned coils with electro-tinned after manufacturing.
- Precoated Aluminum fins.
The pre-coated is hydrophobic polyurethane resin. This option provides substantial corrosion protection beyond standard coil construction.
- Aeris Guard Coil Coating.
The Aeris Guard Coil is a self etching high performance modified epoxy finish that is specifically designed to coat and protect Aluminum and Copper surfaces. In addition, the coating is ideal for the protection of ferrous and non ferrous materials.

Evaporator coils are rated in accordance with AHRI-410. Evaporator coil supplied with suitable size thermostatic expansion valve(s) and multi-circuited distributors providing capacity modulation to match the compressors. The cross wave fins and staggered tubes design uses the evaporator surface effectively by creating uniform air turbulence and optimum heat transfer over the entire finned surface. Requirements for higher face velocities can be handled by use of moisture eliminators to avoid carryover.

Fan Section

Fans in the **PACV-S** units are selected for the best sound characteristics based on maximum fan efficiency. More than one arrangement of evaporator fans are used in the **PACV-S** series packaged units due to the wide range of air flow rates.

Commonly, all fans are double inlet, double width, centrifugal type with forward curved impellers provide the combination of efficiency and quietness of operation. All fans are statically and dynamically balanced, belt driven by motor sizes up to **15 kW** are provided with adjustable pitch pulleys as standard. Above **15 kW** motor sizes are equipped with fixed pitch pulleys as standard and adjustable pitch pulleys are option. Specify VPP.

Single fan is used for **PACV-51008S**, **PACV-51010S**, **PACV-61009S** & **PACV-61012S** models. Models **PACV-51014S**~**PACV-52055S** & **PACV-61018S**~**PACV-62066S** are equipped with two fans. These fans are mounted on a single heavy duty shaft driven by a single electric motor. Shaft end insert into over sized, tapered lock self aligning long life bearings. The motor is mounted on an adjustable base, so that belt tension can be easily adjusted.

Models **PACV-52065S** and **PACV-62076S** onwards, use single fan assembly, which has maximum strength, high performance, quietness and reliability. These fans use self aligned ball or pillow block bearings that are greased for life. Pillow block bearings are provided with re-greasing fittings. The motor is mounted on an adjustable base, so that belt tension can be easily adjusted. The complete fan-motor drive assembly is mounted on a floating sub-base. In order to limit transmission of noise and vibration, the complete fan motor sub-base assembly is mounted on anti-vibration mounts. Flexible connection is provided between fan discharge and casing panel to avoid transmission of vibration to the connecting duct.

The **optional** modular construction units for models **PACV-51008S**~**PACV-52055S** & **PACV-61009S**~**62066S** are also using the same fan specifications as mentioned above.

The electric motors are foot mounted, 4 pole, totally enclosed fan cooled (TEFC), IP-55 protected with Class F insulation.

Drive package is factory selected for the medium air flow rate as shown in the capacity ratings. Alternative drive packages to meet specific job or client requirements can be provided.

Refrigerant Circuit

PACV-S series comes complete, as standard, with correctly sized and piped refrigerant lines including sight glass, filter drier, thermostatic expansion valve, solenoid valve, shut-off valve, and a full operating charge of R-134a in each circuit.

Piping is fabricated from ACR grade copper piping. Suction line is insulated with $\frac{1}{2}$ " (12mm) wall thickness closed cell pipe insulation.

SKM Packaged Air Conditioning Units

PACV Series - R-134a

Filter Section

PACV-S series can be with a range of filter sections and filters to meet requirements for the most demanding applications.

- Flat or vee filter sections to accommodate 1" or 2" cleanable aluminium media filters can be provided.
- A bag filter section to house 22", 30" or 36" deep bag filters having efficiencies as desired can also be provided, as required. Filter sections come with latches to provide easy access for removal and for maintenance.
- On 100% fresh air applications an initial sand trap louvre can effectively minimize entrance of sand into the air stream.
- High efficiency mini pleat panel filters are available as an alternative for bag filter where space is limited. Filter sections come with latches to provide easy access for removal and for maintenance.

To order a sand trap louvre from SKM specify fresh air opening size with option ASL.

Casing/Structure

Designed for ease of handling and low cost to install. The **PACV-S** Air Cooled Packaged Units are factory assembled and mounted on a rigid base. The unit casing used in **PACV-S** Packaged units is made of zinc coated galvanized steel sheets conforming to JIS-G 3302 and ASTM A653 which is phosphatized then baked after an electrostatic powder coat of approximately 60 microns.

This finish and coating pass a 1000 hours in 5 % salt spray testing at 95°F (35°C) and 95% relative humidity as per ASTM B117. The entire casing panels are designed to be leak proof against rain and ensure rain cannot enter the **PACV** series packaged air conditioner interior. Evaporator section sealed by the use of vinyl gasketing material.

The evaporator section is insulated from all sides with black-neoprene faced heavy density 1" thick fiber glass insulation for models up to **PACV**-52055S & 62066S and 2" thick fiber glass insulation for models **PACV**-52065S & 62076S onwards. The insulation cum sound liner meets the fire requirements of NFPA90A and is secured with mechanical fasteners in addition to water resistant adhesive.

For applications requiring an inner skin in the evaporator section, option DSE provides 0.7 mm galvanized inner skin. Suitable isolation to ensure no cold-bridges and no condensation on the exterior of the units is provided. The condensate drain pan is heavily insulated to ensure that condensation may not occur. Stainless steel condensate drain pans are available on request.

Electrical Control Panel

The unit mounted control panel enclosure is fabricated out of heavy gauge sheet steel in phosphatized powder coated baked finish. The enclosure conforms to IP54 as per guidelines in IEC 529. A hinged access door and key-fastener is provided for easy access and security. The panel is factory wired in accordance with NEC 430 & 440, labelled, tagged and features 220V / 240V controls.

- All compressors are with DOL starting.
- Individual compressor, condenser fan motors and evaporator fan motor contactors.
- Motor protector circuit breaker for condenser and evaporator fan motors.
- Voltage monitoring module for protection against under voltage, over voltage, phase loss, phase reversal and phase unbalance of the incoming voltage.
- Control circuit breaker.
- Control circuit on/off switch.
- Microprocessor control boards.
- Control Relays.
- Power and control terminal blocks.

Microprocessor Controller



Microprocessor Controller

All **PACV-S** series package units are equipped with a full function microprocessor based controller as a standard feature. The controller is factory programmed for the control of evaporator fan, compressors and condenser fans. The controller comes with a built in keypad and display for simple but meaningful man machine interface. This controller provides complete operational control for the unit and has built-in auto diagnostic capability that can signal normal operation or alarm conditions as well as shutting down the unit or system if necessary.



Room Unit

The controller comes with a loose supplied sleek and elegant design room unit for installing in the conditioned space. Communication between unit controller and room unit is through two wire interface. **The communication cable should be 2 core, twisted pair, unscreened with stranded conductors. (As per KNX specification)** Maximum distance between room unit and controller can be 700 meters. The room unit has a built in sensor for measuring the room temperature. It transmits room temperature, set point, unit operating mode etc. to the unit controller. Control of the compressors is based on room temperature and the set point, as standard. **If unit control needs to be based on duct temperature, please specify during time of order.**

SKM Packaged Air Conditioning Units PACV Series - R-134a

The Main Features of the controller are as follows:

- Built in LCD display with back light.
- Roll & push knob and 3 function buttons.
- Battery backed up built in real time clock.
- Multiple authorization level to provide tight security for the control system.
- Capacity control based on room temperature or return air temperature.
- Alarm history.
- A sleek & elegant design room unit.

Display Information

SKM **PACV-S** series package units offer LCD display which allows the operator to access different parameters of the unit. Operator can view and change the unit parameters. The display information includes:

- Status
- Outputs
- Inputs
- Alarms
- Set points
- Password

System Control Philosophy

The unit may be enabled or disabled through the control on/off switch in the unit mounted control panel. Control is based on room temperature sensed by room unit. Evaporator fan motor starts first. Compressors will be staged based on the set point and actual room temperature. On an increase in room temperature, cooling stages will be added and on a decrease in room temperature, cooling stages will be removed from the system.

System Protection

The intelligent microprocessor based controller monitors all the safeties related to the unit and makes the necessary protections, by shutting down the entire unit or the effected circuit. The protection includes:

- Low suction pressure.
- High discharge pressure.
- High compressor motor temperature. (For compressors with internal motor protector).
- Compressor short cycling.
- Evaporator fan motor overload

BMS Connectivity (Optional)

Volt free contacts for run status, common fault status, auto mode status and provision for remote on/off shall be provided as option if required.

In addition, the **PACV-S** microprocessor can support the major BMS protocols such as BACnet, Modbus & LON. Extra hardware may be required depending on the protocol.

Optional Features

PACV-S series heavy duty packaged air - conditioners are available with a multitude of optional features which makes design and selection extremely easy and capable of matching the most stringent of requirements.

Alternative Condenser Material

Made of copper tubes and alternative fin material and/or protective coating.

- For Copper Fins, specify **(FC)**.
- For electrotinned Copper Fins only, specify **(CFT)**.
- For Copper Finned Coils electrotinned post manufacturing, specify **(FCT)**.
- For Pre-Coated aluminum fins, specify **(FAP)**.
- For Aluminum Fins with Aeris post Coat Protection, specify **(FAA)**.
- For Copper Fins with Aeris post Coat Protection, specify **(FCA)**.

Alternative Evaporator Material

Made of copper tubes and alternative fin material and/or protective coating.

- For Copper Fins, specify **(EFC)**.
- For electrotinned Copper Fins only, specify **(ECFT)**.
- For Copper Finned Coils electrotinned post manufacturing, specify **(EFCT)**.
- For Pre-coated aluminum fins, specify **(EFAP)**.
- For Aluminum Fins with Aeris post Coat Protection, specify **(EFAA)**.
- For Copper Fins with Aeris post Coat Protection, specify **(EFCA)**.

Condenser Coil Guard

(CGP)

Wire mesh guard, in painted finish for condensers. Recommended on ground level installation where coil needs to be protected against vandalism.

Double Skin Evaporator

(DSE)

Inner skin of **0.7 mm** galvanized sheet in the evaporator section provided with no cold bridges. Recommended for 100% fresh air applications.

Marine Paint

(MP)

To provide increased corrosion resistance coastal environments and offshore location.

Filter Section

(FFS/VFS/BFS)

PACV-S series can be with a range of filter sections and filters to meet requirements for the most demanding applications.

S.No	Filter Type	Option code		
		PACS 51005/61006 to PACS-52053/62065	PACS-52060/62070 to PACS-52095/62110	Modular Construction
Flat Filter Section with Media				
1	1" (25 mm) / 2" (50 mm) Thick Washable Aluminum G2	[FSP1][FSP2]	[FVP1][FVP2]	
2	1" (25 mm) / 2" (50 mm) Thick Synthetic G3	[FSS1][FSS2]	[FIS1][FIS2]	
Vee Filter Section with Media				
3	1" (25 mm) / 2" (50 mm) Thick Washable Aluminum G2	[FSP1][FSP2]	[FVP1][FVP2]	
4	1" (25 mm) / 2" (50 mm) Thick Synthetic G3	[FSS1][FSS2]	[FIS1][FIS2]	
Bag Filter Section with Media*				
5	15" (380 mm) deep bag filter	FSBG1-F8	FIBG1-F8	
6	21" (534 mm) deep bag filter	FSBG1-F8	FIBG1-F8	
7	30" (762 mm) deep bag filter	FSBG2-F8	FIBG2-F8	
Pleated Filter Media*				
8	4" (100 mm) thick	FIMP4-F8	FIMP4-F8	

*F8 indicates the efficiency, For F9 change option code.

Table 1

SKM Packaged Air Conditioning Units

PACV Series - R-134a

- Flat or vee filter sections to accommodate 1" or 2" cleanable aluminium media filters can be provided.
- A bag filter section to house 22", 30" or 36" deep bag filters having efficiencies as desired can also be provided, as required. Filter sections come with latches to provide easy access for removal and for maintenance.
- On 100% fresh air applications an initial sand trap louvre can effectively minimize entrance of sand into the air stream, sand trap louvre (ASL) available upon request.
- High efficiency mini pleat panel filters are available as an alternative for bag filter where space is limited. Filter sections come with latches to provide easy access for removal and for maintenance.

HEPA filters (FIHP)

Ultra high Absolute HEPA (High Efficiency Particulate Air filter with efficiency in excess of 99% when measured by using DOP (Di-Octyle Phthalate) method. In accordance with EN1882 standards. Eff : H13 (including section)

Sand trap louver (ASL)

To extract coarse sand prior to the entry in the unit

Galvanized Frame And Base (GFB)

Steel frame and base which are hot dip galvanized after manufacturing process. This is recommended for highly corrosive environments.

Pressure Gauges (SDG1)

Suction and discharge indication of each refrigerant circuit. Gauges mounted outside the Control Panel.

Pressure Relief Valve (PRV)

To protect the unit from being over-pressurized.

Stainless Steel Drain Pan (SSP)

Heavy gauge 316 stainless steel drain pan under the entire cooling coil and moisture eliminator. Insulation under drain pan as per SKM standard.

Stainless steel drain pan (Grade 304) (SDP)

Stainless steel drain pan(Grade 304). Insulation under drain pan as per SKM standard.

Extra Shut Off Valve(s) (XVF)

To fully isolate refrigerant filter drier, additional shut-off valve(s) can be incorporated in the liquid line.

Rotalock Valves on compressors (RVC)

For additional facilitation of maintenance of unit.

Condenser & Evaporator Fans with polyglycoat coating (PGF)

To provide protection against corrosion for evaporator or condenser fans.

Anti Spark Fan and Belt (SPF)

For special applications like explosion proof units.

Isolated Condenser Fan Motors (CMS)

For elimination of extraneous noise and vibration from condenser fan motor, the motors are individually isolated from the frame

Condenser Fan motors with anti-condensation heaters built-in (CFMA)

Where application so requires.

Mixing Box (BMX)

With or without sand trap louvre and bird screen on fresh air Side.

Two inch insulation (2SG)

for evaporator section.

Modular Construction (MSTD)

Models **PACV** 51008S-53095S and **PACV** 61009S-63110Scan be produced as modular constructions. Refer page no. 34-36 for more details.

Overlapped Evap. coil construction

Use overlapped evaporator coils to limit the height of the unit with frontal fan discharge. Available for models **PACV** 54100S to **PACV** 54125S & **PACV** 64120S to **PACV** 64145S, refer to page 37.

Electric Heating (HTR1)

Electric heating batteries are made up of finned heating elements, constructed from high quality 80/20 nickel chrome resistance wire centred in metal tube by compressed magnesium oxide. Helical fins are tightly wound around the tubular heating element.

Heater batteries when ordered comes with stage contactors, primary auto reset thermal safety cut-out, secondary manual reset thermal safety cut-out and air flow switch. Power fuses / circuit breaker are provided for heaters with total ampere exceeding 48 amperes. For smaller heaters, power fuses can be provided if specified. Control of the heaters will be from the **PACV-S** microprocessor.

Following are the Standard Electrical Heating option kW rating, options other than those specified below can be provided on request. Consult SKM for details

PACV	Heater kW	Stages
51008-S	61009-S	15
51010-S	61012-S	18
51014-S	61018-S	
52015-S	62018-S	30
51017-S	61020-S	
52017-S	62020-S	
52020-S	62024-S	36
52023-S	62028-S	
52026-S	62033-S	
52030-S	62036-S	
52032-S	62037-S	48
52038-S	62046-S	
52045-S	62055-S	
52050-S	62060-S	60
52055-S	62066-S	
52065-S	62076-S	90
53070-S	63085-S	
53075-S	63090-S	126
53080-S	63095-S	
53085-S	63100-S	
53090-S	63105-S	
53095-S	63110-S	
54100-S	64120-S	
54110-S	64130-S	
54115-S	64136-S	
54125-S	64145-S	189
		6

Table 2



SKM Packaged Air Conditioning Units

PACV Series - R-134a

Hot Gas Bypass System

(GBP)

With solenoid to enable operation of a large sized unit at very low loads, during low load demand due to application requirements or where unit is selected to work on 100% fresh air applications.

Electronic Expansion Valve

(EEV)

To provide energy saving benefits over mechanical thermostatic expansion valve (TXV).

Low Ambient Operation Kit

(LAO)

For unit operation down to lower than normal gulf ambient. Please specify during the time of order.

IP 55 Control Panel

(ICP)

Control Panel for special applications to meet IP55 requirements.

Main Isolator (without door interlock)

(ISO)

For main power isolation. (consult SKM)

Control Transformer

(CTX)

This option is necessary and available for **PACS** models rated for 440V/3PH/50Hz or 460V/3PH/60Hz or power supplies without neutral. When ordering for these voltages, this option must be ordered.

Voltage Monitoring Module as per DEWA (DVM)

Under voltage relay as per DEWA regulations.

This option is available for Dubai, UAE only.

Circuit Breaker for Compressor

(CBC)

For those electrical specifications which require additional protection.

External Overload Protection (EOP)

For those electrical specification requires additional overload protection for the compressors.

Ammeter & Phase Selector switch

(AMPC)

To indicate running AMPS of each compressor.

Ammeter & Phase Selector switch

(AMPI)

To indicate running AMPS on main incomer of the unit.

Voltmeter & Selector Switch

(VSS)

For incoming line voltage.

UL 1995

(UL-LISTED)

Unit construction are certified and in compliance of UL 1995 safety standards. Consult SKM for availability of selected models.

Soft Starter

(SFS)

To reduce the starting current of compressors using reduced voltage starting method. Compressors will be started using electronic solid state soft starters that will ramp up the speed of the compressors to rated speed within few seconds thus reducing the mechanical & electrical stresses.

Suction Pressure read out Capability

(SPC)

Additional transducer in suction line to display suction pressure in microprocessor.

BMS Interface Volt free Contacts

(BMVF)

Volt free contacts for run status, common fault status, auto mode status and provision for remote on/off shall be provided as option if required. For additional requirements, please contact SKM.

BMS Interface thru protocol

(BMSP)

For interfacing the units with major BMS protocols such as BACNet, Modbus or LON. Extra hardware may be required depending on the protocol.

Pump Down Facility

(PD)

The compressor will switch off each time with a Pump Down Cycle in order to prevent Liquid refrigerant migration to the compressor during off Cycle periods.

With this option, each circuit will be provided with an additional discharge check valve (if required) to prevent Refrigerant Migration from High side to Low side when the compressor is off.

Options for Field Installations

Anti-vibration mounts

(CAVM)

Recommended for roof mounted units or other locations in the vicinity of occupied spaces, where noise may be objectionable.

Hi-Lo Pressure Gauges

(CSDG1)

Without piping or isolating pet cocks.

Duct Temperature Sensor

(DTS)

In order to control the unit based on return/supply air duct temperature.

Special custom built units incorporating specially required features like units for larger capacities, anti-condensation resistance heaters embedded in evaporator motors, units can be manufactured on request. Consult SKM with detailed requirements.

Contact SKM for all such applications or requirements

Capacity Control Steps

The Standard Capacity Control Steps are shown below.

PACV	Standard	Number of steps
51008-S	61009-S	100-0
51010-S	61012-S	100-0
51014-S	61018-S	100-0
52015-S	62018-S	100-50-0
51017-S	61020-S	100-0
52017-S	62020-S	100-56-0
52020-S	62024-S	100-50-0
52023-S	62028-S	100-58-0
52026-S	62033-S	100-50-0
52030-S	62036-S	100-55-0
52032-S	62037-S	100-50-0
52038-S	62046-S	100-75-50-25-0
52045-S	62055-S	100-79-50-29-0
52050-S	62060-S	100-75-50-25-0
52055-S	62066-S	100-77-50-27-0
52065-S	62076-S	100-75-50-25-0
53070-S	63085-S	100-86-67-53-33-19-0
53075-S	63090-S	100-83-67-50-33-17-0
53080-S	63095-S	100-83-67-50-33-17-0
53085-S	63100-S	100-85-69-53-34-18-0
53090-S	63105-S	100-85-68-53-35-18-0
53095-S	63110-S	100-85-68-51-34-17-0
54100-S	64120-S	100-88-75-63-50-38-25-13-0
54110-S	64130-S	100-88-76-65-51-39-25-14-0
54115-S	64136-S	100-89-75-64-51-40-26-13-0
54125-S	64145-S	100-88-75-63-50-38-25-13-0

Table 3

SKM Packaged Air Conditioning Units

PACV Series - R-134a

Selection Procedure

PACV-S series packaged air-conditioners should be selected with care and using sound engineering judgement. Selections based on matching total capacity alone or air flow rate alone may not be proper. To meet requirements of a specific application, sample procedure for selection is given in examples below.

Application Requirements	Example 1: English Units	Example 2: SI Units
Required total cooling capacity.....	330.0 MBh.....	96.4 kW
Sensible cooling capacity	225.0 MBh.....	65.9 kW
Condenser entering air temp db	115°F.....	46°C
Evaporator entering air temp. db/wb	83/68°F	28.3/20.0°C
Evaporator air flow rate	11,200 cfm.....	5286 l/s
External static pressure	1.2 inwg	300 Pa
Electric power supply	380V/3PH/50Hz.....	380V/3PH/50Hz

Select **PACV-S** model, Evaporator fan motor size and find leaving db/wb conditions.

Selection Procedure:

Enter capacity ratings table (50Hz) at required condenser entering air temperature. Select a unit having total capacity equal or more than specified. Select unit model **PACV-52032-S**, by interpolation, at 11,200 cfm (**5,286 l/s**) and 68°F (**20.0°C**) wb. Unit will provide 332.8 MBh (97.5 kW) total cooling capacity, 236.6 MBh (**69.3 kW**) sensible cooling at 80°F (**26.7°C**) evaporator entering air bulb.

To calculate sensible capacity (SC2) at conditions other than 80°F (26.7°C) evaporator entering air dry bulb, use the formulae as shown	$\begin{aligned} SC2 &= SC1 + SCC \\ &= SC1 + 0.0011 (1 - BPF)(EDB - 80) \times cfm \\ &= 236.6 + 0.0011 (1 - 0.22)(83 - 80) \times 11,200 \\ &= 265.4 \text{ MBh} \end{aligned}$ <p>where</p> <ul style="list-style-type: none"> SC2 = corrected sensible capacity at given evap. entering air dry bulb ° SC1 = sensible capacity at 80°F (26.7°C) DB evaporator entering air temperature SCC = sensible cooling correction BPF = bypass factor E_{db} = evaporator entering air dry bulb cfm & L/S = evaporator air flow rate 	$\begin{aligned} SC2 &= SC1 + SCC \\ &= SC1 + 0.00123 (1-BPF)(E_{db} - 26.7) \times l/s \\ &= 69.3 + 0.00123 (1-0.22)(28.3-26.7) \times \\ &\quad 5286 \\ &= 77.78 \text{ kW} \end{aligned}$
Calculate leaving evaporator air temperature	$\begin{aligned} L_{db} &= E_{db} - \frac{\text{Sensible capacity (MBh)}}{0.0011 \times \text{cfm}} \\ &= 83 - \frac{265.4}{0.0011 \times 11,200} \\ &= 61.4^{\circ}\text{F} \end{aligned}$ <p>where</p> <ul style="list-style-type: none"> E_{db} = Entering evaporator air dry bulb temperature L_{db} = Leaving evaporator air dry bulb temperature L_{wb} = Leaving air wet bulb temperature corresponding to enthalpy of air leaving evaporator coil 	$\begin{aligned} L_{db} &= E_{db} - \frac{\text{Sensible capacity (kW)}}{0.00123 \times \text{L/S}} \\ &= 28.3 - \frac{77.78}{0.00123 \times 5286} \\ &= 16.3^{\circ}\text{C} \end{aligned}$

Calculate leaving air wet bulb	$\begin{aligned} hL_{wb} &= hE_{wb} - \frac{\text{total capacity (BTUH)}}{4.5 \times \text{cfm}} \\ &= 32.3 - \frac{332.8 \times 1000}{4.5 \times 11,200} \\ &= 25.69 \text{ Btu/lb} \\ &= 58.8^{\circ}\text{F } L_{WB} \end{aligned}$ <p>where</p> <ul style="list-style-type: none"> hL_{wb} and hE_{wb} are leaving and entering air enthalpy respectively Btu/lb (kj/kg) L_{WB} = Leaving air wet bulb temperature 	$\begin{aligned} hL_{wb} &= hE_{wb} - \frac{\text{total capacity (kW)}}{1.2 \times \text{L/S}} \times 1000 \\ &= 57.25 - \frac{97.5 \times 1000}{1.2 \times 5286} \\ &= 41.8 \text{ kJ/kg} \\ &= 14.9^{\circ}\text{C } L_{WB} \end{aligned}$
--------------------------------	---	--

To find out wet bulb temperatures corresponding to enthalpy of air refer to psychrometric chart or enthalpy of saturated air tables.		
Selection of evaporator fan rpm and motor size		
Enter fan performance table and interpolate for 11,200 cfm (5,286 l/s) and 1.2 inwg. (300 Pa) ESP to get 978.1 rpm and 5.05 kW absorbed power.		
Motor power = 1.2 x absorbed power = 1.2 x 5.05 = 6.06 kW		
Standard selected motor size =	7.5 kW (10HP)	

SKM Computer selections are available for quick and proper selections



SKM Packaged Air Conditioning Units PACV Series - R-134a

Field Connections

PACV-S series self-contained heavy duty air cooled packaged units are designed for minimum field interaction.

Power hook-ups and control wiring of room unit as per Electrical hook-up diagram is all that is required to electrically connect any model of **PACV-S** series .

Every **PACV-S** series package air conditioning unit requires, at most, field installed fused disconnect switches or circuit breakers, and room unit.

Refer below for a schematic representation of required field electrical hook-ups for a standard **PACV-S** series packaged air conditioning unit.

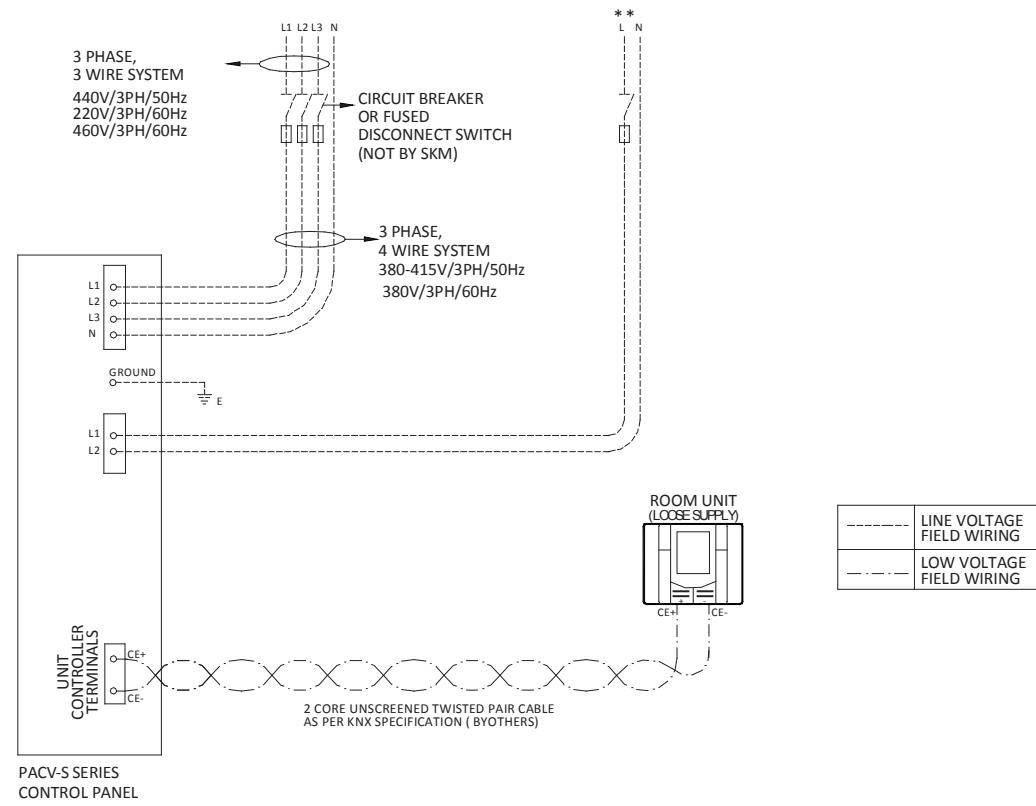
All field wiring must be done in accordance with applicable local and national codes.

For maximum recommended for fuse sizing and minimum circuit amps for cable sizing, see Page 25~27 of this bulletin.

Duct work should be connected with flexible connections to the **PACV-S** series. One or two drains suitably trapped, are required to be connected to the drain outlet of all models of **PACV-S** series.

The **PACV-S** series is then ready to provide cooling, on demand.

Field Wiring Requirement Schematic

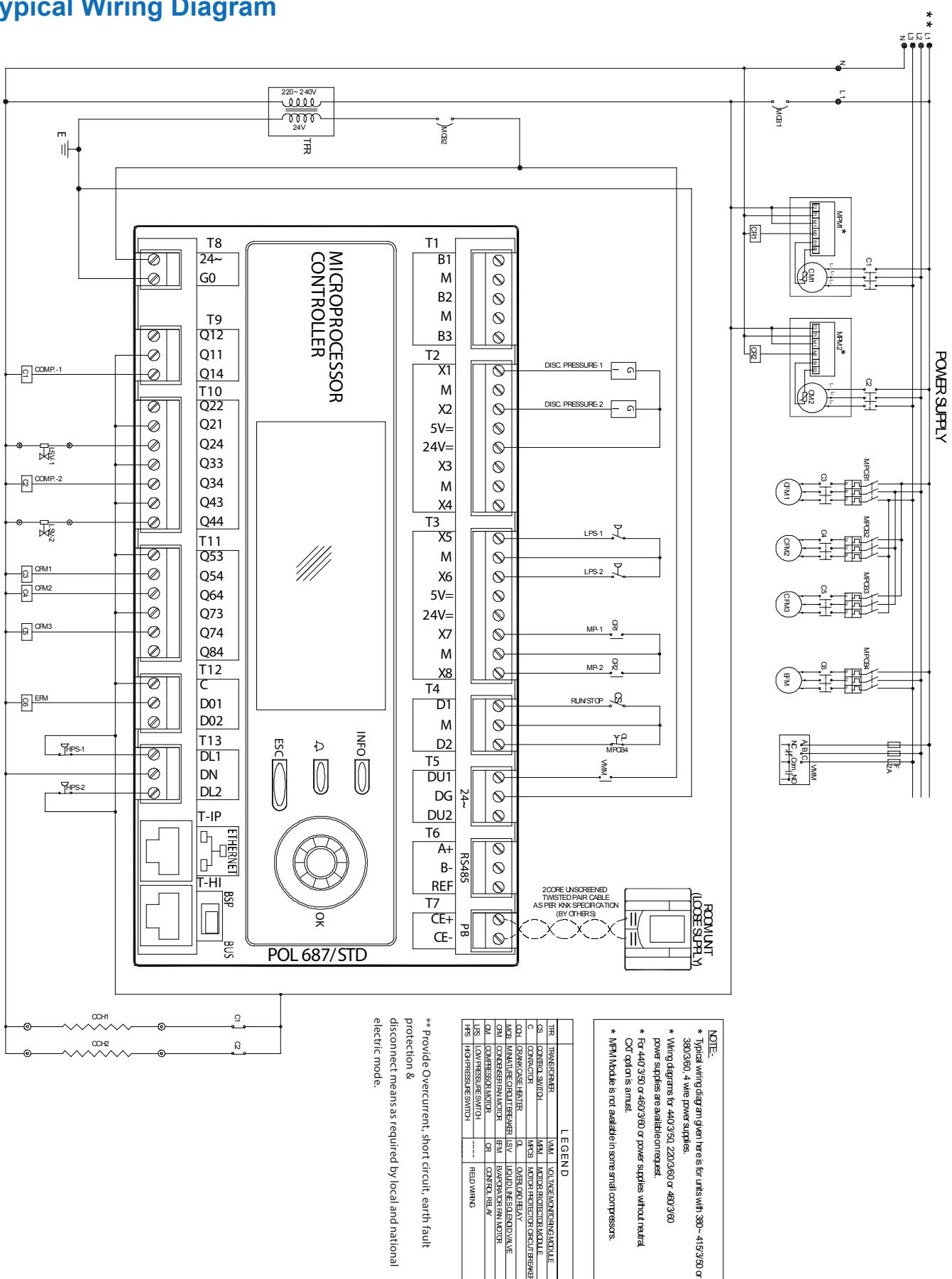


**
PACV-S SERIES UNITS RATED FOR 440V/3PH/50HZ, 460V/3PH/60HZ, OR POWER SUPPLIES WITH OUT NEUTRAL
REQUIRE SEPARATE SOURCE OF CONTROL POWER SUPPLY THRU FIELD SUPPLIED & INSTALLED 15A/220V FUSED
CONTROL DISCONNECT SWITCH OR ORDER WITH FACTORY BUILT IN OPTION 'CXT'.

SKM Packaged Air Conditioning Units

PACV Series - R-134a

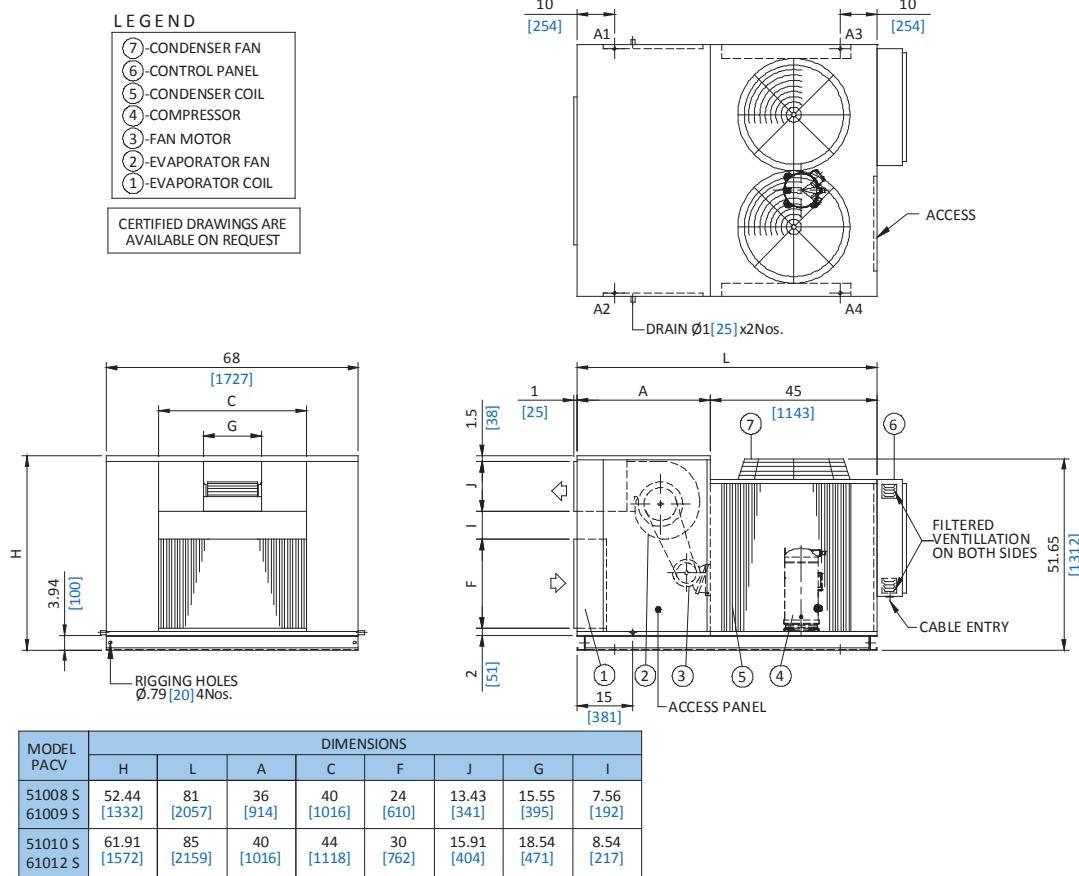
Typical Wiring Diagram



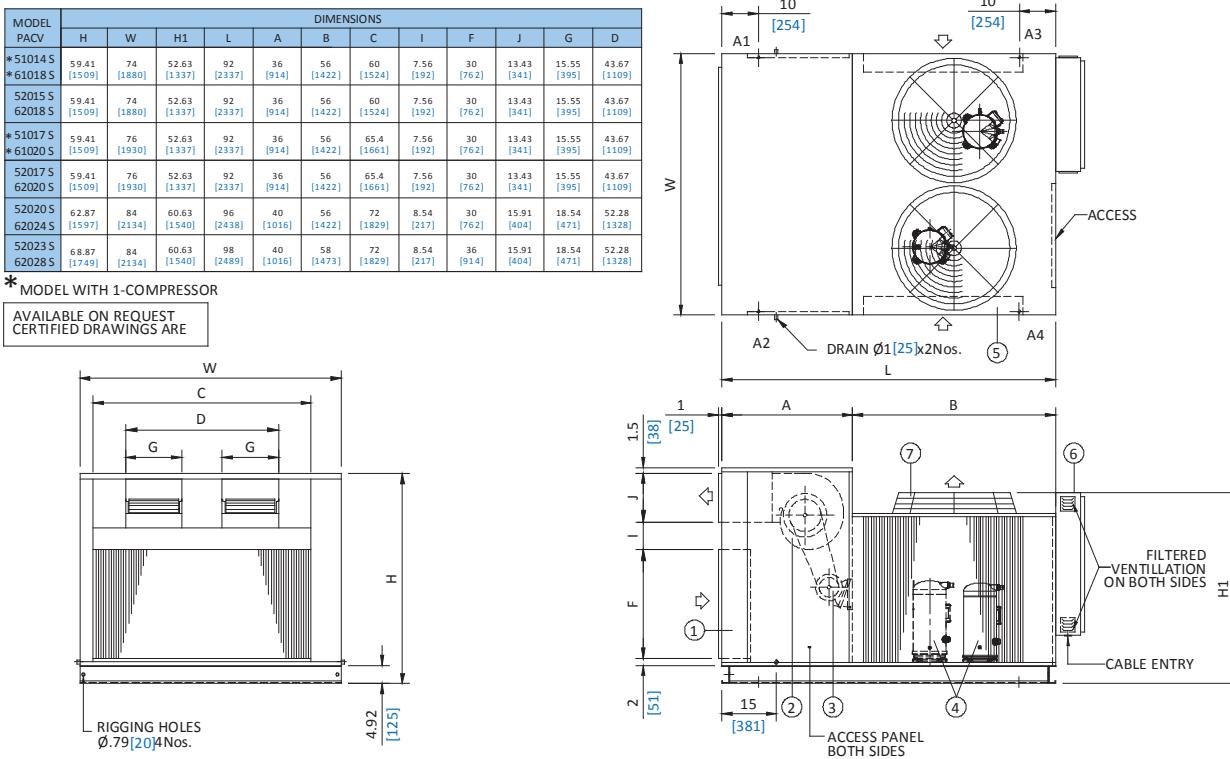
SKM Packaged Air Conditioning Units PACV Series - R-134a

Dimensional Data

PACV Models: 51008 S, 51010 S & 61009 S, 61012 S



PACV Models: 51014 S - 52023 S & 61018 S - 62028 S



SKM Packaged Air Conditioning Units

PACV Series - R-134a

Dimensional Data

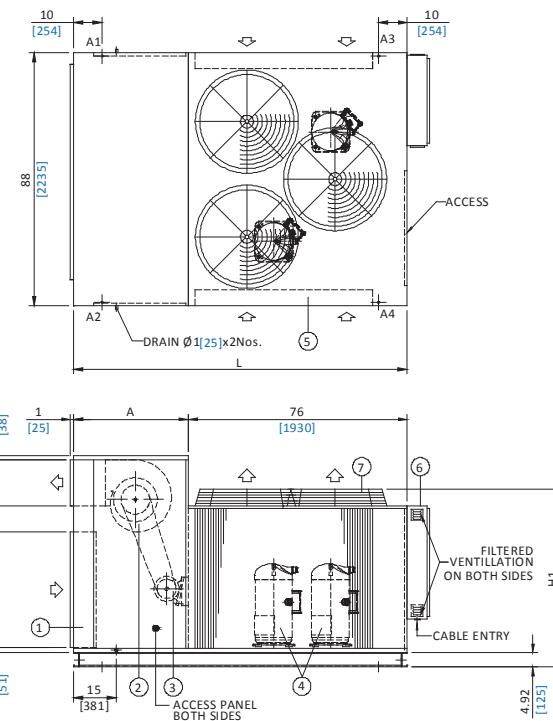
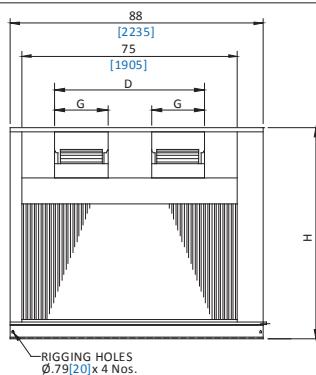
PACV Models: 52026 S - 52038 S & 62033 S - 62046 S

MODEL PACV	DIMENSIONS ARE IN INCHES [mm]								
	H	L	A	F	H1	J	G	D	I
52026 S 62033 S	72.87 [1851]	116 [2946]	40 [1016]	40 [1540]	60.63 [404]	15.91 [471]	18.54 [1328]	52.28 [217]	8.54
52030 S 62036 S	80.87 [2054]	116 [2946]	40 [1016]	48 [1219]	60.63 [1540]	15.91 [404]	18.54 [471]	52.28 [1328]	8.54 [217]
52032 S 62037 S	80.87 [2054]	116 [2946]	40 [1016]	48 [1219]	60.63 [1540]	15.91 [404]	18.54 [471]	52.28 [1328]	8.54 [217]
*52038 S *62046 S	93.99 [2387]	119 [3023]	43 [1092]	56 [1422]	77.63 [1972]	18.82 [478]	21.93 [557]	61.85 [1571]	10.75 [273]

* MODEL WITH TANDEM COMPRESSORS

CERTIFIED DRAWINGS ARE
AVAILABLE ON REQUEST

FROM THE MODELS 52038S/62046S, USING TANDEM COMPRESSORS

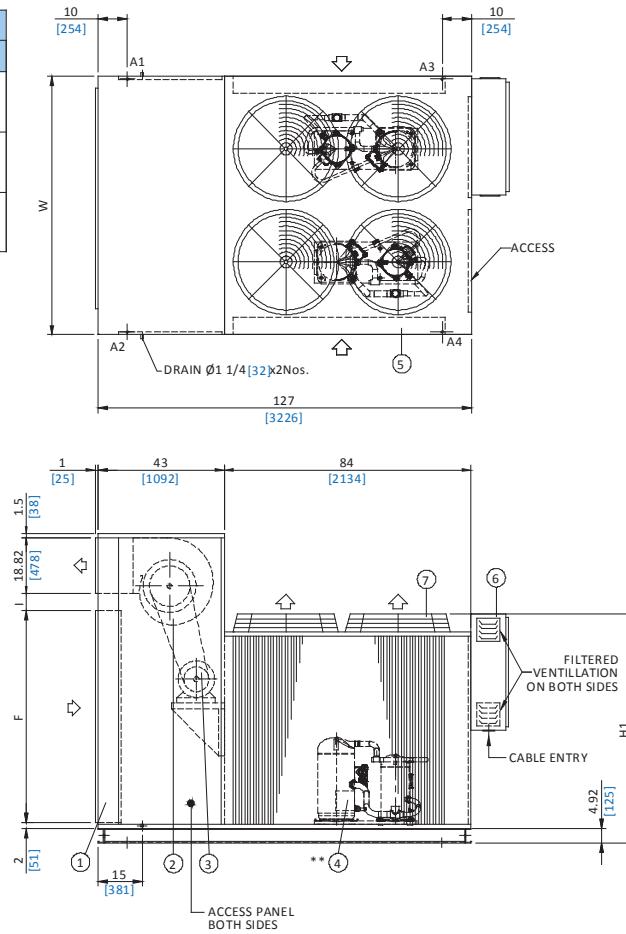
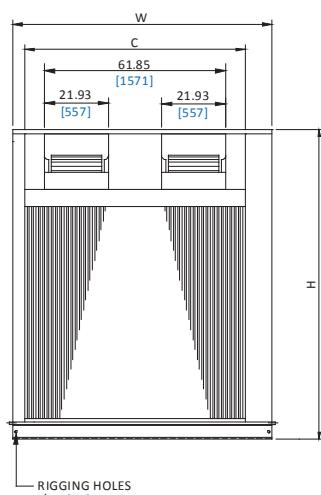


PACV Models: 52045 S - 52055 S & 62055 S - 62066 S

MODEL PACV	DIMENSIONS ARE IN INCHES [mm]					
	H	W	H1	C	F	I
52045 S 62055 S	99.24 [2521]	88 [2235]	77.63 [1972]	75 [1905]	66 [1676]	6 [152]
52050 S 62060 S	103.24 [2622]	88 [2235]	85.63 [2175]	75 [1905]	72 [1829]	4 [102]
52055 S 62066 S	103.24 [2622]	92 [2337]	85.63 [2175]	80 [2032]	72 [1829]	4 [102]

** TANDEM COMPRESSOR

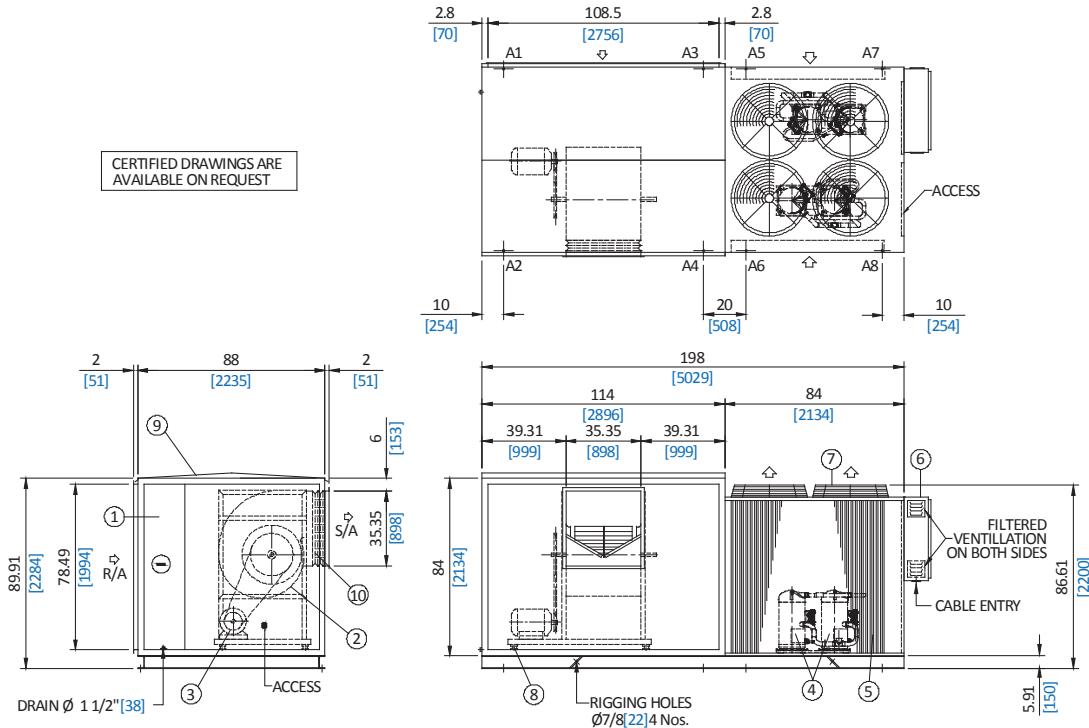
CERTIFIED DRAWINGS ARE
AVAILABLE ON REQUEST



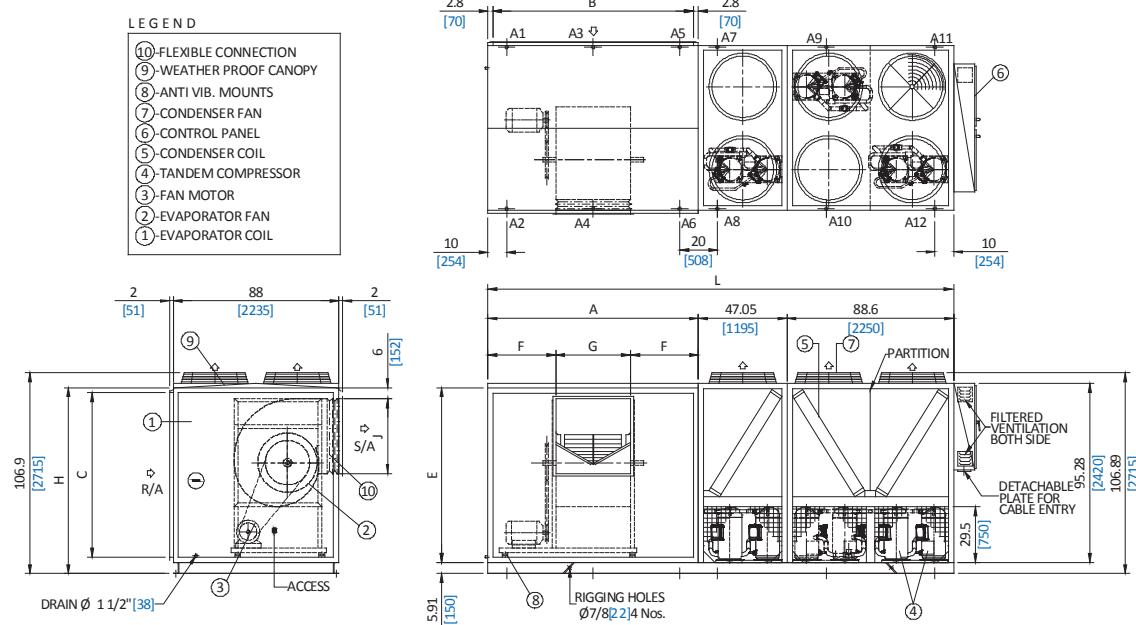
SKM Packaged Air Conditioning Units PACV Series - R-134a

Dimensional Data

PACV Models: 52065 S & 62076 S



PACV Models: 53070 S - 53095 S & 63085 S - 63110 S



MODEL PACV	DIMENSIONS ARE IN INCHES [MM]									
	L	A	B	E	F	H	J	G	C	
53070 S 63085 S	249.6 [6341]	114 [2896]	108.5 [2756]	93 [2362]	37.17 [944]	98.94 [2513]	39.65 [1007]	39.65 [1007]	87.5 [2222]	
53075 S 63090 S	249.6 [6341]	114 [2896]	108.5 [2756]	93 [2362]	37.17 [944]	98.94 [2513]	39.65 [1007]	39.65 [1007]	87.5 [2222]	
53080 S 63095 S	249.6 [6341]	114 [2896]	108.5 [2756]	102 [2591]	37.17 [944]	107.91 [2741]	39.65 [1007]	39.65 [1007]	96.5 [2451]	
53085 S 63100 S	253.6 [6441]	118 [2997]	112.5 [2857]	102 [2591]	36.76 [934]	107.91 [2741]	44.49 [1130]	44.49 [1130]	96.5 [2451]	
53090 S 63105 S	259.6 [6594]	124 [3150]	118.5 [3010]	102 [2591]	39.76 [1010]	107.91 [2741]	44.49 [1130]	44.49 [1130]	96.5 [2451]	
53095 S 63110 S	266.6 [6772]	131 [3327]	125.5 [3188]	102 [2591]	43.26 [1099]	107.91 [2741]	44.49 [1130]	44.49 [1130]	96.5 [2451]	

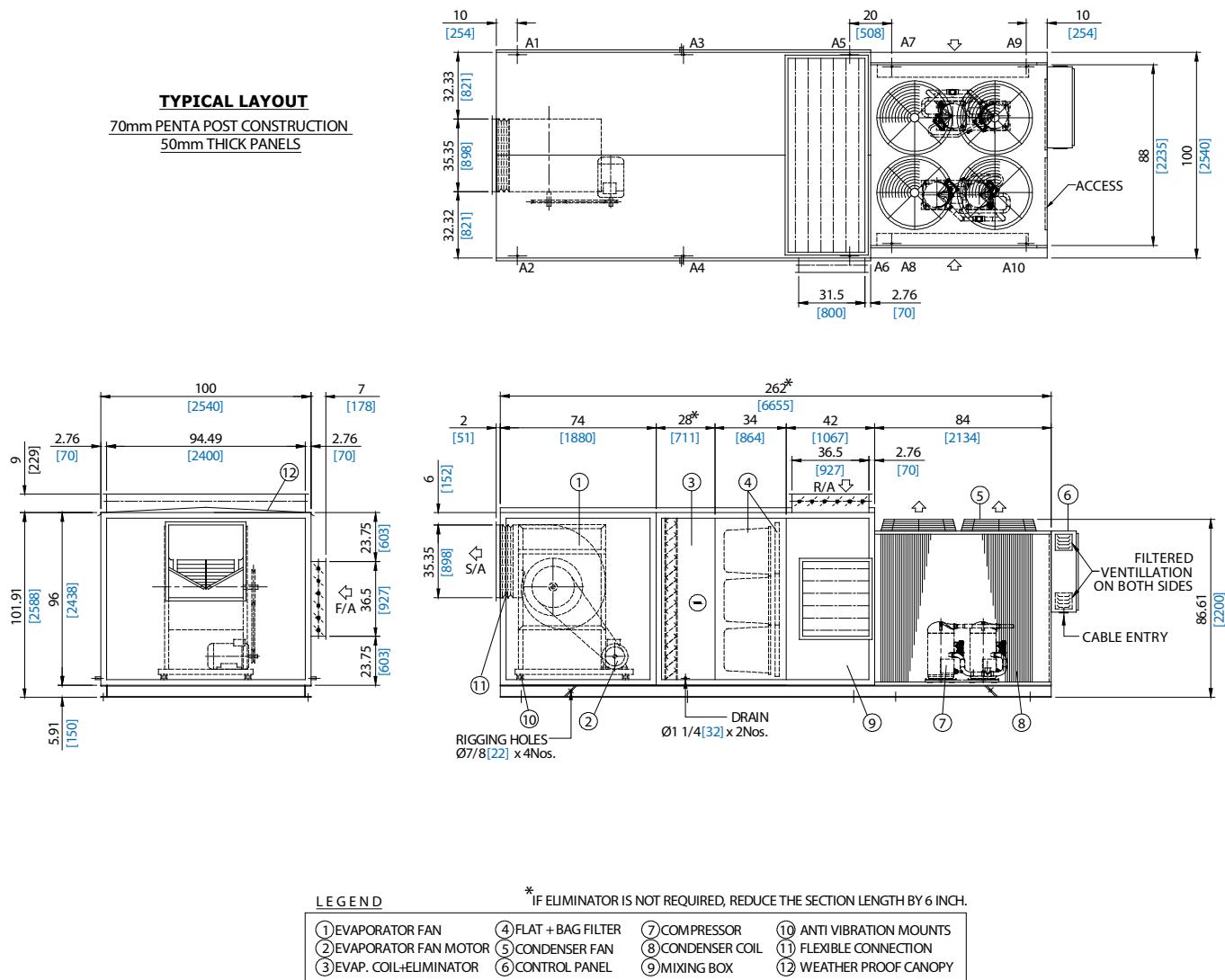
SKM Packaged Air Conditioning Units PACV Series - R-134a

Optional Modular Construction

PACV Models: 52065 S / 62076 S

As an option, listed models can be produced as modular sections as per details given below.

- Mixing Box based on 75% R.A. and 25% F.A.
- Evaporator Fan is Forward Curved, type.
- 22" (559 mm) thick bag filter.
- 2" (50 mm) thick flat filter.
- Base frame size could be changed based on the components and application. Panel thickness is 1" (25 mm).



SKM Packaged Air Conditioning Units

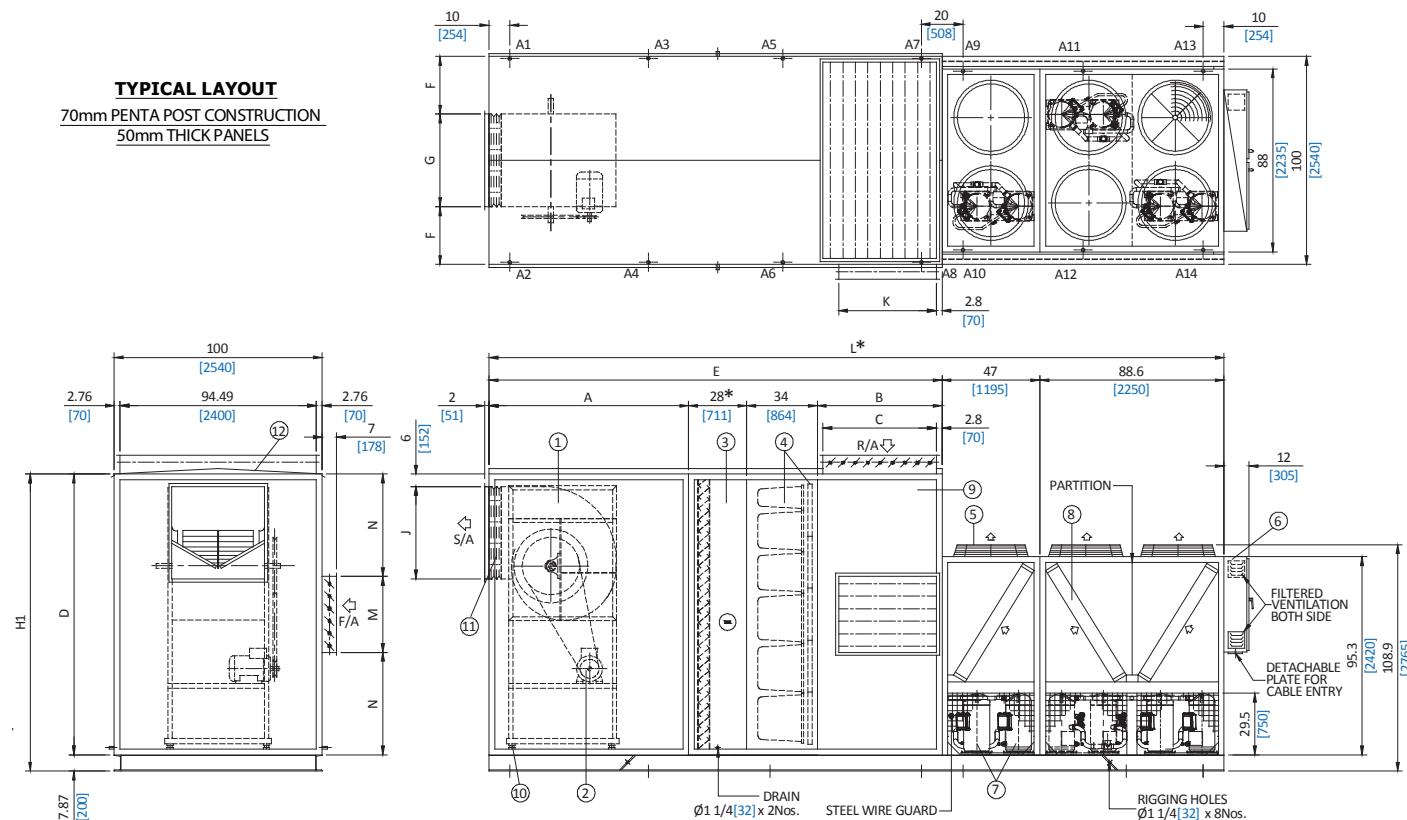
PACV Series - R-134a

Optional Modular Construction

PACV Models: 53070 S / 63085 S - 53095 S & 63110 S

As an option, listed models can be produced as modular sections as per details given below.

- Mixing Box based on 75% R.A. and 25% F.A.
- Evaporator Fan is Forward Curved, type.
- 22" (559 mm) thick bag filter.
- 2" (50 mm) thick flat filter.
- Base frame size could be changed based on the components and application. Panel thickness is 2" (50 mm).



LEGEND

① EVAPORATOR FAN	⑤ CONDENSER FAN	⑨ MIXING BOX
② EVAPORATOR FAN MOTOR	⑥ CONTROL PANEL	⑩ ANTI VIBRATION MOUNTS
③ EVAP. COIL+ELIMINATOR	⑦ COMPRESSOR	⑪ FLEXIBLE CONNECTION
④ FLAT + BAG FILTER	⑧ CONDENSER COIL	⑫ WEATHER PROOF CANOPY

MODEL PACV	DIMENSIONS												EVAP.FAN	
	H1	D	L	A	B	C	E	F	G	J	K	M	N	
53070 S 63085 S	115.87 [2943]	108 [2743]	329.6 [8373]	84 [2134]	48 [1219]	42.5 [1080]	194 [4928]	30.18 [767]	39.65 [1007]	39.65 [1007]	31.5 [800]	42.5 [1080]	32.75 [832]	ADH-800K
53075 S 63090 S	115.87 [2943]	108 [2743]	329.6 [8373]	84 [2134]	48 [1219]	42.5 [1080]	194 [4928]	30.18 [767]	39.65 [1007]	39.65 [1007]	31.5 [800]	42.5 [1080]	32.75 [832]	
53080 S 63095 S	124.87 [3172]	117 [2972]	335.6 [8525]	84 [2134]	54 [1372]	48.5 [1232]	200 [5080]	30.18 [767]	39.65 [1007]	39.65 [1007]	36 [914]	42.5 [1080]	37.25 [946]	ADH-900K
53085 S 63100 S	127.87 [3248]	120 [3048]	347.6 [8830]	96 [2438]	54 [1372]	48.5 [1232]	212 [5385]	27.76 [705]	44.49 [1130]	44.49 [1130]	36 [914]	42.5 [1080]	37.75 [984]	
53090 S 63105 S	133.87 [3400]	126 [3200]	353.6 [8982]	96 [2438]	60 [1524]	54.5 [1384]	218 [5537]	27.76 [705]	44.49 [1130]	44.49 [1130]	47 [1194]	36.5 [927]	44.75 [1137]	
53095 S 63110 S	142.87 [3629]	135 [3429]	353.6 [8982]	96 [2438]	60 [1524]	54.5 [1384]	218 [5537]	27.76 [705]	44.49 [1130]	44.49 [1130]	47 [1194]	36.5 [927]	49.25 [1251]	

Table 22

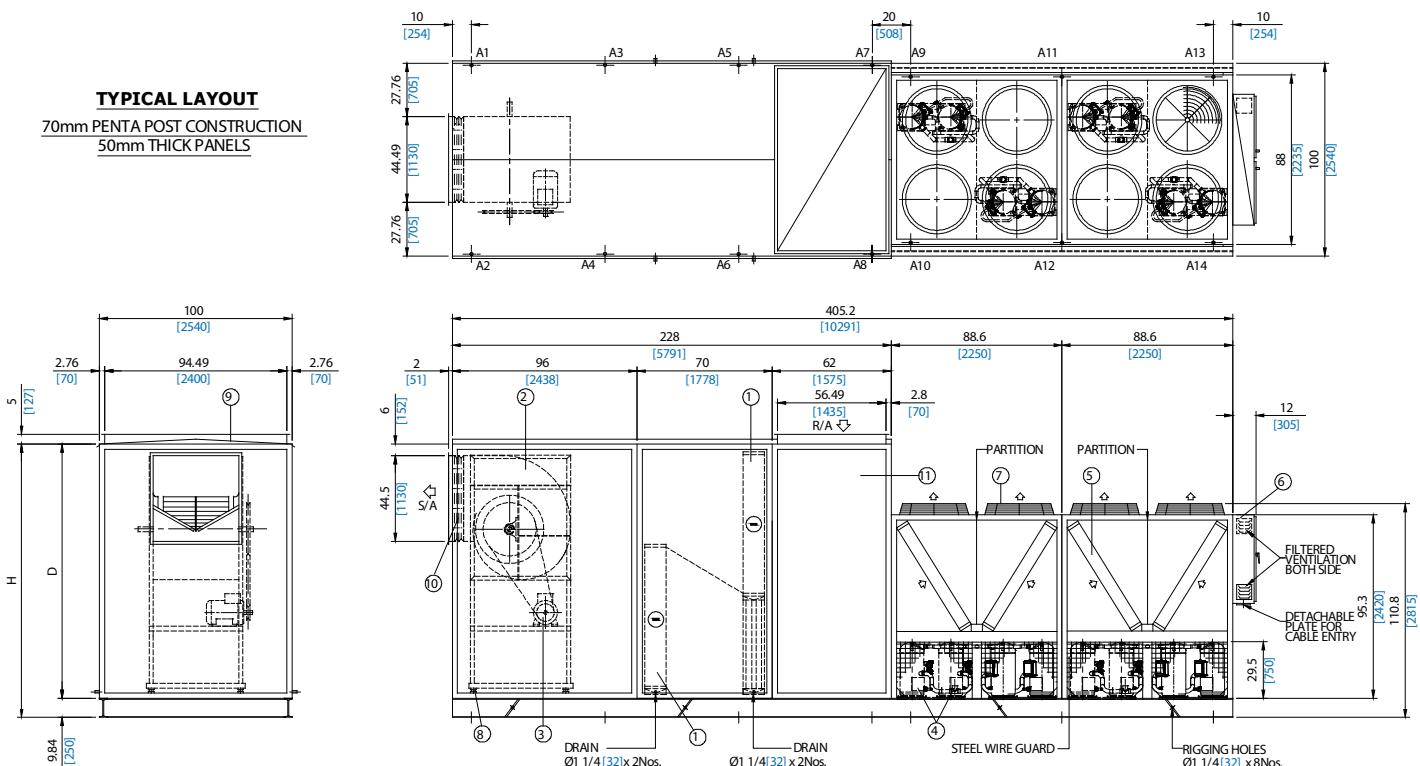
SKM Packaged Air Conditioning Units PACV Series - R-134a

Optional Overlapped evaporator coil design

PACV Models: 54100 S / 64120 S - 54125 S & 64145 S

As an option, listed models can be produced as overlapped evap. coils design with front discharge fan as per details given below.

- 100% Return air box.
- Evaporator Fan Forward Curved, type.
- Base frame size could be changed based on the components and application. Panel thickness is 2" (50 mm)
- Total length of the unit will be depending on the required sections, (e.g: filters, mixing box, eliminators, electric heaters etc...)



DIMENSIONS	MODELS PACV-			
	54100S/64120S	54110S/64130S	54115S/64136S	54125S/64145S
D	117 [2972]	119.5 [3035]	124.5 [3162]	132 [3353]
H	126.84 [3222]	129.34 [3285]	134.34 [3412]	141.84 [3603]

LEGEND							
①	EVAPORATOR COILS	③	EVAPORATOR FAN MOTOR	⑤	CONDENSER COIL	⑦	CONDENSER FAN
②	EVAPORATOR FAN	④	COMPRESSOR	⑥	CONTROL PANEL	⑧	ANTI VIBRATION MOUNTS
⑨	WEATHER PROOF CANOPY	⑩	RETURN AIR BOX				
⑩	FLEXIBLE CONNECTION						

ALL DIMENSIONS ARE IN INCHES [mm]

SKM Packaged Air Conditioning Units

PACV Series - R-134a

Location and Space Requirements

Due to the vertical air flow discharge condenser design, it is recommended that certain precautions are to be taken before installation. There should be no obstruction on the air flow.

Orient the unit so that prevailing winds blow parallel to the unit length thus minimizing the effects on condensing pressure. If it is not practical to orient the unit in this manner, a wind deflecting shield should be considered.

It is also necessary to provide adequate clearance on all sides of the unit for service access and satisfactory performance. This will prevent excessive condensing temperatures and enhance system performance and operating economy.

A flat concrete foundation or floor which can support the weight of the equipment must be provided as the unit must be level for proper operation and functioning of controls.

Under certain critical conditions it is recommended that vibration isolators of rubber-in-shear or spring type be installed under the base.

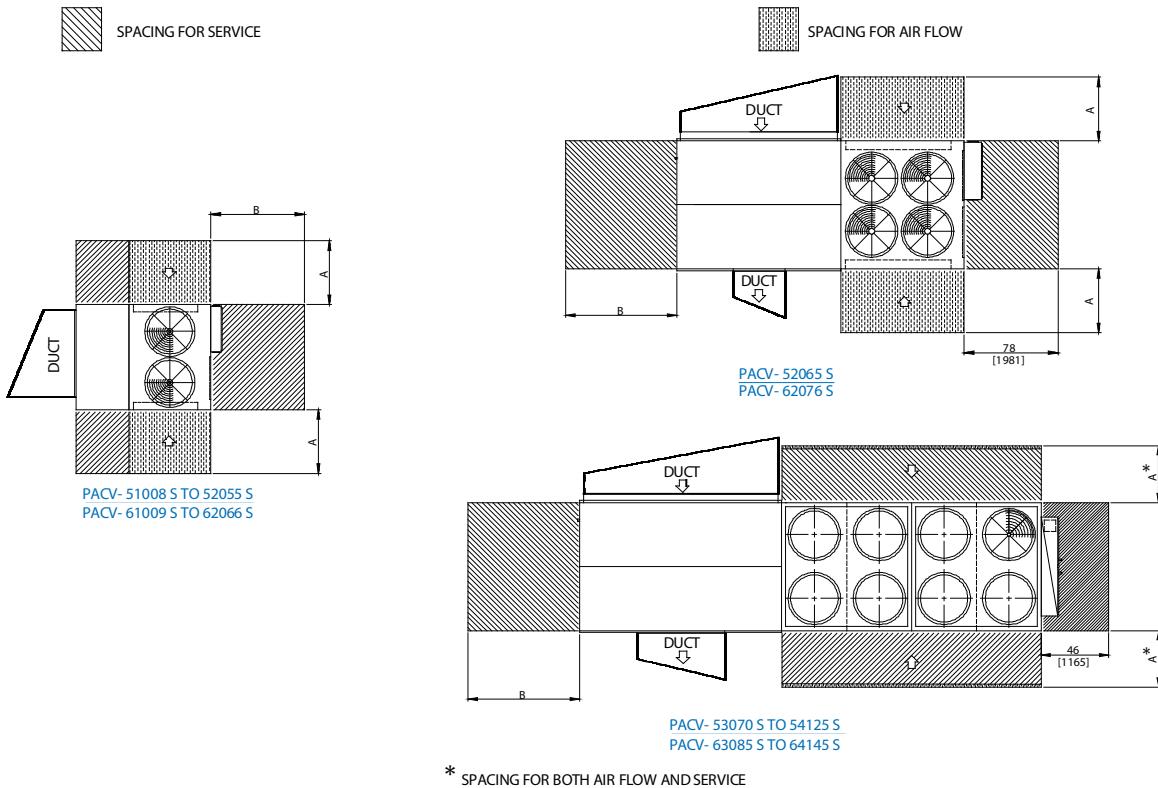
The isolators must be designed for the operating weight of the unit. For operating load points refer to Loading Points Data (page No.32&33). Correct selection of types of isolators depends upon application and structure.

Model PACV	A	B	C
51008-S	61009-S	50	
51010-S	61012-S		
51014-S	61018-S	66	
52015-S	62018-S		
51017-S	61020-S	72	
52017-S	62020-S		
52020-S	62024-S	78	
52023-S	62028-S		54
52026-S	62033-S		
52030-S	62036-S		
52032-S	62037-S		
52038-S	62046-S	82	
52045-S	62055-S		
52050-S	62060-S		
52055-S	62066-S	86	
52065-S	62076-S	78	
53070-S	63085-S		
53075-S	63090-S		
53080-S	63095-S		
53085-S	63100-S		
53090-S	63105-S	84	
53095-S	63110-S		
54100-S	64120-S		
54110-S	64130-S		
54115-S	64136-S		
54125-S	64145-S		108
			142

ALL DIMENSIONS ARE IN INCHES

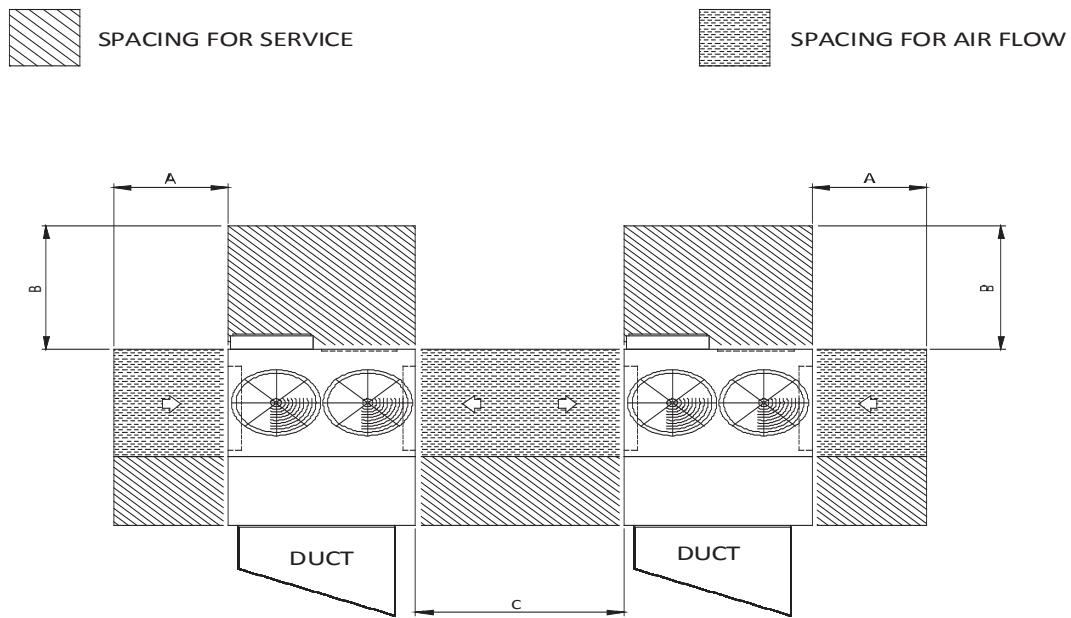
Table 23

Single Unit Installation



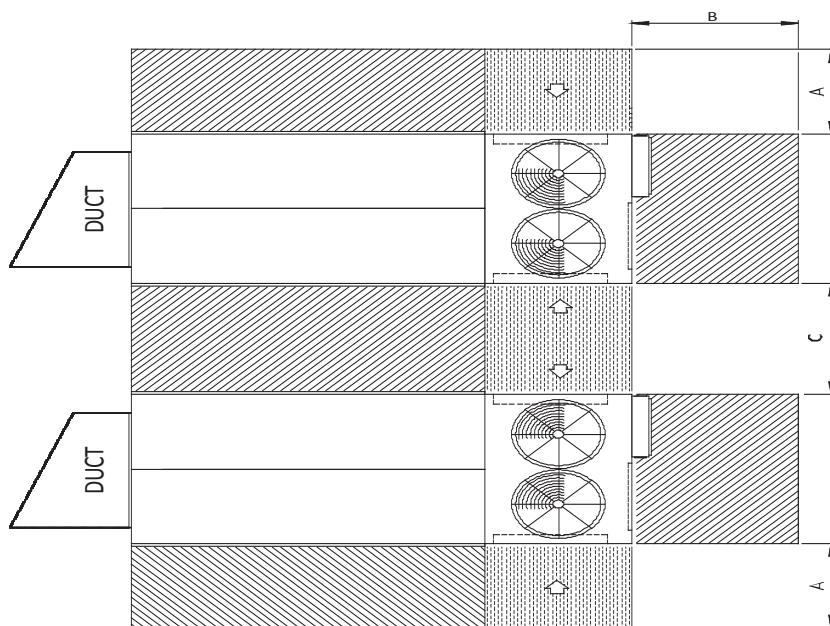
SKM Packaged Air Conditioning Units PACV Series - R-134a

Multiple Unit Installation



PACV- 51008 S TO 52055 S
PACV- 61009 S TO 62066 S

Multiple Unit Installation (Modular Construction)



PACV- 51008 S TO 52055 S
PACV- 61009 S TO 62066 S

SKM Packaged Air Conditioning Units PACV Series - R-134a

GUIDE SPECIFICATIONS

GENERAL FEATURES

Packaged air conditioners shall be composed of compressor(s), condenser coil(s), evaporator coil, expansion valve(s), connecting piping, all necessary liquid line accessories and safety controls.

Unit shall be factory assembled, internally wired, fully refrigerant charged with R-134a and thoroughly tested before delivery. Units should be capable to operate from 50°F (10°C) to 125°F (52°C) ambient temperature, and shall be rated in accordance with ARI 340-360 standards.

CONDENSER COIL(S)

Coil shall be air cooled with integral sub-cooling circuit, constructed of seamless copper tubes 3/8" OD mechanically bonded to wavy Aluminium (Copper) fins with maximum 14 FPI (1.8mm) spacing. Coil shall be tested against leakage by pressurizing air at 450 psig (3100 kPa) in coil, under water, cleaned and dehydrated at the factory.

COMPRESSOR(S)

Compressor shall be hermetic scroll, refrigerant gas cooled furnished with internal overload protection device, crankcase heater, and shall be mounted on rubber isolators.

CONDENSER FAN(S) & MOTOR(S)

The machine shall be furnished with direct driven propeller type discharging air upward condenser fans. Fans shall be constructed of corrosion resistant blades such as heavy gauge aluminum. The fan and drive shall be held in proper alignment. Fan assemblies shall be provided with heavy gauge, rust resistant steel wire fan guard. All condenser fans shall be individually, statically, and dynamically balanced for vibration free operation. Motors shall be Totally Enclosed Air Over (TEAO), 6 poles, class F insulation, minimum IP55 protection and factory wired to unit control panel.

EVAPORATOR COIL

Evaporator coil shall be constructed of seamless copper tubes mechanically bonded to aluminum (copper) cross-wave fins with maximum 12FPI (2.1mm) spacing. Coil consists of headers of seamless copper tubing, thermostatic expansion valve(s) & multi-circuited distributor(s). These coils shall be tested against leakage by air pressure of 300 psig (2068 kPa) underwater, cleaned & dehydrated at the factory. Coil shall conform to AHRI-410.

EVAPORATOR FAN & MOTOR

Evaporator fan shall be forward curved, double inlet double width (DIDW) centrifugal type, statically and dynamically balanced, mounted on single heavy duty shaft with permanently lubricated bearings and belt driven by "V" belts with an adjustable variable pitch motor pulley up to 15 kW. Above 15 kW fixed pulleys shall be standard. Variable pitch pulleys shall be provided above 15 kW motors, if so specified.

Motor shall be totally enclosed fan cooled (TEFC) 4 poles, class F insulated, minimum IP55 protected and factory wired to unit control panel.

REFRIGERANT PIPING

The refrigerant circuit piping shall be fabricated from ACR grade copper piping, with 1, 2, 3, or 4 refrigeration circuits, each liquid line shall include shut off valve, filter drier, sight glass, solenoid valve and thermostatic expansion valve.

Suction line shall be insulated with ½" (12mm) wall thickness enclosed cell pipe insulation with maximum K factor 0.28 Btu.in /ft².h.°F. (0.040 W/mK).

CASING

Unit casing shall be made of zinc coated galvanized steel sheets conforming to JIS-G3302 and ASTMA653 which shall be phosphatized and then electrostatically dry powder coated of approx.60 microns to provide an extremely tough, scratch resistance, excellent anti-corrosive protection that can pass 1000 hrs in 5% salt spray testing at 95°F (35°C) and 95% relative humidity as per ASTM B117.

Evaporator section shall be sealed with vinyl gaskets and completely insulated faced with black glass tissue (BGT) heavy density, fire retardant, 32 Kg/m³ density having Max. K factor 0.23 Btu.in /ft².h.°F (0.033 W/mK) and permanent odorless fibre glass insulation of minimum 1" (25mm) thickness for models up to PACV-52055S & 62066S and 2" (50mm) thickness for models PACV-52065S & 62076S onwards. Unit casing shall be provided with access panels for easy service and maintenance of all units parts.

GUIDE SPECIFICATIONS

FILTERS

Units shall be supplied with a range of filter sections with flat filter or vee filter 1" or 2" thick, with 54% or 72% dust arrestance, respectively, in accordance with ASHRAE 52.2, if so specified.

A bag filter section to house 22", 30", or 36" deep bag filters having efficiency as desired shall be provided, if so specified.

High efficiency pleat filter shall be provided as an alternative to bag filter, if so specified.

For 100%, Fresh Air application, a sand trap louver shall be provided, if so specified.

CONTROL PANEL

The unit mounted control panel enclosure shall be fabricated out of heavy gauge sheet steel in phosphatized powder coated baked finish. The enclosure shall conform to IP54 as per guidelines in IEC 529. A hinged access door and key-fastener shall be provided for easy access and security. The panel shall be factory wired in accordance with NEC 430 & 440, labeled, tagged and features 220V / 240V controls and shall include the following as a minimum.

- All compressors shall be with DOL starting.
- Individual compressor, condenser fan motors and evaporator fan motor contactors.
- Motor protector circuit breaker for condenser and evaporator fan motors.
- Voltage monitoring module for protection against under voltage, over voltage, phase loss, phase reversal and phase unbalance of the incoming voltage.
- Control circuit breaker.
- Control circuit on/off switch.
- Microprocessor control boards.
- Control Relays.
- Power and control terminal blocks.

MICROPROCESSOR CONTROL

Package units shall be equipped with a full function microprocessor based controller as a standard feature. The controller shall be factory programmed for the control of evaporator fan, compressors and condenser fans. The controller shall come with a built in keypad and display for simple but meaningful man machine interface. This controller shall provide complete operational control for the unit and shall have built-in auto diagnostic capability that can signal normal operation or alarm conditions as well as shutting down the unit or system if necessary.

The controller shall come with a loose supplied sleek and elegant design room unit for installing in the conditioned space. Communication between unit controller and room unit shall be through two wire interface.

The communication cable shall be 2 core, twisted pair, unscreened with stranded conductors. (As per KNX specification). Maximum distance between room unit and controller shall be 700 meters. The room unit shall have a built in sensor for measuring the room temperature. It shall transmit room temperature, set point, unit operating mode, operating schedule etc. to the unit controller. Control of the compressors shall be based on room temperature and the set point, as standard. Control based on duct temperature shall be available if required.

The Main Features of the controller shall be as follows:

- Built in LCD display with back light.
- Built in keypad.
- Battery backed up built in real time clock.
- Multiple authorization level to provide tight security for the control system.
- Capacity control based on room temperature or return air temperature.
- Alarm history.
- A sleek & elegant design room unit.

DISPLAY INFORMATION

The package units shall offer an LCD display which will allow the operator to access different parameters of the unit. Operator shall be able to view and change the unit parameters. The display information shall include:

- Status
- Outputs
- Inputs
- Alarms
- Set points
- Password

The intelligent microprocessor based controller shall monitor all the safeties related to the unit and makes the necessary protections, by shutting down the entire unit or the effected circuit. The protections shall include:

- Low suction pressure.
- High discharge pressure.
- High compressor motor temperature.
- Compressor short cycling.
- Evaporator fan motor overload.

Volt free contacts for run status, common fault status, auto mode status and provision for remote on/off shall be available as option.

In addition, the unit microprocessor shall be able to support the major BMS protocols such as BACnet, Modbus & LON as option.

SKM Packaged Air Conditioning Units

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