

MISRA C 2023

The Motor Industry Software Reliability Association (MISRA) guidelines for C published in 2023

MISRA Mission Statement:

We provide world-leading, best practice guidelines for the safe and secure application of both embedded control systems and standalone software.

MISRA is a collaboration between manufacturers, component suppliers and engineering consultancies which seeks to promote best practice in developing safety and security-related electronic systems and other software-intensive applications. To this end, MISRA publishes documents that provide accessible information for engineers and management, and holds events to permit the exchange of experiences between practitioners

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	All Rules Advisory Directive Mandatory Required				
Understand % Coverage	95%	91%	100%	100%	96%
Understand Coverage	207	43	1	21	142
Total Rules	217	47	1	21	148

Checks

Check ID	Check Name	Supported	Category
MISRA23_1.1	1.1 The program shall contain no violations of the standard C syntax and constraints, and shall not exceed the implementation's translation limits	Yes	Required
MISRA23_1.2	1.2 Language extensions should not be used (Partial)	Yes	Advisory
MISRA23_1.3	1.3 There shall be no occurrence of undefined or critical unspecified behaviour	Yes	Required
MISRA23_1.4	1.4 Bounds-checking Interfaces	Yes	Required
MISRA23_1.5	1.5 Storage Class Specifiers Not At Beginning	Yes	Required
MISRA23_2.1	2.1 A project shall not contain unreachable code	Yes	Required
MISRA23_2.2	2.2 A project shall not contain dead code (Partial)	Yes	Required
MISRA23_2.3	2.3 A project should not contain unused	Yes	Advisory

Check ID	Check Name	Supported Category	
	type declarations		
MISRA23_2.4	2.4 Unused Tag Declarations	Yes	Advisory
MISRA23_2.5	2.5 Unused Macros	Yes	Advisory
MISRA23_2.6	2.6 A function should not contain unused label declarations	Yes	Required
MISRA23_2.7	2.7 A function should not contain unused parameters	Yes	Advisory
MISRA23_2.8	2.8 Unused Objects	Yes	Advisory
MISRA23_3.1	3.1 The character sequences /* and // shall not be used within a comment	Yes	Required
MISRA23_3.2	3.2 Line-Splicing in // Comments	Yes	Required
MISRA23_4.1	4.1 Octal and Hexadecimal Sequences	Yes	Required
MISRA23_4.2	4.2 Trigraphs should not be used	Yes	Advisory
MISRA23_5.1	5.1 External identifiers shall be distinct	Yes	Required
MISRA23_5.2	5.2 Identifiers declared in the same scope and name space shall be distinct	Yes	Required
MISRA23_5.3	5.3 An identifier declared in an inner scope shall not hide an identifier declared in an outer scope	Yes	Required
MISRA23_5.4	5.4 Indistinct Macro Identifiers	Yes	Required
MISRA23_5.5	5.5 Same Identifier and Macro Name	Yes	Required
MISRA23_5.6	5.6 A typedef name shall be a unique identifier	Yes	Required
MISRA23_5.7	5.7 A tag name shall be a unique identifier	Yes	Required
MISRA23_5.8	5.8 Identifiers that define objects or functions with external linkage shall be unique	Yes	Required
MISRA23_5.9	5.9 Identifiers that define objects or functions with internal linkage should be unique	Yes	Advisory
MISRA23_6.1	6.1 Bit-fields shall only be declared with an appropriate type	Yes	Required
MISRA23_6.2	6.2 Signed single-bit named bit-fields	Yes	Required
MISRA23_6.3	6.3 A bit field shall not be declared as a member of a union	Yes	Required
MISRA23_7.1	7.1 Octal constants shall not be used	Yes	Required
MISRA23_7.2	7.2 Unsigned Integer Literal Without Suffix	Yes	Required
MISRA23_7.3	7.3 Lowercase L Suffix	Yes	Required
MISRA23_7.4	7.4 A string literal shall not be assigned	Yes	Required

Check ID	Check Name	Supported Category	
	to an object unless the object's type is "pointer to const-qualified char"		
MISRA23_7.5	7.5 The argument of an integer constant macro shall have an appropriate form	Yes	Mandatory
MISRA23_7.6	7.6 Small Integer Constant Macros	Yes	Required
MISRA23_8.1	8.1 Types shall be explicitly specified	Yes	Required
MISRA23_8.2	8.2 Use Named Parameters and Prototype Form	Yes	Required
MISRA23_8.3	8.3 All declarations of an object or function shall use the same names and type qualifiers	Yes	Required
MISRA23_8.4	8.4 A compatible declaration shall be visible when an object or function with external linkage is defined	Yes	Required
MISRA23_8.5	8.5 An external object or function shall be declared once in one and only one file	Yes	Required
MISRA23_8.6	8.6 An identifier with external linkage shall have exactly one external definition	Yes	Required
MISRA23_8.7	8.7 Functions and objects should not be defined with external linkage if they are referenced in only one translation unit	Yes	Advisory
MISRA23_8.8	8.8 The static storage class specifier shall be used in all declarations of objects and functions that have internal linkage	Yes	Required
MISRA23_8.9	8.9 An object should be declared at block scope if its identifier only appears in a single function	Yes	Advisory
MISRA23_8.10	8.10 Non-static Inline Functions	Yes	Required
MISRA23_8.11	8.11 When an array with external linkage is declared, its size should be explicitly specified	Yes	Advisory
MISRA23_8.12	8.12 Within an enumerator list, the value of an implicitly-specified enumeration constant shall be unique	Yes	Required
MISRA23_8.13	8.13 A pointer should point to a const-qualified type whenever possible	Yes	Advisory
MISRA23_8.14	8.14 Restrict Qualifier	Yes	Required
MISRA23_8.15	8.15 All declarations of an object with an explicit alignment specification shall specify the same alignment	Yes	Required
MISRA23_8.16	8.16 The alignment specification of zero	Yes	Advisory

Check ID	Check Name	Supported Category	
	should not appear in an object declaration		
MISRA23_8.17	8.17 At most one explicit alignment specifier should appear in an object declaration	Yes	Advisory
MISRA23_9.1	9.1 The value of an object with automatic storage duration shall not be read before it has been set	Yes	Mandatory
MISRA23_9.2	9.2 The initializer for an aggregate or union shall be enclosed in braces	Yes	Required
MISRA23_9.3	9.3 Arrays shall not be partially initialized	Yes	Required
MISRA23_9.4	9.4 An element of an object shall not be initialized more than once	Yes	Required
MISRA23_9.5	9.5 Where designated initializers are used to initialize an array object the size of the array shall be specified explicitly	Yes	Required
MISRA23_9.6	9.6 An initializer using chained designators shall not contain initializers without designators	Yes	Required
MISRA23_9.7	9.7 Atomic objects shall be appropriately initialized before being accessed	Yes	Mandatory
MISRA23_10.1	10.1 Operands shall not be of an inappropriate essential type	Yes	Required
MISRA23_10.2	10.2 Expressions of essentially character type shall not be used inappropriately in addition and subtraction operations	Yes	Required
MISRA23_10.3	10.3 The value of an expression shall not be assigned to an object with a narrower essential type or of a different essential type category	Yes	Required
MISRA23_10.4	10.4 Both operands of an operator in which the usual arithmetic conversions are performed shall have the same essential type category	Yes	Required
MISRA23_10.5	10.5 The value of an expression should not be cast to an inappropriate essential type	Yes	Advisory
MISRA23_10.6	10.6 The value of a composite expression shall not be assigned to an object with wider essential type	Yes	Required
MISRA23_10.7	10.7 Implicit Casts of Operations	Yes	Required

Check ID	Check Name	Supported	Category
MISRA23_10.8	10.8 The value of a composite expression shall not be cast to a different essential type category or a wider essential type	Yes	Required
MISRA23_11.1	11.1 Conversions shall not be performed between a pointer to a function and any other type	Yes	Required
MISRA23_11.2	11.2 Conversions shall not be performed between a pointer to an incomplete type and any other type	Yes	Required
MISRA23_11.3	11.3 A conversion shall not be performed between a pointer to object type and a pointer to a different object type	Yes	Required
MISRA23_11.4	11.4 A conversion should not be performed between a pointer to object and an integer type	Yes	Advisory
MISRA23_11.5	11.5 A conversion should not be performed from pointer to void into pointer to object	Yes	Advisory
MISRA23_11.6	11.6 A cast shall not be performed between pointer to void and an arithmetic type	Yes	Required
MISRA23_11.7	11.7 A cast shall not be performed between pointer to object and a non-integer arithmetic type	Yes	Required
MISRA23_11.8	11.8 A conversion shall not remove any const, volatile or _Atomic qualification from the type pointed to by a pointer	Yes	Required
MISRA23_11.9	11.9 The macro NULL shall be the only permitted form of integer null pointer constant	Yes	Required
MISRA23_11.10	11.10 The _Atomic qualifier shall not be applied to the incomplete type void	Yes	Required
MISRA23_12.1	12.1 The precedence of operators within expressions should be made explicit	No	Advisory
MISRA23_12.2	12.2 The right hand operand of a shift operator shall lie in the range zero to one less than the width in bits of the essential type of the left hand operand	Yes	Required
MISRA23_12.3	12.3 The comma operator shall not be used.	Yes	Advisory
MISRA23_12.4	12.4 Evaluation of constant expressions	No	Advisory

Check ID	Check Name	Supported Category	
	should not lead to unsigned integer wrap-around		
MISRA23_12.5	17.4 Size of Array Parameter	Yes	Mandatory
MISRA23_12.6	12.6 Structure and union members of atomic objects shall not be directly accessed	Yes	Required
MISRA23_13.1	13.1 Initializer lists shall not contain persistent side effects	Yes	Required
MISRA23_13.2	13.2 The value of an expression and its persistent side effects shall be the same under all permitted evaluation orders	Yes	Required
MISRA23_13.3	13.3 A full expression containing an increment (++) or decrement (--) operator should have no other potential side effects other than that caused by the increment or decrement operator	Yes	Advisory
MISRA23_13.4	13.4 The result of an assignment operator should not be used	Yes	Advisory
MISRA23_13.5	13.5 The right hand operand of a logical && or operator shall not contain persistent side effects	Yes	Required
MISRA23_13.6	13.6 The operand of the sizeof operator shall not contain any expression which has potential side effects	Yes	Mandatory
MISRA23_13.13	13.13 Character Function Misuse	Yes	Mandatory
MISRA23_14.1	14.1 A loop counter shall not have essentially floating type	Yes	Required
MISRA23_14.2	14.2 A for loop shall be well-formed	Yes	Required
MISRA23_14.3	14.3 Controlling expressions shall not be invariant	Yes	Required
MISRA23_14.4	14.4 The controlling expression of an if statement and the controlling expression of an iteration-statement shall have essentially Boolean type	Yes	Required
MISRA23_15.1	15.1 The goto statement should not be used	Yes	Advisory
MISRA23_15.2	15.2 The goto statement shall jump to a label declared later in the same function	Yes	Required
MISRA23_15.3	15.3 Goto Into or Between Blocks	Yes	Required
MISRA23_15.4	15.4 There should be no more than one break or goto statement used to terminate any iteration statement	Yes	Advisory

Check ID	Check Name	Supported	Category
MISRA23_15.5	15.5 A function should have a single point of exit at the end	Yes	Advisory
MISRA23_15.6	15.6 The body of an iteration-statement or a selection-statement shall be a compound-statement	Yes	Required
MISRA23_15.7	15.7 All if ... else if constructs shall be terminated with an else statement	Yes	Required
MISRA23_16.1	16.1 All switch statements shall be well-formed	Yes	Required
MISRA23_16.2	16.2 A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement	Yes	Required
MISRA23_16.3	16.3 An unconditional break statement shall terminate every switch-clause	Yes	Required
MISRA23_16.4	16.4 Every switch statement shall have a default label	Yes	Required
MISRA23_16.5	16.5 A default label shall appear as either the first or the last switch label of a switch statement	Yes	Required
MISRA23_16.6	16.6 Every switch statement shall have at least two switch-clauses	Yes	Required
MISRA23_16.7	16.7 Switch Boolean	Yes	Required
MISRA23_17.1	17.1 The standard header file <stdarg.h> shall not be used	Yes	Required
MISRA23_17.2	17.2 Functions shall not call themselves, either directly or indirectly	Yes	Required
MISRA23_17.3	17.3 A function shall not be declared implicitly	Yes	Mandatory
MISRA23_17.4	17.4 All exit paths from a function with non-void return type shall have an explicit return statement with an expression	Yes	Required
MISRA23_17.5	17.5 The function argument corresponding to a parameter declared to have an array type shall have an appropriate number of elements	Yes	Required
MISRA23_17.6	17.6 Static Keyword in Array Brackets	Yes	Mandatory
MISRA23_17.7	17.7 The value returned by a function having non-void return type shall be used	Yes	Required
MISRA23_17.8	17.8 A function parameter should not be	Yes	Advisory

Check ID	Check Name	Supported Category	
	modified		
MISRA23_17.9	17.9 Invalid _Noreturn	Yes	Mandatory
MISRA23_17.10	17.10 A function declared with a _Noreturn function specifier shall have void return type	Yes	Required
MISRA23_17.11	17.11 A function that never returns should be declared with a _Noreturn function specifier	Yes	Advisory
MISRA23_17.12	17.12 A function identifier should only be used with either a preceding &, or with a parenthesized parameter list	Yes	Required
MISRA23_17.13	17.13 A function type shall not be type qualified	Yes	Required
MISRA23_18.1	18.1 A pointer resulting from arithmetic on a pointer operand shall address an element of the same array as that pointer operand	Yes	Required
MISRA23_18.2	18.2 Subtraction between pointers shall only be applied to pointers that address elements of the same array	Yes	Required
MISRA23_18.3	18.3 The relational operators >, >=, < and <= shall not be applied to objects of pointer type except where they point into the same object	Yes	Required
MISRA23_18.4	18.4 The +, -, += and -= operators should not be applied to an expression of pointer type	Yes	Advisory
MISRA23_18.5	18.5 Declarations should contain no more than two levels of pointer nesting	Yes	Advisory
MISRA23_18.6	18.6 The address of an object with automatic or thread-local storage shall not be copied to another object that persists after the first object has ceased to exist	Yes	Required
MISRA23_18.7	18.7 Flexible Array Members	Yes	Required
MISRA23_18.8	18.8 Variable-length arrays shall not be used	Yes	Required
MISRA23_18.9	18.9 An object with temporary lifetime shall not undergo array-to-pointer conversion	Yes	Required
MISRA23_18.10	18.10 Pointer to Variable-length Array	Yes	Mandatory
MISRA23_19.0.3	19.0.3 #include directives should only be	Yes	Advisory

Check ID	Check Name	Supported Category	
	preceded by preprocessor directives or comments		
MISRA23_19.1	19.1 An object shall not be assigned or copied to an overlapping object (Partial)	Yes	Mandatory
MISRA23_19.2	19.2 Unions	Yes	Advisory
MISRA23_20.1	20.1 #include directives should only be preceded by preprocessor directives or comments	Yes	Advisory
MISRA23_20.2	20.2 Invalid Header Name	Yes	Required
MISRA23_20.3	20.3 The #include directive shall be followed by either a <filename> or "filename" sequence	Yes	Required
MISRA23_20.4	20.4 Keyword Macros	Yes	Required
MISRA23_20.5	20.5 Preprocessor #undef	Yes	Advisory
MISRA23_20.6	20.6 Tokens that look like a preprocessing directive shall not occur within a macro argument	Yes	Required
MISRA23_20.7	20.7 Expressions resulting from the expansion of macro parameters shall be enclosed in parentheses	Yes	Required
MISRA23_20.8	20.8 The controlling expression of a #if or #elif preprocessing directive shall evaluate to 0 or 1	Yes	Required
MISRA23_20.9	20.9 All identifiers used in the controlling expression of #if or #elif preprocessing directives shall be #define'd before evaluation	Yes	Required
MISRA23_20.10	20.10 The # and ## operators should not be used	Yes	Advisory
MISRA23_20.11	20.11 A macro parameter immediately following a # operator shall not immediately be followed by a ## operator	Yes	Required
MISRA23_20.12	20.12 A macro parameter used as an operand to the # or ## operators, which is itself subject to further macro replacement, shall only be used as an operand to these operators	Yes	Required
MISRA23_20.13	20.13 A line whose first token is # shall be a valid preprocessing directive	Yes	Required
MISRA23_20.14	20.14 All #else, #elif and #endif preprocessor directives shall reside in	Yes	Required

Check ID	Check Name	Supported Category	
	the same file as the #if, #ifdef or #ifndef directive to which they are related		
MISRA23_21.1	21.1 #define and #undef shall not be used on a reserved identifier or reserved macro name	Yes	Required
MISRA23_21.2	21.2 Reserved Identifiers or Macros	Yes	Required
MISRA23_21.3	21.3 The memory allocation and deallocation functions of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.4	21.4 The standard header file <setjmp.h> shall not be used	Yes	Required
MISRA23_21.5	21.5 Standard Header signal.h	Yes	Required
MISRA23_21.6	21.6 C Standard Library I/O Functions	Yes	Required
MISRA23_21.7	21.7 The Standard Library functions atof, atoi, atol and atoll of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.8	21.8 The Standard Library termination functions of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.9	21.9 The library functions bsearch and qsort of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.10	21.10 The Standard Library time and date functions shall not be used	Yes	Required
MISRA23_21.11	21.11 The standard header file <tgmath.h> shall not be used	Yes	Advisory
MISRA23_21.12	21.12 The standard header file <fenv.h> shall not be used	Yes	Required
MISRA23_21.13	21.13 Any value passed to a function in <ctype.h> shall be representable as an unsigned char or be the value EOF	Yes	Mandatory
MISRA23_21.14	21.14 The Standard Library function memcmp shall not be used to compare null terminated strings	Yes	Required
MISRA23_21.15	21.15 Incompatible Pointers	Yes	Required
MISRA23_21.17	21.17 Use of the string handling functions from <string.h> shall not result in accesses beyond the bounds of the objects referenced by their pointer parameters	Yes	Mandatory
MISRA23_21.19	21.19 The pointers returned by the Standard Library functions localeconv, getenv, setlocale or, strerror shall only be used as if they have pointer to const-	Yes	Mandatory

Check ID	Check Name	Supported Category	
	qualified type		
MISRA23_21.20	21.20 The pointer returned by the C++ Standard Library functions asctime, ctime, gmtime, localtime, localeconv, getenv, setlocale or strerror must not be used following a subsequent call to the same function	Yes	Mandatory
MISRA23_21.21	21.21 The Standard Library function system of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.22	21.22 All operand arguments to any type-generic macros declared in <tgmath.h> shall have an appropriate essential type	Yes	Mandatory
MISRA23_21.23	21.23 All operand arguments to any multi-argument type-generic macros declared in <tgmath.h> shall have the same standard type	Yes	Required
MISRA23_21.24	21.24 The random number generator functions of <stdlib.h> shall not be used	Yes	Required
MISRA23_21.25	21.25 Atomic Operations with Inconsistent Order	Yes	Required
MISRA23_21.26	21.26 The Standard Library function mtx_timedlock() shall only be invoked on mutex objects of appropriate mutex type	Yes	Required
MISRA23_22.1	22.1 All resources obtained dynamically by means of Standard Library functions shall be explicitly released	Yes	Required
MISRA23_22.2	22.2 A block of memory shall only be freed if it was allocated by means of a Standard Library function	Yes	Mandatory
MISRA23_22.3	22.3 The same file shall not be open for read and write access at the same time on different streams	Yes	Required
MISRA23_22.4	22.4 There shall be no attempt to write to a stream which has been opened as read-only	Yes	Mandatory
MISRA23_22.5	22.5 Dereference of FILE Pointer	Yes	Mandatory
MISRA23_22.6	22.6 Use of Closed FILE Pointers (Partial)	Yes	Mandatory
MISRA23_22.7	22.7 EOF Macro Misuse	Yes	Required
MISRA23_22.8	22.8 The value of errno shall be set to zero prior to a call to an errno-setting-	Yes	Required

Check ID	Check Name	Supported Category	
	function		
MISRA23_22.9	22.9 The value of errno shall be tested against zero after calling an errno-setting-function	Yes	Required
MISRA23_22.10	22.10 The value of errno shall only be tested when the last function to be called was an errno-setting-function	Yes	Required
MISRA23_22.11	22.11 A thread that was previously either joined or detached shall not be subsequently joined nor detached	Yes	Required
MISRA23_22.12	22.12 Thread Data Misuse	Yes	Mandatory
MISRA23_22.13	22.13 Thread objects, thread synchronization objects and thread-specific storage pointers shall have appropriate storage duration	Yes	Required
MISRA23_22.15	22.15 Thread synchronization objects and thread-specific storage pointers shall not be destroyed until after all threads accessing them have terminated	Yes	Required
MISRA23_22.16	22.16 All mutex objects locked by a thread shall be explicitly unlocked by the same thread	Yes	Required
MISRA23_22.17	22.17 No thread shall unlock a mutex or call cnd_wait() or cnd_timedwait() for a mutex it has not locked before	Yes	Required
MISRA23_22.18	22.18 Non-recursive mutexes shall not be recursively locked	Yes	Required
MISRA23_22.19	22.19 Mutexes with One Condition Variable	Yes	Required
MISRA23_23.1	23.1 Generic Outside of Macro	Yes	Advisory
MISRA23_23.3	23.3 Unconditional Generic	Yes	Advisory
MISRA23_23.4	23.4 A generic association shall list an appropriate type	No	Required
MISRA23_23.5	23.4 A generic selection should not depend on implicit pointer type conversion	No	Advisory
MISRA23_23.6	23.4 The controlling expression of a generic selection shall have an essential type that matches its standard type	No	Advisory
MISRA23_23.7	23.7 Generic Expression Not Always Evaluated Once	Yes	Advisory
MISRA23_23.8	23.8 Generic Default Not First or Last	Yes	Required

Check ID	Check Name	Supported	Category
MISRA23_DIR_1.1	Directive 1.1 Any implementation-defined behaviour on which the output of the program depends shall be documented and understood	No	Required
MISRA23_DIR_2.1	Directive 2.1 All source files shall compile without any compilation errors	Yes	Required
MISRA23_DIR_3.1	Directive 3.1 All code shall be traceable to documented requirements	No	Required
MISRA23_DIR_4.1	Directive 4.1 Run-time failures shall be minimized	No	Required
MISRA23_DIR_4.2	Directive 4.2 All usage of assembly language should be documented	Yes	Advisory
MISRA23_DIR_4.3	Directive 4.3 Assembly language shall be encapsulated and isolated.	Yes	Required
MISRA23_DIR_4.4	Directive 4.4 Sections of code should not be "commented out"	Yes	Advisory
MISRA23_DIR_4.5	Directive 4.5 Identifiers in the same name space with overlapping visibility should be typographically unambiguous	Yes	Advisory
MISRA23_DIR_4.6	Directive 4.6 Typedefs that indicate size and signedness should be used in place of the basic numerical types	Yes	Advisory
MISRA23_DIR_4.7	Directive 4.7 If a function returns error information, then that error information shall be tested	Yes	Required
MISRA23_DIR_4.8	Directive 4.8 If a pointer to a structure or union is never dereferenced within a translation unit, then the implementation of the object should be hidden	Yes	Advisory
MISRA23_DIR_4.9	Directive 4.9 A function should be used in preference to a function-like macro where they are interchangeable	Yes	Advisory
MISRA23_DIR_4.10	Directive 4.10 Precautions shall be taken in order to prevent the contents of a header file being included more than once	Yes	Required
MISRA23_DIR_4.11	Directive 4.11 The validity of values passed to library functions shall be checked	Yes	Required
MISRA23_DIR_4.12	Directive 4.12 Dynamic Memory Allocation	Yes	Required
MISRA23_DIR_4.13	Directive 4.13 Functions which are	Yes	Advisory

Check ID	Check Name	Supported Category	
	designed to provide operations on a resource should be called in an appropriate sequence (Partial)		
MISRA23_DIR_4.14	Directive 4.14 The validity of values received from external sources shall be checked	Yes	Directive
MISRA23_DIR_5.1	Directive 5.1 There shall be no data races between threads	No	Required
MISRA23_DIR_5.2	Directive 5.2 There shall be no deadlocks between threads	No	Required
MISRA23_DIR_5.3	Directive 5.3 There shall be no dynamic thread creation	Yes	Required