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BSI Standards Publication

## Programming languages — C++

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## National foreword

This British Standard is the UK implementation of ISO/IEC 14882:2020. It supersedes BS ISO/IEC 14882:2017, which is withdrawn.

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# Programming languages — C++

*Langages de programmation — C++*



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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

This sixth edition cancels and replaces the fifth edition (ISO/IEC 14882:2017), which has been technically revised.

The main changes compared to the previous edition are as follows:

- inclusion of the provisions of ISO/IEC TS 19217:2015, ISO/IEC TS 21425:2017, ISO/IEC TS 22277:2017, ISO/IEC TS 21544:2018, portions of ISO/IEC TS 19571:2016, and portions of ISO/IEC TS 19568:2017.
- addition of concepts, *requires-clauses*, *requires-expressions*, and `<concepts>` (18.3) header
- addition of coroutines, including `co_yield`, `co_await`, and `co_return` keywords and `<coroutine>` (17.12.2) header
- addition of modules, *import-declarations*, and *export-declarations*
- addition of three-way comparison, defaulted comparisons, rewriting of comparison operator expressions, and `<compare>` (17.11.1) header
- addition of designated initializers
- support for class types and floating-point types as the type of a non-type template parameter
- new attributes `[[no_unique_address]]`, `[[likely]]`, `[[unlikely]]`
- support for optional reason string in `[[nodiscard]]` attribute
- ability to require constant initialization with `constexpr` keyword
- ability to require constant evaluation with `constexpr` keyword
- extensions to constant evaluation
- support for controlling destruction in a class-specific operator delete function
- addition of `using enum` declaration
- addition of `char8_t` type
- support for an initializer statement in range-based for loops

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- support for parenthesized aggregate initialization
- extensions to lambda expressions
- extensions to structured bindings
- support for inline namespaces in nested namespace definitions
- support for conditionally-explicit member functions
- extensions to class template argument deduction
- reduced cases in which `typename` is required
- support for calling an undeclared *template-id* via argument-dependent name lookup
- revised memory model
- extended support for variadic macros with `__VA_OPT__`
- feature test macros and `<version>` (17.3.2) header
- addition of ranges and `<ranges>` (24.2) header
- addition of calendar and time zone support
- addition of text formatting library and `<format>` (20.20.1) header
- addition of `<barrier>` (32.8.3.2), `<latch>` (32.8.2.2), and `<semaphore>` (32.7.2) headers
- addition of mathematical constants library and `<numbers>` (26.9.1) header
- support for representing source locations and `<source_location>` (17.8.1) header
- addition of `span` view and `<span>` (22.7.2) header
- addition of joining thread class and `<stop_token>` (32.3.2) header
- extensions to atomic types and operations
- addition of `unsequenced` execution policy
- new utility functions, types, and templates in the standard library
- addition of bit manipulation library and `<bit>` (26.5.2) header
- addition of a synchronized buffered output stream and `<syncstream>` (29.10.1) header
- support for heterogeneous lookup for unordered containers
- support for element existence detection in associative containers
- support for move semantics in `<numeric>` (25.9) algorithms
- support for efficient access to the buffer of a `basic_stringbuf`
- extended constant expression evaluation support in the standard library

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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# 1 Scope

[intro.scope]

- <sup>1</sup> This document specifies requirements for implementations of the C++ programming language. The first such requirement is that they implement the language, so this document also defines C++. Other requirements and relaxations of the first requirement appear at various places within this document.
- <sup>2</sup> C++ is a general purpose programming language based on the C programming language as described in ISO/IEC 9899:2018 *Programming languages — C* (hereinafter referred to as the *C standard*). C++ provides many facilities beyond those provided by C, including additional data types, classes, templates, exceptions, namespaces, operator overloading, function name overloading, references, free store management operators, and additional library facilities.