المملكـــة العربيـــة السعوديـــة

KINGDOM OF SAUDIA ARABIA

الـهيئـــة السـعوديـــة للمواصفـــات والمقاييـــس والجـــودة

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مكيفات الهواء – الحدود الدنيا لكفاءة استهلاك الطاقة وطرق الاختبار

AIR CONDITIONERS - MINIMUM ENERGY PERFORMANCE REQUIREMENTS AND TESTING REQUIRMENTS

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Saudi Standards

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NATIONAL FOREWORD

The Saudi Standards, Metrology and Quality (SASO) has prepared the Following Technical Regulation:

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AIR CONDITIONERS - MINIMUM ENERGY PERFORMANCE REQUIREMENTS AND TESTING REQUIRMENTS

المواصفات القياسية السعودية

Saudi Standards

Air Conditioners -

Minimum Energy Performance Requirements And Testing Requirements

1. Scope

This Standard specifies the Minimum Energy Performance Standard (MEPS) and testing requirements for air conditioners of the following main product categories:

- Electrically operated air conditioners
- Condensing units
- Chillers
- Absorption chillers
- Electrically operated variable refrigerant flow (VRF) air conditioners
- Close control air conditioners and condensing units serving computer rooms

It shall apply to air conditioners designed to operate in AC single-phase circuits of 220 V or 230 V, or designed for dual voltage or voltage range including these values, and three-phase circuits of 380 V or 400 V with a frequency of 60 Hz. Air-conditioners having special voltages, not under the scope of this standard, shall be subject to SASO approval, in condition that they do not exceed 600 V.
For water-cooled chillers voltages up to 15000 V are included.

Product categories, capacities, and applicable testing standards falling under the scope of this Standard are detailed in section 5.

1.1 Exclusions

This Standard does not apply to air conditioners that are covered under the scope of the latest version of SASO 2663 Standard.

2. Normative references

The following normative reference standards applies. For undated references the latest apply. In addition this Standard supersedes the below reference standards in case of conflicting requirements.

- ANSI/AHRI 210/240: “Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment”.
- ANSI/AHRI 340/360: “Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment”.
- ANSI/AHRI 365(I-P):“Commercial and Industrial Unitary Air-Conditioning Condensing Units”.
- ANSI/AHRI 550/590(I-P): “Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle”.
- ANSI/AHRI 1230: “Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment”.
- ANSI/AHRI 1360 (I-P): Performance Rating of Computer and Data Processing Room Air Conditioners
- ANSI/AHRI 560(I-P): “Absorption Water Chilling and Water Heating Packages”.
- GSO 1899 "GCC Standard Voltages and Frequencies for Alternating Current Distribution Systems".
- ISO 5151 (2010): Non-ducted air conditioners and heat pumps — Testing and rating for performance
- ISO 13253 (2011): Ducted air-conditioners and air to air heat pumps – Testing and rating for performance
- SASO ISO13256-1 (2007): Water-source heat pumps – Testing and rating for performance – Part 1 – Water to air and brine to air heat pumps
- SASO ISO13256-2 (2007): Water-source heat pumps – Testing and rating for performance – Part 2 – Water to water and brine to water heat pumps
- ISO15042 (2011): Multiple split-system air conditioners and air to air heat pumps – Testing and rating for performance
- ASHRAE 90.1:2016 : Energy standard for Buildings Except Low-Rise Residential Buildings

3. Terms and definitions

For the purposes of this Standard, the following terms and definitions shall apply.

3.1 Absorption Chillers

A factory designed and prefabricated assembly employing water as the refrigerant and consisting of an evaporator, absorber, condenser, generator(s) and solution heat exchangers, with interconnections and accessories used for chilling or heating water. The package utilizes single or multiple reconcentrations of an absorbent solution. The reconcentrations of the absorbent are known as effects. A single effect package employs one step reconcentration of the absorbent in the generator. Water vapor is released after the heat energy is introduced into the generator. The concentrated absorbent is returned to the absorber where it can absorb water vapor flashed off in the evaporator. A double effect package employs a two steps reconcentrations of the absorbent through the use of an additional high temperature generator. An absorption package can be further defined by the following:

3.1.1 Direct Fired Package

This type of package reconcentrates the absorbent from heat energy through the combustion of natural gas, LP gas or oil.

3.1.2 Indirect Fired Package:

This type of package reconcentrates the absorbent from heat energy from steam or hot water.

3.2 Accredited laboratory

Any laboratory recognized by SASO or/and recognized through the ILAC system for the list of testing procedures listed in this standard

3.3 Adjustment factor (Kadj)

Factor used to adapt the performance of air-conditioners not designed for operation at testing conditions.

Note: For centrifugal chillers ASHRAE 901:2013 Section 6.4.1.2.1 is a recognized method to calculate such a factor

3.4 Basic Model group (BMG)

A BMG is a set of models that share characteristics which allow the performance of one (1) model to be generally representative of the performance of other models within the group. This group of products does not necessarily have to share discrete performance. The Product Specific Operations Manual specifies the exact product features that define a BMG.

Example: A basic model group of commercial boilers is a set of models that range in size, but are of similar type, design, and construction. A basic model group would consist of boilers that are:

- Constructed of the same material (i.e. aluminum, cast iron, or steel);
- Have the same control mechanism (i.e. condensing, modulating, pressure fired, power burner, natural draft, etc.);
- Have the same vent size; and have the same energy input capacity.

Example: A basic model group of residential air-conditioning systems consists of outdoor units (which have same condenser, outdoor coil surface area, and outdoor air quantity) that are paired with specific indoor models (coils)

Note: Use of Basic Model Group applies to Path A only

3.5 Chillers:

A factory-made and prefabricated assembly (not necessarily shipped as one package) of one or more compressors, condensers and evaporators, with interconnections and accessories designed for the purpose of cooling or heating water. It is a machine specifically designed to make use of a vapor compression refrigeration cycle to remove heat from water and reject the heat to a cooling medium, usually air or water. The refrigerant condenser may or may not be an integral part of the package

3.6 Close Control Air Conditioners and Condensing Units Serving Computer Rooms:

A Computer and Data Processing Room Air Conditioner consisting of one or more factory-made assemblies, which include a direct expansion evaporator or chilled water cooling coil, an air-moving device(s), and air-filtering device(s). The air conditioner may include a compressor, condenser, humidifier, or reheating function. The functions of a CDPR, either alone or in combination with a cooling plant, are to provide air filtration, air circulation, cooling, and humidity control (if the necessary options are included).

3.7 Condenser

A refrigeration system component which condenses refrigerant vapor. Desuperheating and sub-cooling of the refrigerant may occur as well.

3.7.1 Air-Cooled Condenser

A component which condenses refrigerant vapor by rejecting heat to air mechanically circulated over its heat transfer surface causing a rise in the air temperature.

3.7.2 Evaporatively-Cooled Condenser

A component which condenses refrigerant vapor by rejecting heat to a water and air mixture mechanically circulated over its heat transfer surface, causing evaporation of the water and an increase in the enthalpy of the air.

3.7.3 Water-Cooled Condenser

A component which utilizes refrigerant-to-water heat transfer means, causing the refrigerant to condense and the water to be heated

3.8 Condensing Units

A factory-made assembly of refrigeration components designed to compress and liquefy a specific refrigerant. It consists of one or more refrigerant compressors, refrigerant condensers (air-cooled, evaporatively – cooled, and/or water-cooled), condenser fans and motors (where used) and factory-supplied accessories.

3.9 Ducted air conditioners

An air conditioner model configuration where the indoor side is situated remote to the space to be conditioned. The conditioned air is supplied or extracted via a duct.

3.10 Electrically Operated Unitary ACs

One or more factory-made assemblies, which normally include a cooling coil, an air moving device, a compressor(s) and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together, and the requirements of rating outlined in this standard shall be based upon the use of matched assemblies. These assemblies are electrically operated, vapor compression refrigeration systems.

3.11 Electrically Operated Variable Refrigerant Flow (VRF) Air Conditioners

An engineered direct expansion (DX) multi-split system incorporating at least one variable capacity compressor distributing refrigerant through a piping network to multiple indoor fan coil units each capable of individual zone temperature control, through proprietary zone temperature control devices and common communications network. Variable refrigerant flow implies three or more steps of control on common, inter-connecting piping.

3.12 Energy Efficiency Ratio (EER)

A ratio of the Cooling Capacity in Btu/h to the power input values in watts at any given set of rating conditions.

3.13 Maximum Operating Conditions

The maximum allowable working conditions that a system, a part of a system or equipment is designed to and/or can withstand.

3.14 Modular Unit

A Modular Unit is a unit that is made up of multiple units that can function individually or as a single unit. Modular units shall be certified, provided that the unit is rated and listed in the AHRI certification directory as a complete unit with a specific combination of modules and with a total capacity that is within the scope of the program. In this case, the complete Modular Unit consisting of multiple modules must be certified as a single complete unit as part of the certification program**.**

Note: unit can be chiller, condenser or other product within the scope of this document.

3.15 Multiple split Air conditioners and Heat pump (or Multi-split or multi split air conditioners and heat pumps

Split system that has one outdoor unit and two or more Indoor units and/or blower coil indoor units connected with a single refrigerant circuit. The indoor units operate independently and can condition multiple zones in response to at least two indoor thermostats or temperature sensors. The outdoor unit operates in response to independent operation of the indoor units based on control input of multiple indoor thermostats or temperature sensors, and/or refrigeration circuits sensor input (e.g. suction pressure).

3.16 Net sensible cooling capacity

The total gross cooling capacity less the latent cooling less the energy to the air movement.

3.17 Net Sensible Coefficient of Performance (NSenCOP)

A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions.

3.18 Non-ducted air conditioner

An air conditioner or heat pump that is designed to be permanently installed equipment and directly heats or cools air within the conditioned space using one or more indoor coils that are mounted on room walls and/or ceilings. The unit may be of a modular design that allows for combining multiple outdoor coils and compressors to create one overall system.

3.19 Rated capacity

The nominal rated capacity claimed by the manufacturer of an air conditioner model determined as per the relevant testing and rating standard.

3.20 Rated power

Effective power input of the air conditioner model as claimed by the manufacturer during the determination of rated cooling capacity and rated heating capacity, as applicable.

3.21 Rated voltage

The electric potential or potential difference claimed by the manufacturer of an air conditioner model for which a piece of equipment is designed.

3.22 Rated frequency

The number of cycles per second through which an alternating electric current passes as claimed by the manufacturer of an air conditioner model.

3.23 SASO registration system:

Web application used by SASO to register and edit a certificate of conformity necessary to put the registered product on the Saudi market.

3.24 Sensible coefficient of performance (NsensCOP)

A ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watt (excluding re-heaters and humidifiers) at conditions detailed in the relevant testing standard. The net sensible cooling capacity minus the energy dissipated into the cooled space by the fans system**.**

3.25 Split system

Any air conditioner that has at least two separate assemblies that are connected with refrigerant piping when installed. One of these assemblies includes an indoor coil that exchanges heat with the indoor air to provide heating or cooling, while one of the others includes an outdoor coil that exchanges heat with the outdoor air. Split Systems may be either blower coil systems or coil-only systems.

3.26 "Shall" or "Should":

"Shall" or "should" shall be interpreted as follows:

3.26.1 Shall:

Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.26.2 Should

“Should” is used to indicate provisions which are desirable as good practice, but which are not mandatory.

3.27 Variable Refrigerant Flow (VRF) system

An engineered direct expansion (DX) Multi-split system incorporating the following

- a split-system air conditioner or Heat Pump incorporating a single refrigerant circuit that is a common piping network to multiple indoor units,

- air-conditioner, heat pump or heat recovery type system,

- one or multiple manifolded outdoor units with a specific model number with at least one more variable compressor,

- indoor units,

- three or more steps of control, inter-connecting piping

3.28 VRF multiple air to air - air split system

A VRF system air-conditioner or VRF Heat Pump with one or more manifolded Outdoor Units that have air-to-air heat exchangers

3.29 VRF heat recovery multiple split system

VRF air-to-air Heat Pump or VRF Water Source Heat Pump that is capable of providing simultaneous heating and cooling operation, where recovered energy from the Indoor Units operating in one mode can be transferred to one or more other Indoor Units operating in the other mode.

3.30 Water Chilling or Water-Heating Package

A factory-made and prefabricated assembly (not necessarily shipped as one package) of one or more compressors, condensers and evaporators, with interconnections and accessories designed for the purpose of cooling or heating water. It is a machine specifically designed to make use of a vapor compression refrigeration cycle to remove heat from water and reject the heat to a cooling medium, usually air or water. The refrigerant condenser may or may not be an integral part of the package

4. Testing Requirements

4.1 Reference test conditions

The reference testing conditions are presented in Table 1.

Tests are performed according to the relevant AHRI or ISO standards corresponding to the type of air conditioners listed in Clause 5.

All units shall be tested under the T1 temperature (35 ^{o}C) at full load according to AHRI or ISO standards as applicable.

All units shall be tested under the T3 temperature (46 ^{o}C) at full load for reference according to AHRI or ISO standards as applicable.

For water cooled system, the testing conditions are presented in the relevant standards for each type of air-conditioners.

In addition, the operability shall be checked at 52°C according to AHRI or ISO standards as applicable.

The minimum energy performance standard (MEPS) requirements for large capacity air conditioners in the scope of this Standard are based on T1 testing conditions (see Table 1).

For room computers and data processing air conditioners MEPS and temperature conditions are defined in Table 9.

Products are tested under the rated voltage and rated frequency (60Hz) applicable according to GSO1899.

Table 1 – REFERENCE TESTING CONDITIONS

TESTING CONDITIONS	INDOOR SECTION		OUTDOOR SECTION	
	Dry-Bulb °C [°F]	Wet-Bulb when applicable °C [°F]	Dry-Bulb °C [°F]	Wet-Bulb when applicable °C [°F]
TEMPERATURE T1	27.0 [80.6]	19.0 [66.2]	35.0 [95.0]	24.0 [75.2]
TEMPERATURE T3	29.0 [84.2]	19.0 [66.2]	46.0 [114.8]	24.0 [75.2]
OPERABILITY AT 52 °C	26.7 [80.0]	19.4 [67.0]	52.0 [125.6]	31.0 [87.8]
Test Frequency*	Rated Frequency			
Test Voltage	See Table 2			
*: for equipment with dual rated frequencies (50-60 Hz), it shall be tested at 60 Hz				

For tests the rated voltage applies; if not mentioned in the testing standards then Table 2, below, presents the voltages used for the tests.

Table 2 – VOLTAGES FOR CAPACITY AND PERFORMANCE TESTS

Rated voltage [a] V	Test voltage [b] V
90 to 109	100
110 to 127	115
180 to 207	200
208 to 253	230
254 to 341	265
342 to 420	400
421 to 506	460
507 to 633	575

[a] For equipment with dual voltage, such as 115/230 and 220/440, the test voltage would be 115 V and 230 V in the first example, and 230 V and 460 V in the second example. For equipment with an extended voltage range, such as 110 V to 120 V or 220 V to 240 V, the test voltage would be 115 V or 230 V respectively. Where the extended voltage range spans two or more of the rated voltage ranges, the mean of the rated voltage shall be used to determine the test voltage of this table.

Example: For equipment with an extended voltage range of 200 V to 220 V, the test voltage would be 230V, based on the mean voltage of 210 V.

[b] The voltages in this table are for capacity and performance tests other than the maximum cooling performance tests.

For voltages over 600 V and up to 15000 V admissible tested voltage is presented for each relevant standard.

4.2 Declaration of the rated cooling capacity

The declaration of the rated cooling CC_{rated} shall be expressed only in terms of Btu/h as show in Table 3.

Table 3 – RULES TO EXPRESS THE RATED COOLING CAPACITY	
Rated cooling capacity (Btu/h)	Multiples
CC_{rated} <20,000 [5.86 kW]	100 (Btu/h) or 30 (W)
20,000 [5.86 kW] ≤ CC_{rated} <38,000 [11.13 kW]	200 (Btu/h) or 60 (W)
38,000 [11.13 kW] ≤ CC_{rated} <65,000 [19.05 kW]	500 (Btu/h) or 150 (W)
65,000 [19.05 kW] ≤ CC_{rated} <135,000 [39.56 kW]	1,000 (Btu/h) or 300 (W)
135,000 [39.56 kW] ≤ CC_{rated} <400,000 [117.20 kW]	2,000 (Btu/h) or 500 (W)
CC_{rated} ≥ 400,000 [117.20 kW]	5,000 (Btu/h) or 1000 (W)

4.3 Declaration of the rated Energy Efficiency Ratio or Coefficient of Performance

Standard measures of energy efficiency, whenever published, shall be expressed in multiples of the nearest 0.05 Btu/(W·h) for the rated EER or in multiples of the nearest 0.01 (W/W) for the rated net sensible COP (NsensCOP).

5. Minimum Energy Performance Standard (MEPS)

5.1 Applicable values for MEPS

MEPS applicable for Air Conditioners within the scope of this standard are presented in Tables 4 through 9.

The MEPS are established from the rated values. Conditions for acceptability of the tested values used to confirm the rated values are presented in Clause 6.

For convenience, the cooling capacities are expressed in Btu/h and in kW using a conversion factor of 1000 Btu/h equal to 0.293 kW

5.2 MEPS for Electrically operated Unitary air conditioners[1,2]

Table 4 – MEPS for electrically operating air conditioners (Unitary Air Conditioning Equipment)			
Air Conditioner Appliance Type	Rated cooling capacity (Btu/h) [kW]	Testing method	EER (Btu/W.h)
Air conditioners, air cooled	≤ 65,000 [19.05 kW] (excluding window, split ducted, and split non-ducted)	ANSI/AHRI 210/240 or ISO 5151 or ISO 13253	11.2
	> 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]	ANSI/AHRI 340/360 Or ISO 5151 Or ISO 13253	11.2
	> 135,000 [39.56 kW] and ≤ 240,000 [70.32 kW]		11.0
	> 240,000 [70.32 kW] and ≤ 760,000 [222.68 kW]		10.0
	> 760,000 [222.68 kW]		9.7
Air conditioners, water cooled	≤ 65,000 [19.05 kW]	ANSI/AHRI 210/240 Or ISO 13256-1	12.1
	> 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]	ANSI/AHRI 340/360 Or ISO 13256-1	12.1
	> 135,000 [39.56 kW] and ≤ 240,000 [70.32 kW]		12.5
	> 240,000 [70.32 kW] and ≤ 760,000 [222.68 kW]		12.4
	> 760,000 [222.68 kW]		12.2
Air conditioners, evaporatively cooled	≤ 65,000 [19.05 kW]	ANSI/AHRI 210/240	12.1
	> 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]	ANSI/AHRI 340/360	12.1
	> 135,000 [39.56 kW] and ≤ 240,000 [70.32 kW]	ANSI/AHRI 340/360	12.0
	> 240,000 [70.32 kW] and ≤ 760,000 [222.68 kW]	ANSI/AHRI 340/360	11.9
	> 760,000 [222.68 kW]	ANSI/AHRI 340/360	11.7

[1] Values apply when the unit has no heating section or when the heating section is of electrical resistance type. For all other types, deduct 0.2 from the EER values

[2] For systems with heat recovery, deduct 0.2 from the EER values

5.3 MEPS for Condensing units

Table 5 – MEPS for condensing units

Air Conditioner Appliance Type	Rated cooling capacity (Btu/h) [kW]	Testing methods	EER (Btu/W.h)
Condensing units, air cooled	≤ 135,000 [39.56 kW]	ANSI/AHRI 210/240 ANSI/AHRI 340/360	11.0
Condensing units, air cooled	> 135,000 [39.56 kW]	ANSI/AHRI 365	10.5
Condensing units, water cooled	≤ 135,000 [39.56 kW]	ANSI/ANSI/AHRI 340/360	11.9
Condensing units, water cooled	> 135,000 [39.56 kW]	ANSI/AHRI 365	13.5
Condensing units, evaporatively cooled	≤ 135,000 [39.56 kW]	ANSI/AHRI 340/360	11.9
Condensing units, evaporatively cooled	> 135,000 [39.56 kW]	ANSI/AHRI 365	13.5

5.4 MEPS for Chillers

Table 6 – MEPS for chillers			
Air Conditioner Appliance Type	Rated cooling capacity (Btu/h) [kW][1]	Testing methods	EER [2] (Btu/W.h)
Air-cooled chillers	≤ 1,800,000 [527.40 kW]	ANSI/AHRI 550/590	9.7
	> 1,800,000 [527.40 kW]		9.7
Water-cooled electrically operated, positive displacement	≤ 900,000 [263.70 kW]	ANSI/AHRI 550/590 or ISO 13256-2	15.4
	> 900,000 [263.70 kW] and ≤ 1,800,000 [[527.40 kW]		16.0
	> 1,800,000 [527.40 kW] and ≤ 3,600,000 [1,054.80 kW]		17.7
	> 3,600,000 [1054.80 kW] and ≤ 7,200,000 [21,109.60 kW]		19.2
	> 7,200,000 [2,109.60 kW]		19.2
Water-cooled electrically operated, centrifugal	≤ 3,600,000 [1,054.80 kW]		17.3
	> 3,600,000 [1,054.80 kW] and ≤ 7,200,000 [2,109.60 kW]		20.5
	> 7,200,000 [2,109.60 kW] and ≤ 14,400,000 [4,219.20 kW]		20.5
	> 14,400,000 [4,219.20 kW]		20.5

[1/] Expression of cooling capacity using TR units is accepted using conventional conversion of 1 TR = 12,000 Btu/h

[2/] Use of the Kadj factor expressed in ASHRAE 90.1 Clause 6.4.1.2.1 is allowed for determination of the rated EER at T1 conditions

5.5 MEPS for Absorption chillers

Table 7 – MEPS for absorption chillers

Air Conditioner Appliance Type	Rated cooling capacity (Btu/h)	Testing methods	EER [1] (Btu/W.h)
Air-cooled absorption, single effect	All capacities	ANSI/AHRI 560	2.0
Water-cooled absorption, single effect	All capacities		2.4
Absorption double effect, indirect fired	All capacities		3.4
Absorption double effect, direct fired	All capacities		3.4

[1/] Use of the Kadj factor expressed in ASHRAE 90.1 Clause 6.4.1.2.1 is allowed for determination of the rated EER at T1 conditions

5.6 MEPS for Electrically operated variable-refrigerant-flow (VRF) air conditioner systems

Table 8 – MEPS for Electrical operated variable refrigerant flow (VRF) air conditioner systems

Air Conditioner Appliance Type	Rated cooling capacity (Btu/h) [kW]	Testing methods	EER (Btu/W.h)
VRF multi split air conditioners, air cooled	< 65,000 [19.05 kW]	ANSI/AHRI 1230 or ISO 15042	11.2
	≥ 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]		11.2
	> 135,000 [39.56 kW] and ≤ 240,000 [70.32 kW]		11.0
	> 240,000 [70.32 kW]		10.0
VRF multi split air conditioners, heat pumps (1)	≤ 65,000 [19.05 kW]		11.2
	> 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]		11.0
	> 135,000 and ≤ 240,000 [70.32 kW]		10.6
	> 240,000 [70.32 kW]		9.5
VRF multi split air conditioners, water cooled (1)	≤ 65,000 [19.05 kW]		12.0
	> 65,000 [19.05 kW] and ≤ 135,000 [39.56 kW]		12.0
	> 135,000 [39.56 kW] and ≤ 240,000 [70.32 kW]		10.0
	> 240,000 [70.32 kW]		10.0

5.7 MEPS for Close control air conditioners and condensing units serving computer rooms

For this type of air conditioners, the testing conditions are specified according to table 9 which supersedes Table1.

Table 9 - MEPS for Computer and Data Processing Room Air Conditioners (as defined by clause 3)

			Minimum Net Sensible COP (NsensCOP)			
			Return Air Dry-Bulb Temperature/Dew-Point Temperature			
			Class 1	Class 2	Class 3	
Equipment Type	**Net Sensible Cooling Capacity (Btu/h)** [kW]	**Standard Model**	**23.9°C / 11.1°C (75F/52F)**	**29.4°C/ 11.1°C (85F/52F)**	**35°C / 11.1°C (95F/52F)**	**Test Procedure**
Air Cooled	<65,000 [19.05 kW]	Down-Flow Unit		2.30		AHRI 1360
		Up-Flow Unit - Ducted		2.10		
		Up-Flow Unit – Non-Ducted	2.09			
		Horizontal-Flow Unit			2.45	
	≥65,000 [19.05 kW] and <240,000 [70.32 kW]	Down-Flow Unit		2.20		
		Up-Flow Unit - Ducted		2.05		
		Up-Flow Unit – Non-Ducted	1.99			
		Horizontal-Flow Unit			2.35	
	≥240,000 [70.32 kW]	Down-Flow Unit		2.00		
		Up-Flow Unit - Ducted		1.85		
		Up-Flow Unit – Non-Ducted	1.79			
		Horizontal-Flow Unit			2.15	
Water Cooled	<65,000 [19.05 kW]	Down-Flow Unit		2.50		AHRI 1360
		Up-Flow Unit - Ducted		2.30		
		Up-Flow Unit – Non-Ducted	2.25			
		Horizontal-Flow Unit			2.70	
	≥65,000 [19.05 kW] and <240,000 [70.32 kW]	Down-Flow Unit		2.40		
		Up-Flow Unit - Ducted		2.20		
		Up-Flow Unit – Non-Ducted	2.15			
		Horizontal-Flow Unit			2.60	
	≥240,000 [70.32 kW]	Down-Flow Unit		2.25		
		Up-Flow Unit - Ducted		2.10		
		Up-Flow Unit – Non-Ducted	2.05			
		Horizontal-Flow Unit			2.45	
Water Cooled with Fluid	<65,000 [19.05 kW]	Down-Flow Unit		2.45		AHRI 1360
		Up-Flow Unit - Ducted		2.25		
		Up-Flow Unit – Non-Ducted	2.20			

Economizer		Horizontal-Flow Unit			2.60	
	≥65,000 [19.05 kW] and <240,000 [70.32 kW]	Down-Flow Unit		2.35		
		Up-Flow Unit - Ducted		2.15		
		Up-Flow Unit – Non-Ducted	2.10			
		Horizontal-Flow Unit			2.55	
	≥240,000 [70.32 kW]	Down-Flow Unit		2.20		
		Up-Flow Unit - Ducted		2.05		
		Up-Flow Unit – Non-Ducted	2.00			
		Horizontal-Flow Unit			2.40	
Glycol Cooled	<65,000 [19.05 kW]	Down-Flow Unit		2.30		AHRI 1360
		Up-Flow Unit - Ducted		2.10		
		Up-Flow Unit – Non-Ducted	2.00			
		Horizontal-Flow Unit			2.40	
	≥ 65,000 [19.05 kW] and <240,000 [70.32 kW]	Down-Flow Unit		2.05		
		Up-Flow Unit - Ducted		1.85		
		Up-Flow Unit – Non-Ducted	1.85			
		Horizontal-Flow Unit			2.15	
	≥240,000 [70.32 kW]	Down-Flow Unit		1.95		
		Up-Flow Unit - Ducted		1.80		
		Up-Flow Unit – Non-Ducted	1.75			
		Horizontal-Flow Unit			2.10	
Glycol Cooled with Fluid Economizer	<65,000 [19.05 kW]	Down-Flow Unit		2.25		AHRI 1360
		Up-Flow Unit - Ducted		2.10		
		Up-Flow Unit – Non-Ducted	2.00			
		Horizontal-Flow Unit			2.35	
	≥ 65,000 [19.05 kW] and <240,000 [70.32 kW]	Down-Flow Unit		1.95		
		Up-Flow Unit - Ducted		1.80		
		Up-Flow Unit – Non-Ducted	1.75			
		Horizontal-Flow Unit		2.10		
	≥240,000 [70.32 kW]	Down-Flow Unit		1.90	2.10	
		Up-Flow Unit - Ducted		1.80		
		Up-Flow Unit – Non-Ducted	1.70			
		Horizontal-Flow Unit			2.10	

5.8 Maximum Operating Temperature Requirements.

5.8.1 Scope for the test of operability at 52 °C

If not described in the reference standard listed in Clause 2 and applicable to the tested product the following procedure applies.

The test is applicable to air conditioners covered by Clause 5 and if the fluid entering in the outdoor unit (condenser) is air.

5.8.2 Temperature Conditions.
Temperature conditions shall be maintained as shown in Table 1.

5.8.3 Voltages.
Tests shall be run at the unit's rated voltage according to Table 2.

5.8.4 Procedure and measurements
All power to the equipment shall be interrupted for a period sufficient to cause the compressor to stop (not to exceed 5 seconds) and then be restored.

The unit shall resume continuous operation within one hour of restoration of power and shall then operate continuously for one hour. Operation and resetting of safety devices prior to establishment of continuous operation is permitted.

Air volume rate is based on specification from manufacturer.

When relevant, the external static pressure shall be greater than or equal to the minimum external static pressure defined for the measurements at T1 (or specified temperature class defined in Table 9) and described in the corresponding standard per type of units as presented in Clause 5.3 to 5.9.

For information, the average cooling capacity and power of the unit during the test are reported.

5.8.5 Tolerances for high temperature operating test
The tolerance for the outdoor temperature is ±0.6 ^{o}C (or ±1 ^{o}F).

The tolerances for the power and thermal capacities are identical to the tolerances used for determination of the power and capacities at T1 and T3 testing conditions.

5.8.6 Requirements for operability at high temperature conditions
During the test, the equipment shall operate continuously without interruption for any reasons during the duration of the tests.

6. Criteria for acceptability of products at registration

6.1 General

Registration of products in SASO registration system is necessary to enter into the Saudi market and applies to both imported and locally manufactured products.

To ensure the compliance to MEPS and operability test, the manufacturer shall submit evidence of the performances claimed according to Path A or Path B, demonstrated below.

When products covered by the scope of this standard are built on a modular structure defined as Modular Unit and including multiple units, the performance of each unit can be used to confirm the performance of the Modular Unit.

For products which capacity are over the capacity of certified products (Path A only), over the capacity of the lab (Path A or Path B) or for specific design the applicant shall add a technical note, based on a similar certified or tested products (using same compressor(s) unit(s) used as reference).

In this case the test report or certificate of the unit used as reference shall be attached for the registration.

6.2 Path A – Product using the AHRI certification program

The product/products submitted for registration shall present a valid AHRI certification covering the model/models registered. If a product fails AHRI certification or if its certification is removed, the product registration will be automatically canceled.

Operability at 52^0C is verified by test or based on self-declaration (in this case justification of the operability at 52^0C and a guaranty of operation of the product at the specified conditions shall be included in the declaration).

Note: If the cooling capacity of the product is out of the scope of AHRI certification program, then path B applies.

6.3 Path B – Product using test report as evidence of the declared performances

6.3.1 General

A test report, per product, from an accredited laboratory shall be presented for registration.

This test report shall include results for cooling capacity and EER at T1 and T3.

Operability at 52^0C is verified by test or based on self-declaration (in this case justification of the operability at 52^0C and a guaranty of operation of the product at the specified conditions shall be included in the declaration).

The test procedure shall correspond to the type of product and relevant testing standard as described in Clause 5.

6.3.2. Conditions for the test report and technical justification

For products with specific design or which capacities are higher than the maximum capacity available from accredited laboratory a technical justification shall be presented; conditions and content of this technical justification are expressed below.

- Test report shall correspond to the model tested
- Test for one sample is sufficient
- Technical justification for products not able to present a test report of the model registered. Content of the technical justification includes:
    - Certificate or test report of a model used as reference;
    - Justification for representability of the reference model;
    - Identification of the method used to predict EER (or NsensCOP);
    - Information about relevance and confidence for the method used;
    - Information that validates the operability at 52^oC;
    - Any information that validates the prediction of the EER/ NsensCOP.

6.3.3. Criteria for acceptability

The values presented in the test report shall be accepted as valid if they meet the following criteria for cooling, as applicable:

a) Tested effective power input ……......≤ 1.05 x rated power;
b) Tested cooling capacity ……..……. ≥ 0.95 x rated capacity;
c) Tested EER (or NsensCOP) …… ≥ MEPS;
d) Tested EER (or NsensCOP) ……. ≥ 0.95 x rated EER (or rated NsensCOP);
e) The standard for tests is defined according to the type of AC in Clause 5;
f) Tested voltage is decided according to table 2
g) Tested Frequency 60 Hz according to table 1

7. Criteria for market surveillance

7.1 Periodic verification for air-conditioners using Path A for registration

For products registered using Path A, SASO will check periodically if the AHRI certification is still valid.

In case the product registered is no more AHRI certified, the registration will be canceled.

7.2 Criteria for acceptability

The product shall be tested based on the corresponding AHRI/ANSI or ISO standards as registered through SASO system.

The values shall be accepted as valid when a single sample of an appliance or unit model tested according to relevant standard corresponding to the type of AC and presented in Clause 5 meets the following criteria for cooling, as applicable:

a) Tested effective power input ……......≤ 1.05 x rated power;
b) Tested cooling capacity ……..……. ≥ 0.95 x rated capacity;
c) Tested EER (or NsensCOP) …… ≥ MEPS;
d) Tested EER (or NsensCOP) ……. ≥ 0.95 x rated EER (or rated NsensCOP);
e) The standard for tests is defined according to the type of AC in Clause 5;
f) Tested voltage is decided according to table 2
g) Tested Frequency 60 Hz according to table 1

8. Marking and instructions

8.1 General

The following information shall be marked on the nameplate of the air-conditioner, in Arabic or English or both. The marking shall not be on a detachable part of the unit and shall be indelible, durable and easily legible.

Any information related to energy performance added on any part of the air-conditioner unit or packaging shall not have any ambiguity or lead to misunderstanding of the performance of the unit.

8.2 Information on the Nameplate

The information on the nameplate shall include as a minimum:

- Manufacturer’s name and/or trademark

- Year and month of manufacturing
- Country of origin
- Manufacturer's model or type reference and serial number of the unit
- Rated voltage or rated voltage range in volts (V)
- Rated frequency in hertz (Hz)
- For each of cooling and heating test conditions as per the relevant testing and rating standard:
  - Rated current in amperes (A)
  - Rated power input in Watt (W) or kilowatts (kW)
  - Rated cooling capacity in kW and Btu/h or kW and TONS (TR) for chillers only
  - Rated heating capacity in kW and Btu/h
  - Rated Energy Efficiency Ratio (EER) in Btu/(W.h) or Rated Net sensible coefficient of performance (NsensCOP) in W/W when relevant.
  - Refrigerant used and mass of refrigerant charge in kg

8.3 Additional nameplate voltage requirements for 60 Hz equipment

Nameplate voltages for 60 Hertz systems shall include one or more of the equipment nameplate voltage ratings shown in Clause 4.

8.4 Instruction sheet

An instruction sheet *(*basic instructions with description for storage, installation, …*)* in both Arabic and English shall be delivered with each air-conditioner. Tables, drawings and circuit diagrams may be depicted in English only except for capacities of 65,000 Btu/h (19.05 kW) or less, it shall be in both Arabic and English.

In addition, a manual in Arabic or English or both shall be delivered with each air-conditioner except for capacities of 65,000 Btu/h (19.05 kW) or less, it shall be in both Arabic and English.

In addition, a manual in Arabic or English or both shall be delivered with each air-conditioner.

The instruction sheet or manual shall include the following information as a minimum:

- The information specified in clause 8.1
- Dimensions of the unit and its method of mounting
- Minimum clearances between the various parts of the unit and the surrounding framework
- Instructions necessary for the correct operation of the unit and any special precautions to be observed to ensure its safe use and maintenance
- Instruction for packing and unpacking the unit
- Instructions on unit handling and rigging
- Weight of the unit, both the net and the gross
- Refrigeration charging instructions, including charging and discharging refrigerant

9. Registration requirements

Product registration in SASO registration system is mandatory, where information (refer to Appendix A) about registration requirements will be available in the information center of the Saudi Standards, Metrology, and Quality Organization (SASO), and reference shall be made to the separate SASO registration forms and requirements.

The registration system will cover the definition of products when different options (Chillers, VRF, ...) are covered by the certification or the test report submitted.

Applications shall be submitted through the registration system electronically via SASO website (www.saso.gov.sa). The applicant shall fulfill all updated requirements of the electronic registration system and any new requirements, procedures, and regulations required by SASO.

To justify the performance of the registered products the following documents shall be attached to the registration form (details in Appendix):

- a certificate from AHRI covering the air-conditioner submitted shall be attached, or

- a test report issued by an accredited laboratory identified in the SASO application,

- a technical justification (report) when the performances of the product presented are derived from another product with tested or certified performances

Appendix - Framework for registration of the Air Conditioners within the scope of this standard (Informative)

A draft of the registration form is provided below. The final version is the one avaialble on the SASO registration

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APPLICATION FOR REGISTRATION OR RENEWAL OF REGISTRATION OF LARGE AIR CONDITIONERS FOR ENERGY EFFICIENCY (INFORMATIVE)

I hereby apply for the registration of an air conditioner (s) for the purpose of energy efficiency.

In the country of: ……

(specify the country in which this application is made)

SECTION (1) – APPLICANT DETAILS

Name of applicant	……..
Business address	……..
P.O Box	……..
Post code	……..
Contact person	……..
Position/title	……..
Tel	(……)……
Fax	(……)……
Email	……..

SECTION (2) – DESCRIPTION OF THE PRODUCT

Name of manufacturer	…….
Brand name	…….
(System) Model(s) number(s) ➢ For VRF and multiple split indicates the model used as outdoor units and list all indoor units covered ➢ For modular units, give information for each type of unit per capacity of compressor	…… ……. …….. …….
Country of manufacturing	…….
Model year	…….
AC type	□ Electrically operated air conditioners – air cooled □ Electrically operated air conditioners – water cooled □ Electrically operated air conditioners – evaporative cooled □ Condensing units – air cooled □ Condensing units – water cooled □ Condensing units – evaporative cooled □ Chillers – air cooled □ Chillers – water cooled electrically operated, positive displacement □ Chillers – water cooled electrically operated, centrifugal □ Absorption chillers – air cooled absorption, single effect □ Absorption chillers – water cooled absorption, single effect □ Absorption chillers – absorption double effect, indirect fired □ Absorption chillers – absorption double effect, direct fired □ VRF multi split air conditioners – air cooled □ VRF multi split air conditioners – heat pumps □ VRF multi split air conditioners – water cooled □ Computer and Data Processing Room Air Conditioners

Rated (total) cooling capacity (Btu/h) at T1 (Note 1 ; Note 2)	……
Rated EER at T1 Btu/(W.h) (Note 1 ; Note 2)	……
Rated heating (total) capacity (Btu/h) if applicable (Note 1)	……
Rated voltage range (V)	……
Rated current (A)	……
Rated power input (W)	……
Refrigerant used	……
Mass of refrigerant (kg)	……
Dimensions of unit (mxmxm)	……
Weight of the unit (kg)	……

Note 1 – for modular units this information is completed for the whole and per each model designated as part of the whole products

Note 2 – for Computer and Data Processing Room Air Conditioners T1 is substituted with the temperature corresponding to the relevant Temperature Class and EER is substituted with the value of the net sensible COP corresponding to the class of temperature and type of air – conditioner as defined in Table 9

SECTION (3 A) – TESTING AND TEST REPORT – Path A

Certificate number	……..
Certificate date	……..
Model Number	……..
Verification number (bottom page)	……..
Reference temperature for MEPS in ^{o}C	Value will be displayed by the application (T1 or Temperature class from Table 9)
Reference of the calculation method (if applicable)	☐ ASHRAE 90.1:2013 Clause 6.4.1.2.1 ☐ Other ……..……
EER (or NsensCOP) at full load Btu/(W.h) or (W/W) See note 1 and 2	……..
Voltage (V)	……..
Current (A) See note 1	……..
Power input (W) See note 1	……..
EER (or NsensCOP) T3 (46^{o} C) if available See note 1 and 2	……..
Cooling capacity at T3, if available See note 1	……..
EER at full load at T3, if available in Btu/(W.h) See note 1	……..

Voltage (V) ……..

Current (A) ……..

See note 1

Power input for test at T3 (W) if available ……..
See note 1

Operability at 52° C
- ☐ Tested
- ☐ Declared
- ☐ Cooling capacity _____ Btu/h
- ☐ Power _____ kW

Note 1 – For VRF or modular units this information is completed for the whole and per each model designated as part of the whole products

SECTION (3 B) – TESTING AND TEST REPORT – PATH B

NOTE: For specific design or air conditioners which exceed the capacity of the labs section 3B is used for the model used for reference. Section 3C shall be completed

Name of laboratory ……..

Test date ……..

Tested unit brand name ……..

Tested unit model number ……..

Type of test
- ☐ Physical testing (at independent lab)
- ☐ Witness testing (at manufacturer's lab with witness from approved entity)
- ☐ Other (please specify) ……

Reference of the calculation method (if applicable)
- ☐ ASHRAE 90.1:2013 Clause 6.4.1.2.1
- ☐ Other ….....……

Testing method
- ☐ ANSI/AHRI 210/240
- ☐ ANSI/AHRI 340/360
- ☐ ANSI/AHRI 365
- ☐ ANSI/AHRI 550/590
- ☐ ANSI/AHRI 560
- ☐ ANSI/AHRI 1230
- ☐ ANSI/AHRI 1360

- ☐ ISO 5151
- ☐ ISO 13253
- ☐ ISO 13256-1
- ☐ ISO 13256-2
- ☐ ISO 15042

Reference temperature for MEPS	Automatically displayed based on T1 or Temperature classes from Table 9
Cooling capacity (Btu/h) See note 1	……..
EER at full load Btu/(W.h) See note 1 and note 2	……..
Voltage (V)	……..
Current (A) See note 1	……..
Power input (W) See note 1 and 2	……..
Tested at T3 (46^{o} C): See note 1 and 2	……..
Cooling capacity (Btu/h) See note 1	……..
EER (or NSensCOP) at full load Btu/(W.h) See note 1 and 2	……..
Voltage (V)	……..
Current (A) See note 1	……..
Power input (W) See note 1	……..
Operatibility at 52^{o} C	☐ Tested ☐ Declared ☐ Cooling capacity _____ Btu/h ☐ Power _____ kW

Note 1 – for modular units this information is completed for the whole and per each model designated as part of the whole products

Note 2 – for Computer and Data Processing Room Air Conditioners T1 is substituted with the temperature corresponding to the relevant Temperature Class and EER is substituted with the value of the net sensible COP corresponding to the class of temperature and type of air –conditioner as defined in Table 9

SECTION (3 C) – TESTING, TEST REPORT AND TECHNICAL REPORT FOR AIR CONDITIONERS WITH SPECIAL DESIGN OR WHICH RESULTS ARE DERIVED FROM A SIMILAR PRODUCT

3 C –Part 1 Identification of the model used for reference

Model Number ……..

Model number (others) if relevant ……..

Main characteristics

Compressor

Other ……..

Other ……..

3 C – Part 2 Identification of changes compared to the reference model

Identification	Submitted model	Reference Model
Compressor	Compressor	……
Other	……..	……
Other	……..	……
Other	……..	……

3 C - Part 3 Identification of the software used for predicting performances claimed in Part 2

Name and reference version of the software ……..

Developer/Ownership
- □ Public
- □ Manufacturer
- □ Other, then precise ……

Validation characteristics
- □ Used for AHRI certifcation
- □ Other, then precise ……

Quality process reference for validation updates ……..

3 C – Part 4 Justification of results

Reference of the technical documentation ……..

Type of document
- Technical requirements
- Calculation sheet
- Other, then complete ……

SECTION (4) – ADDITIONAL INFORMATION FOR PERFORMANCE BASED ON PART LOAD EER

(INFORMATIVE SECTION)

PERFORMANCE AT PART LOAD [(a)] Note: values in table 6 are not mandatory. Priority is given to identify which test method is used and value of the integrated part load performance. If available results at part load can be added.		
STANDARD FOR REFERENCE (e.g. AHRI 210/240, …)		[(b)]
Acronym used for the combined part load performance	e.g (SEER, IEER, IPLV,…)	
Value	……	[(c)]
Performance at part load 25%	External temperature(Dry- Bulb) [^{o}C]	[(c) (d)]
	(Electric) Power [kW]	[(c) (d)]
	EER 25%	[(c) (d)]
Performance at part load 50%	External temperature (Dry-Bulb) [^{o}C]	[(c) (d)]
	(Electric) Power [kW]	[(c) (d)]
	EER 50%	[(c) (d)]
Performance at part load 75%	External temperature (Dry-Bulb) [^{o}C]	[(c) (d)]
	(Electric) Power [kW]	[(c) (d)]

	EER 75%	(c) (d)
Performance at 100%	External temperature (Dry-Bulb) [^{o}C]	(c) (d)
	(Electric) Power [kW]	(c) (d)
	EER 100%	(c) (d)

(a) These data are not mandatory

(b) Testing methodology used for assessment of the seasonal performance or integrated part load performance

(c) Value with 2 decimal points

(d) If available