

SS 591:2021
(ICS 27.200)

SINGAPORE STANDARD

**Code of practice for long term measurement of
central chilled water system energy efficiency**



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Foreword

This Singapore Standard was prepared by the Working Group on Long Term Measurement of Central Chilled Water System Energy Efficiency set up by the Technical Committee on Building Maintenance and Management under the purview of BCSC.

The standard is a revision of SS 591 : 2013 Code of practice for long term measurement of central chilled water system energy efficiency. The purpose of this standard is to enable an organisation to design and implement a measurement and verification system for the long term, continuous and accurate tracking of central chilled water system energy efficiency.

Central chilled water systems account for the lion's share of the energy consumption of most large buildings in the tropics. They are also the major energy consumers in industrial facilities.

When new systems are considered or when systems are retrofitted, the data from long term and continuous monitoring are vital for the correct sizing of plant components in order to optimise floor space, electrical and structural infrastructure as well as to reduce capital and operating costs. Measurement and verification (M&V) can also be used as an accountability tool to gauge the performance of the supplied equipment post installation. In addition, installation of a permanent M&V system can help to facilitate the reporting of the performance of the central chilled water system to relevant authorities.

The objectives of long term, continuous and accurate tracking of energy efficiency, important process parameters and relevant performance data of central chilled water system are to:

- a) generate useful and accurate chiller performance data for the proper operation, maintenance, sizing, and control of the system to improve energy efficiency, and to reduce greenhouse gas emissions and water consumption;
- b) allow buyers to specify energy efficiency requirements that are met and guaranteed by suppliers, Energy Services Companies (ESCOs), contractors, and designers of equipment and system;
- c) improve system reliability by enabling more effective maintenance and operations;
- d) reduce noise and vibrations from improper operation of chillers and other plant equipment;
- e) reduce chemicals and other materials usage; and
- f) extend the useful life of the plant and equipment.

The standard also subscribes to the general principles of international energy management system standards, such as ISO 50001 and its related guidance standards.

Permission has been sought from the International Organization for Standardization to reproduce materials from ISO/IEC 17025:2017, "General requirements for the competence of testing and calibration laboratories" (refer to the footnote in the standard). ISO standards can be purchased from Enterprise Singapore.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

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1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as “mature standards”. Mature standards will not be subject to further review unless there are requests to review such standards.*
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Code of practice for long term measurement of central chilled water system energy efficiency

1 Scope

This code specifies the requirements for sensors and instruments in capturing relevant process parameters, their installation, commissioning, operational monitoring and maintenance in order to perform continuous, long-term measurement of central chilled water system energy efficiency.

This code also:

- a) specifies the appropriate uncertainty levels for continuous measurements of central chilled water system energy efficiency;
- b) specifies the parameters and performance indicators for continuous measurements;
- c) specifies installation details for easy comparison of sensor calibration and as-installed performance; and
- d) recommends the development of useful presentation formats for the data collected, to be used widely and on various platforms, including web-based platforms.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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| ASHRAE Guideline 14-2014 | Measurement of energy, demand, and water savings |
| ASHRAE Guideline 22-2012 | Instrumentation for monitoring central chilled-water plant efficiency |
| IEC 61869-2:2012 | Instrument transformers – Part 2: Additional requirements for current transformers |
| IEC 61869-3:2011 | Instrument transformers – Part 3: Additional requirements for inductive voltage transformers |
| IEC 61869-5:2011 | Instrument transformers – Part 5: Additional requirements for capacitor voltage transformers |
| IEC 62053-22:2003 | Electricity metering equipment (a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S) |
| IEEE 519-2014 | IEEE Recommended practices and requirements for harmonic control in electrical power systems |
| ISO 4185:1980 | Measurement of liquid flow in closed conduits – Weighing method |
| ISO 8316:1987 | Measurement of liquid flow in closed conduits – Method by collection of the liquid in a volumetric tank |
| ISO/IEC 17025:2017 | General requirements for the competence of testing and calibration laboratories |