Cooling Seasonal Performance Factor

Nominal Efficiency vs. Seasonal Efficiency in line with real life performance

Cooling Seasonal Performance Factor

Currently, the energy efficiency of cooling devices is measured in artificial and standardized conditions. For air conditioners, this is done at a constant temperature of 46 °C or 35 °C and at full cooling capacity. This results in T1 & T3 energy efficiency (EER), which is representing only two points to conclude on Energy performance.

In other markets, like in the US and Europe, seasonal performance is measured with IPLV, SEER or ESEER calculations based on real-life conditions. However, these calculation methods have not been adopted for high Ambient or hot climates. In order to correct this situation, a more realistic calculation method called Cooling Seasonal Performance Factor for Hot Climate $CSPF_{T3}$ has been developed by the ISO Refrigeration and Air-Conditioning Subcommittee (SC6) for the testing and rating of air conditioners and heat pumps. This is the standard ISO 16358 -1 Amendment 1 issued in 2019 for the hot T3 climate zones.

The implementation of the Seasonal Efficiency calculation reflects more realistic energy efficiency value through the entire cooling season at hot climate conditions compared to currently used EER value.

The calculation follows the below considerations:

- Use of a high ambient climate weather bin for cooling instead of one nominal temperature
- Considering operation at partial capacity instead of full capacity.

The adoption of the $CSPF_{T3}$ calculation method will result in a better estimation of the equipment's real-life performance over a year.

What is $CSPF_{T3}$?

(Cooling Seasonal Performance Factor for Hot Climate $CSPF_{T3}$) is the testing and rating of air conditioners as per the ISO 16358 -1 Amendment 1 issued in 2019 for T3 hot climate zones and takes into consideration the bin hours reflecting high ambient conditions. Regulatory bodies like ESMA and SASO are seriously considering the adoption of this as a standard in the region.

How is $CSPF_{T3}$ expressed?

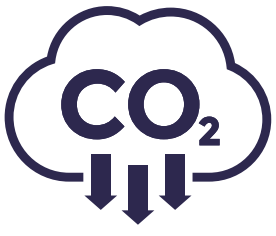
- It is expressed as the $CSPF_{T3}$ value (**Cooling Seasonal Performance Factor for Hot Climate $CSPF_{T3}$**)
- It is defined as the ratio of the total annual amount of heat that the equipment can remove from the indoor air when operating for cooling in active mode to the total annual amount of energy consumed by the equipment during the same period.

$$CSPF_{T3} = \frac{\text{Cooling Seasonal Total Load @ T3 ISO weather bin}}{\text{Cooling Seasonal Energy Consumption @ T3 ISO weather bin}}$$

Benefits of $CSPF_{T3}$

The implementation of seasonal efficiency will provide end users with a fair comparison of different equipment based on realistic year-round efficiency which will lead to:

Reduced energy consumption



Reduced CO2 emission

Reduced electricity bills

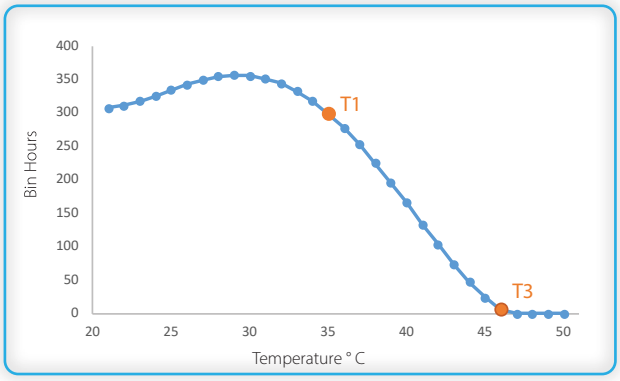
Pioneering in innovation and environmental responsibility

For Daikin, seasonal efficiency brings together two core ambitions: pushing for innovation and reducing the environmental footprint of our products. Being the first in the industry to design equipment based on optimal seasonal efficiency values, Daikin is once again pioneering high-performance cooling products that lower the impact on the environment and on your wallet.

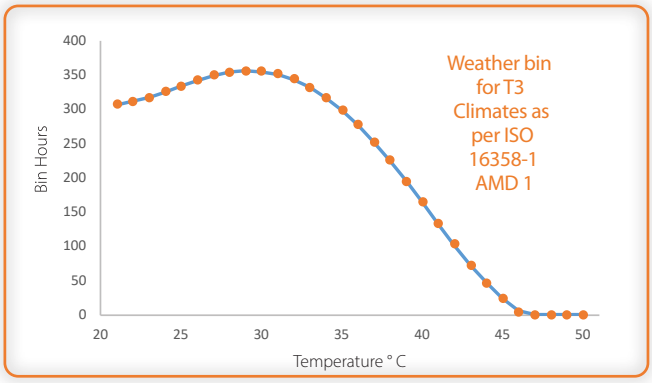
Benefits of Seasonal Efficiency vs. Nominal Efficiency

Energy Efficiency Ratio → **Cooling Seasonal Performance Factor**

TEMPERATURE



Energy Efficiency Ratio rating is based on one outdoor Ambient Temperature condition (T1 or T3)



Cooling Seasonal Performance Factor is based on the Hot Climate Weather bin as per ISO 16358-1 AMD1

EFFICIENCY

$$EER_{@T1\ or\ T3} = \frac{\text{Cooling Capacity}_{@T1\ or\ T3}}{\text{Power Input}_{@T1\ or\ T3}}$$

$$CSPF_{T3} = \frac{\text{Cooling Seasonal Total Load}_{@T3\ ISO\ Weather\ bin}}{\text{Cooling Seasonal Energy Consumption}_{@T3\ ISO\ Weather\ bin}}$$

Nominal efficiency gives an indication on how efficient an air conditioner operates at nominal conditions. 100% capacity performance is used to measure EER

$CSPF_{T3}$ gives an indication on how efficient an air conditioner operates over an entire cooling season. Variable or seasonal performance close to real life is used and not 100% capacity performance.

For example, 10 HP Daikin VRV IV+Unit (RXYTQ10U7YF) can be evaluated using below mentioned efficiencies:

T3 EER : 10.1 (Btu/h)/W
2.96 W/W

$CSPF_{T3}$: 20.9 (Btu/h)/W
6.13 W/W

When the new ISO standard for hot climate was published, Daikin has resolutely chosen for early implementation of this new legislation and started testing all products for seasonal efficiency. This commitment to pioneering the implementation of seasonal efficiency is a practice we observe every day.

Today, Daikin leads the way towards more efficient and cost-effective comfort solutions. All Daikin products - residential, commercial, as well as industrial - are seasonal-efficient, reducing energy and costs the smart way.

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