Static Analysis

QAMISRA

Accelerate C/C++ Coding Standards Compliance & Code Quality Insights

QA SYSTEMS
The Software Quality Company

Driving embedded software quality

QAMISRA

Automated coding standards compliance

All the standards for C and C++ in one tool

With QA-MISRA there are no hidden extras, coding language variants, or compliance module add-ons. It provides a single solution to automatically check your C or C++ source code for compliance against the most common international software safety and security standards below.

- **MISRA C 2012**
  C coding Guidelines
  including Amendments 1 & 2
- **MISRA C++ 2008**
  C++ Coding Guidelines
- **AUTOSAR C++14**
  C++ for Adaptive Autosar
- **HIS Metrics**
  Hersteller Initiative Software
- **JSF AV C++**
  C++ coding standard for JSF
  F-35 aircraft program
- **CERT C/C++ 2016**
  C/C++ Coding Guidelines
- **CWE 4.7**
  Common Weakness Enumeration
- **ISO TS 17961:2013**
  C Secure Coding Rules

QA-MISRA statically analyses all the C and C++ source code language versions below.

- ISO/IEC9899:1990 (C90)
- ISO/IEC9899:1999 (C99)
- ISO/IEC9899:2011 (C11)
- ISO/IEC9899:2018 (C18)
- ISO/IEC 14882:2003 (C++03)
- ISO/IEC 14882:2011 (C++11)
- ISO/IEC 14882:2014 (C++14)
- ISO/IEC 14882:2017 (C++17)

Comprehensive rule compliance

The development of QA-MISRA took place in close cooperation with experts in the MISRA committee. Full compliance matrices for each coding guidelines standard classify the degree of support provided by QA-MISRA for each individual rule.

A comprehensive knowledge base is available in QA-MISRA with extensive sample code sets, helping developers comply with these standards and automated reports provide clear and definitive compliance status of analysed code.

Key Benefits

- Fast C/C++ coding standards compliance analysis
- Multiple coding standards
- Reduces effort wasted on assessing false positives
- Code quality insight metrics & visualizations
- Flexible permanent user licensing
- Certified for safety standards
- Improves code complexity, maintainability, portability
- Contextual rule explanations
- Configurable compliance rulesets & reports
- Full traceability of issues
- Robust finding classification
- Interactive result exploration
- Tracking and visualization of project progress and analysis revisions
- Full batch mode execution
- 3rd party integrations

Why Targeted Static Analysis?

Cut the cost of coding standards compliance

All safety- critical software development standards highly recommend or mandate the use of static analysis tools to ensure compliance with safe and secure coding best practice. International functional safety coding standards such as MISRA and AUTOSAR, and security standards such as CERT and CWE, have become the de-facto coding standards. QA-MISRA automates the static analysis of C and C++ source code targeted for complying with all these coding standards in a single tool.

Certification of static analysis tools can be a heavy compliance cost burden. QA-MISRA has been independently certified by SGS-TÜV SAAR GmbH and provides a Tool Certification Kit with everything needed out-of-the-box, available free of charge. A Qualification Support Kit is also available.

TÜV certified

- ISO 26262:2018
- EN 50128:2011/A2:2020
- EN 50657:2017
- IEC 62304:2006
- IEC 61508:2010
- IEC 60880:2006

Qualifiable for:

- DO-178C / DO-330
- Other standards as required

Detect software errors early

Through static analysis with QA-MISRA, dangerous structures, problems with security, maintenance and portability can easily be found as soon as source code components are written. The earlier software errors are identified and eliminated in the development process, the more your costs are reduced. QA-MISRA checks for over 900 potential software errors in source code.

Even ISO-standard-compliant C/C++ can behave differently than expected, because not all problems are classified as incorrect. Static analysis with QA-MISRA uncovers problems with your code that are often overlooked by developers and compilers. Ensuring your code complies with functional safety coding standards such as MISRA and AUTOSAR, or security standards such as CERT and CWE, provides developers with a fully automated code review early in development and saves them time.

Reduce risk of software failure

Product recalls and jeopardy of brand and corporate reputations can far exceed the development cost of each application. Static analysis for coding standards compliance as soon as source code is written is the first stage of software verification to reduce risk of failure. Project over-runs can be mitigated by shifting verification effort to the earliest stage in the software development lifecycle. This reduces the risks of delays during later testing and complete system analysis stages because compliant components are easier and more predictable to integrate.

Fitness for purpose litigation against companies and individuals is now an increasing risk. Companies who fail to follow industry best practices, such as coding standards compliance, cannot use the “state of the art” legal defence against such litigation.

Shorten time to market

Industry leaders recognise the need to ship faster without endangering quality. QA-MISRA provides two key time advantages for development managers:

› Not delaying static analysis until a full system is available, means standards compliant components are easier to unit test.

› Automated code reviews for coding standards compliance , trains developers to produce code with lower error rates.

Fast static analysis of source code

QA-MISRA analyses extensive and complex software packages very quickly, regardless of the size of the codebase. By targeting the static analysis on the coding standards compliance rules, developers can apply QA-MISRA from individual components to full systems as code is developed. This analysis speed becomes especially valuable for teams deploying automated CI/CD pipelines, to verify compliance quality on every branch check-in.

Zero False Positives & False Negatives

QA-MISRA produces zero false negatives and zero false positives on syntactic rules. When also coupled with the sound static analyzer ASTRÉE, it then produces zero false negatives and very low false positives on semantical rules.

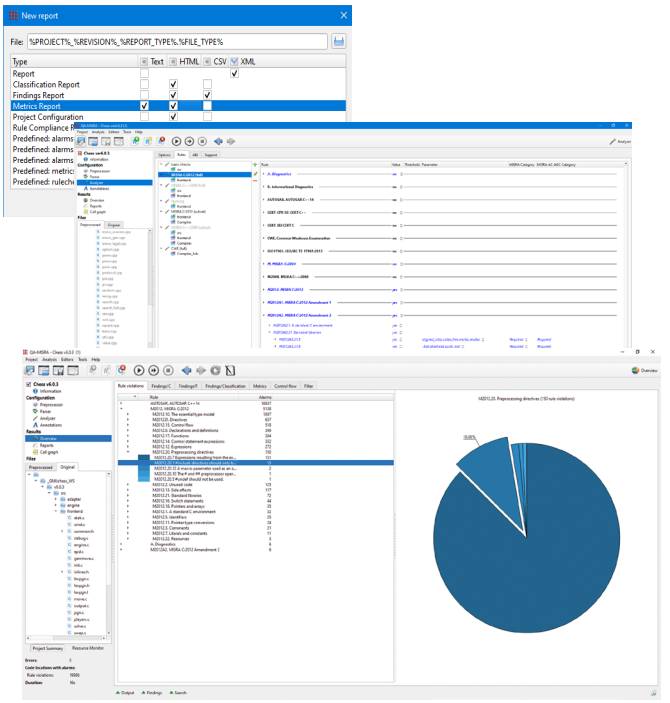
Lower false negatives mean more confidence the analysis has not missed problems. Lower false positives mean less wasted effort on assessing and discarding as 'false' a reported rule violation (alarm).

Configurable rulesets

Drill-down selection and combinations of different standards to individual rules and checks for each project, provide flexible configuration for projects with mixed C & C++, autogenerated code or manually written code. All alarm messages and rulesets can be selected, interactively filtered and explored in the GUI, or stored in DAX files for command line batch execution.

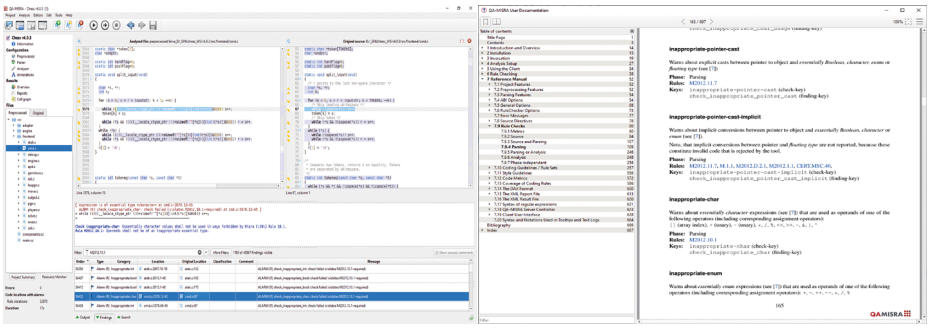
Offline detailed reports

QA-MISRA generates configurable reports in multiple open standard formats for offline compliance reports. This includes all alarm messages on source file level to be used in further automated processes or automatically distributed to offline users.



Contextual rule explanations help developers understand and learn

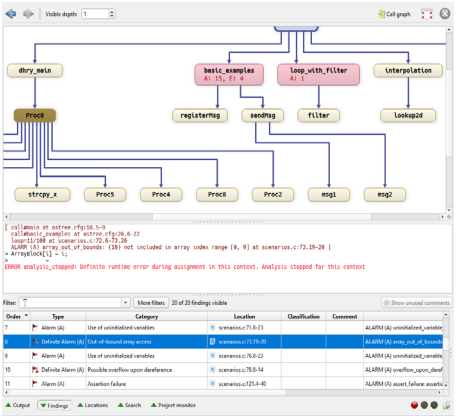
For each rule violation detected, QA-MISRA details alarm explanations to reduce the effort to understand it's root cause.



All alarm messages refer to either original source file (Source phase checks) or a single occurrence in the source (even if the original code is included in multiple pre-processed files (Parsing and Analysis phase checks) – so identifying sole root cause.

Call graph visualization

Folding call graphs, contextual rule findings, source code links and CSV exports provide graphical insights into code quality.

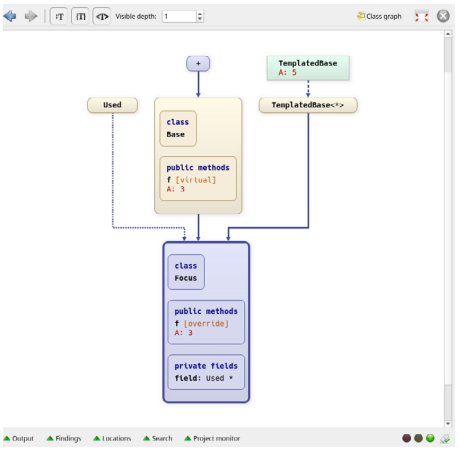


Code metrics

Code quality can be analysed through numeric metrics. In addition to the HIS metrics, many commonly used metrics are computed, and threshold values automatically checked.

C++ classes visualization

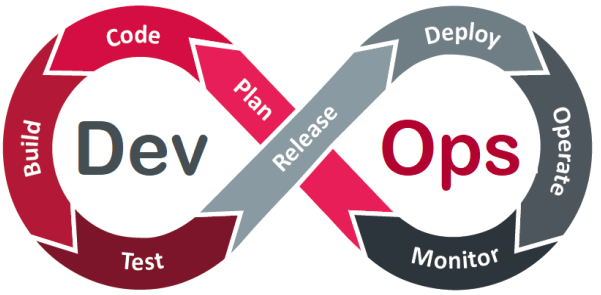
A filterable view in the GUI presents all classes and class relationships for the selected code, including those defined inside the C++ standard namespace.
A class graph visualizes a selected class together with its relations to others. Possible relations are inheritance, template instantiation/specialization, and usage as type of field members. For each individual class, detailed information on the respective field and method members can be inspected.



Flexible permanent user licensing

Unlike most static analysis tools, the QA-MISRA client/server architecture supports centralized user license management options. Licenses can be permanent or subscription and node-locked to a single machine or floating network concurrent user. This provides greater flexibility for teams to queue processing of analyses, without limiting each license to named individuals or size of source code.

Continuous integration



Analysis projects can be created and re-run in batch mode for full command line continuous integration. Analysis specification is defined in DAX files generated from the GUI or even automatically on-the-fly from XML and scripts.

This allows for high degree of automated report generation and resulting actions (e.g., quality gates in DevOps pipelines).

Platforms & Integrations

QA-MISRA is available on Linux and Windows platforms. Pre-processing and parsing knowledge of the compilation environment is captured in project set-up and used in the analysis to support embedded software.

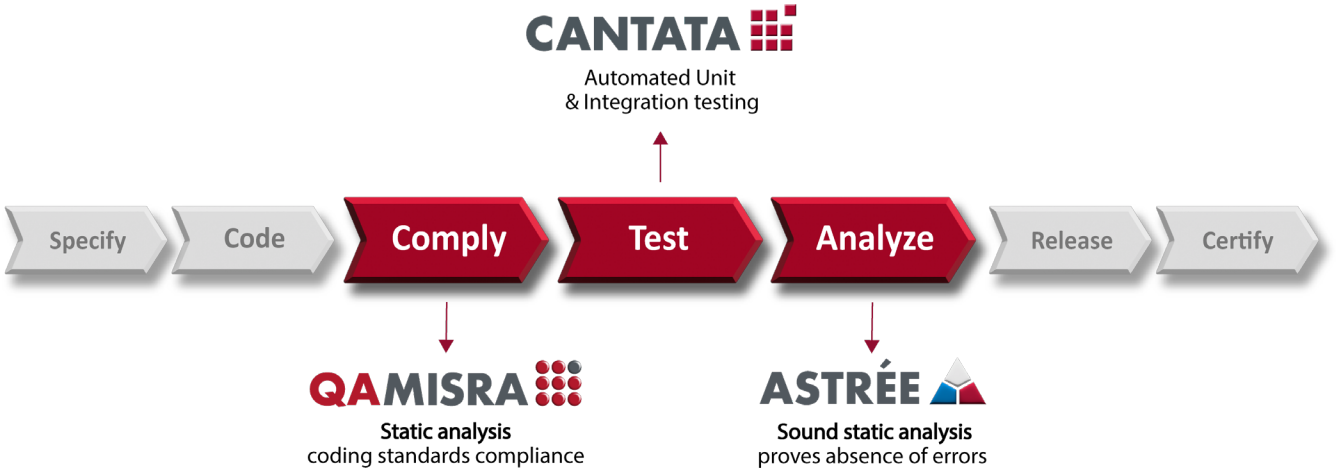
In addition to the GUI client and full command line interfaces QA-MISRA is integrated with the following:

- Eclipse®
- ARM Keil µVision IDE / Debugger®
- dSPACE TargetLink®
- MATLAB /SIMULINK®

Please refer to the QA-MISRA Release Notes for versions supported.

Verification Centric Tools

QA Systems static analysis and software testing tools support verification in the linear flow of software development below. We recommend applying sequential approach to these verification stages with tools targeted for each purpose.



Comply	Use **QA-MISRA** for fast coding standard compliance at the developer's desktop first.
Test	Use **CANTATA** for automated dynamic execution of the standard compliant software.
Analyze	Use **ASTRÉE** for proving absence of run-time errors on whole application.

NB: ASTRÉE uses the same configuration as QA-MISRA, so the effort to apply it later to a QA-MISRA project is low.

Special shared license bundle option

QA-MISRA and CANTATA share the same Sentinel RMS user license technology. This allows customers to obtain a bundled solution for both tools to share the same concurrent user license pool, as well as the tools being integrated together in the Eclipse based IDE.

When QA-MISRA is purchased as a bundle with CANTATA or when an existing CANTATA license is converted to a bundle, there are very attractive combined prices available. Please contact us for more information.

Get a demo

Contact us to arrange a bespoke demo for your team.

Start free trial

Take QA-MISRA for a test drive with your own code and develop mentenvironment.

Learn more

Visit the QA-MISRA website for more information.

QA SYSTEMS
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With offices in Waiblingen (D) | Bath (UK) | Boston (USA) | Paris (F) | Milan (I) | Da Nang (VN)
www.qa-systems.com