

**SS 697:2023**  
(ICS 13.020.10; 35.020)

**SINGAPORE STANDARD**

# **Deployment and operation of data centre IT equipment under tropical climate**



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### **Deployment and operation of data centre IT equipment under tropical climate**

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## Foreword

This Singapore Standard was prepared by the Working Group (WG) on Tropical Data Centres. The WG was set up by the Technical Committee on Green Information Technology under the purview of the Information Technology Standards Committee (ITSC).

This Singapore Standard (SS) is intended to help local data centre operators transition from traditional data centre operations to deploying and operating data centre information technology equipment (ITE) in settings that are optimised for energy efficiency in a tropical climate. While international standards exist for data centre operators to manage their energy use, this standard has been developed specifically for data centres located in tropical climates. Apart from devising a cooling strategy optimised for the typical temperature and relative humidity ranges found in the tropics, this SS also informs data centre operators on ways to measure and calculate the total cost of operations under these conditions, to justify their use and get buy-in from data centre customers on the benefits of tropical data centres.

In preparing this SS, reference was made to the following publications:

1. ASHRAE TC 9.9:2013 Gaseous and particulate contamination guidelines for data centers
2. ASHRAE TC 9.9:2008 ASHRAE Environmental guidelines for datacom equipment – Expanding the recommended environmental envelope
3. 2022 Best practice guidelines for the EU code of conduct on data centre energy efficiency (Version 13.1.1)
4. Tropical data centre proof-of-concept technical report

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# Deployment and operation of data centre IT equipment under tropical climate

## 0 Introduction

Data Centres (DCs) are key infrastructure in a digital economy and play an important role in enabling the digitalisation of products and services. However, DCs rely heavily on resources such as energy and water. The current industry practice for data centre operations is that cooling and relative humidity (RH) levels within the facilities are set with large safety margins. As a result, cooling and air-conditioning account for a major part of a data centre's energy consumption, apart from that which is consumed by ITE. This contributes substantially to the carbon footprint of the industry.

Based on current practices, DCs located in a tropical climate like Singapore uses more energy for cooling and RH control compared to DCs located in temperate zones. To help reduce the carbon footprint, this standard describes measures to help DCs develop a total cost of ownership (TCO)-based model for their operations. A DC that uses such a model is able to structure different service offerings competitively while running their operations at increased temperatures and RH levels. The adjusted environmental operating envelopes devised through using a TCO-based model are optimised for tropical climates and reduces energy use without compromising the reliability and performance of the ITE hosted within such facilities.

## 1 Scope

The objective of this Singapore Standard (SS) is to provide a set of recommendations for DCs located within tropical climate zones such as Singapore, where the average temperature hovers around 30 °C, with a typical range of 24 °C to 31 °C, but can be as high as 37 °C; the average RH level is about 84 %, typically ranging from 60 % to above 90 %. Based on analysis of empirical data collected from production servers monitored by the Tropical Data Centre (TDC) research team, an environmental operating envelope optimised for energy efficiency is derived, and the method for application, measurement and monitoring is described.

This SS provides recommendations that cover the following:

- Set-up and operation of ACMV systems within a DC;
- How to perform TCO analysis in order for DC operators to establish an optimal environmental operating envelope for their facility;
- Best practices for selection and deployment of IT equipment for TDCs; and
- Best practices for TDC site infrastructure.

It does not cover:

- alternative cooling methods; and
- recommendations for DCs located outside tropical zones.

## 2 Normative references

There are no normative references in this standard.