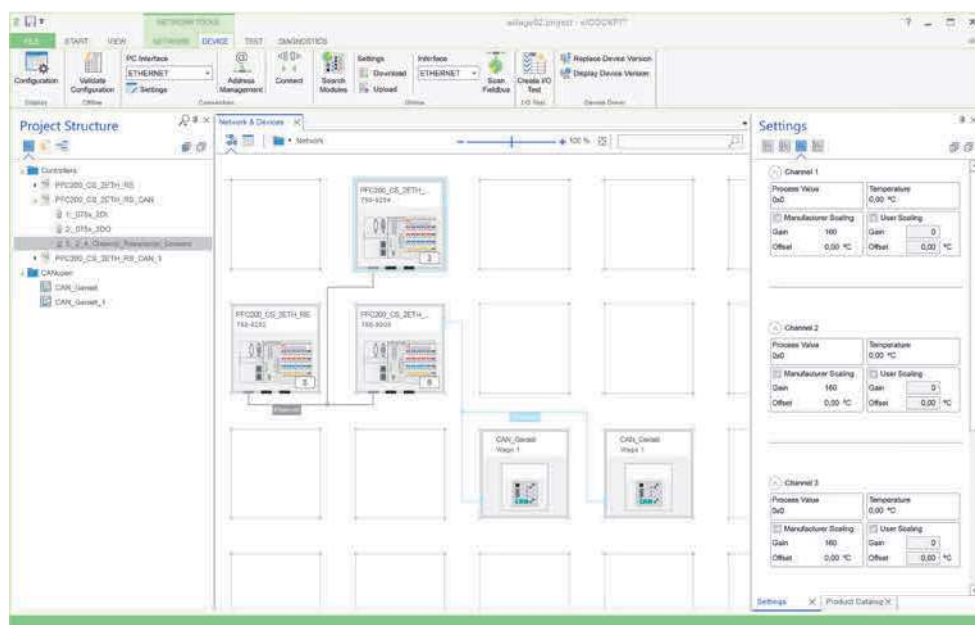


e!COCKPIT Engineering Software Based on CODESYS V3

2



e!COCKPIT automation software for faster machine and system startup: WAGO's new engineering software shortens development time for automation projects while impressing with a modern and clearly laid out user interface. At the software's core is CODESYS V3 for simple and versatile creation of applications.

Ensuring a project's long-term viability through sustainable cost savings hinges on a user's ability to quickly adapt to new software that offers a high degree of reusability.

WAGO set out to fulfill these exact requirements by developing its own engineering software: e!COCKPIT. This integrated development environment supports every automation task, from hardware configuration, programming, simulation and visualization up to commissioning – all in one software package.

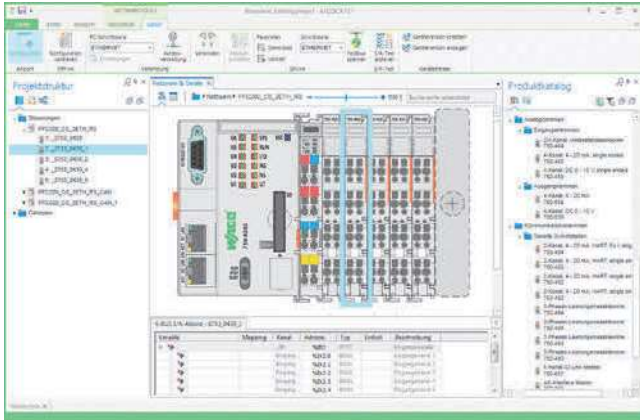
Use the programming tool to cover all important automation bases while simultaneously engineering particularly complex projects quickly and easily.

e!COCKPIT					
License Type	Number of PCs	Item No.	Order Text		
Workplace license	2	2759-0101/1110-2002	e!COCKPIT; Workstation license	Can be installed on up to two PCs (e.g., notebook & desktop)	
Multi-user license	5	2759-0101/1110-2005	e!COCKPIT; Multi-user license; 5	Multiple installations up to specified number	
Multi-user license	10	2759-0101/1110-2010	e!COCKPIT; Multi-user license; 10		
Multi-user license	15	2759-0101/1110-2015	e!COCKPIT; Multi-user license; 15		
Multi-user license	20	2759-0101/1110-2020	e!COCKPIT; Multi-user license; 20		
Site license	unlimited	2759-0101/1110-3000	e!COCKPIT; Site license	Unlimited installations at a company location	
Buy-out license	unlimited	2759-0101/1110-4000	e!COCKPIT; Buy-out license	Unlimited installations within a company at all locations in a country; in addition, the software may be used in company products that contain WAGO's automation technology to form a functional unit.	

Supported operating systems	Windows 7 (32- and 64-bit), Windows 8, Windows 8.1 (32- and 64-bit), Windows 10
System Requirements	
Processor	Dual-core
Memory	4 GB
Hard disk space	10 GB
Graphics resolution	1,366 x 768 px
Supported devices	Controllers based on CODESYS V3, I/O modules (750/753)
Supported fieldbuses	CANopen; Modbus TCP/UDP; Modbus RTU; PROFIBUS
Supported device descriptions	DTP; EDS; GSD
Connectivity	TCP; USB; OPC; CODESYS network variables; CODESYS DataServer
Programming languages per IEC 61131-3	ST; LD; FBD; IL; FC; CFC
Import/export formats	CODESYS V3 project files (*.project)
Delivery type	Installation file (download)
For data sheet and further information, see:	wago.com/ecockpit

Internet connection may be required for license activation.

Windows® is a registered trademark of Microsoft Corporation.



Configuration and Parameterization

The integrated **e!COCKPIT** configurators provide modern operating tools and workspaces, such as:

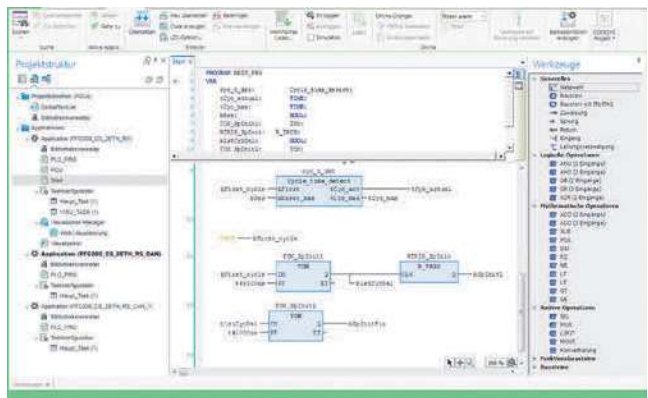
Examples:

- Graphical network topology: Complex relationships between network devices and their current states can be identified easily and intuitively.
- Drag & Drop: Simplifies device interaction.
- Copy & Paste: Individual devices or whole network branches can be duplicated quickly.
- Batch processing: Parameter values are set simultaneously for several devices.

Programming

e!COCKPIT offers multiple software development options:

- IEC 61131-3 PLC programming languages: Structured Text (ST), Ladder Diagram (LD), Function Block Diagram (FBD), Instruction List (IL), Sequential Function Chart (SFC), Continuous Function Chart (CFC)
- For flexibility, all programming languages can be combined with one another.
- Created programs can be easily debugged on the engineering PC via simulation.
- New paradigms such as object-oriented programming are included.



Visualization

Advanced user interfaces for operating and monitoring machines are standard. Today, HMI-based design is a critical factor that influences the purchase of an entire automation line. **e!COCKPIT** employs Drag & Drop to streamline the design of modern user interfaces. The integrated visualization editor provides:

- Access to IEC program variables
- Closed simulation of HMI and PLC programs on the engineering PC
- Guaranteed language independence via Unicode character set
- Current standards such as HTML 5 or CSS



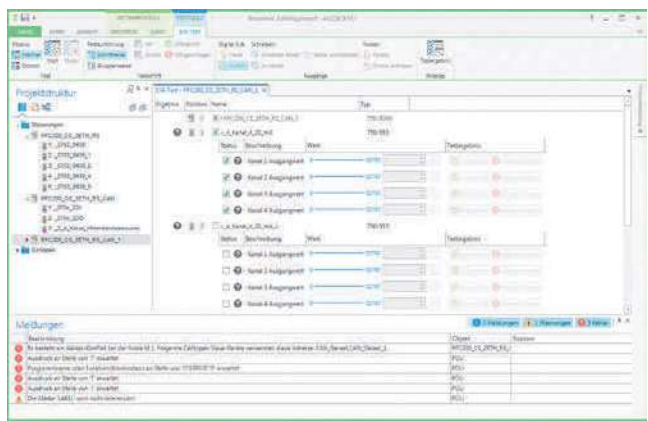
Diagnostics

Being acutely aware of the automation network's current status is an absolute must for the rapid detection and elimination of errors – be it during development in the office or directly on the machine during commissioning. **e!COCKPIT** provides comprehensive diagnostic capabilities:

Individual views, for example, always display the controllers' status information both graphically and in tabular form

To keep the project on time, error messages are transmitted directly and clearly.

The structured wiring test function systematically identifies wiring errors.



e!COCKPIT UML Software Modeling in UML

UML (Unified Modeling Language) is a graphical language for specifying, designing and documenting object-oriented software. It clearly facilitates discussions between programming and other disciplines within system development. The e!COCKPIT UML add-on extends the e!COCKPIT Engineering Software with two languages of the "Unified Modeling Language": the class diagram and the status diagram.

Advantages:

- Improved readability of the program code via clear class and behavior diagrams in standardized form
- Reduce programming errors by generating program code from UML diagrams
- Easier debugging through online data in the state diagram

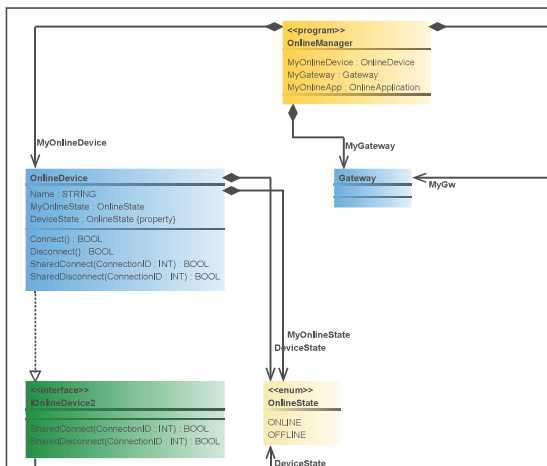
Class Diagram:

The class diagram belongs to the group of UML structure diagrams. With the additional graphic editor, the object-oriented structure of e!COCKPIT projects can be mapped or designed. The various object classes (e.g., function blocks or interfaces), including the variables and methods used in them, and their relationships are clearly displayed.

The existing project structure can be imported directly from the device structure when creating a class diagram. However, a project structure can also be rebuilt using the following available class and relationship elements:

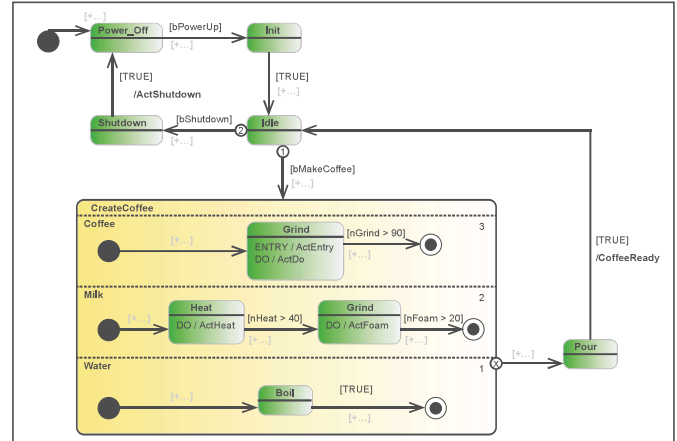
- Class (POU)
- Interface
- Variable declaration
- Property
- Method
- Generalization
- Realization relationship
- Association
- Composition

New objects in the class diagram editor are automatically inserted into the device structure.



State Diagram:

The state diagram belongs to the group of UML behavior diagrams. It is a graphical language for specifying and designing the sequence of event-discrete systems. Unlike with the class diagram, executable application code is generated when compiling a state diagram.



The state diagram editor includes a selection of step and transition elements:

- Start state
- End state
- State
- Composite state
- Junction/connection
- Selection
- Transition
- End transition
- Exception transition

When the application is running, the status diagram is switched according to the clock cycle. In addition, an independent switching behavior can be realized via cyclic internal state diagrams. In online mode, the state diagram is animated so that the current status of the process can be tracked at any time.

Item Description	Item No.
e!COCKPIT UML; Single-user license	2759-402/1420-1000

Minimum e!COCKPIT version	V1.3.0
Hard disk space	20 MB
Delivery type	Installation file (download)
Data sheet and further information, see:	wago.com/2759-402/1420-1000

Single license allows installation on one computer.

Internet connection may be required for license activation.

e!COCKPIT Static Analysis Static Code Analysis

In addition to the compiler check, the **e!COCKPIT** Static Analysis add-on checks the source code based on defined rules and naming conventions. This add-on displays potential development problems, allowing errors to be detected and corrected before field testing. More than 100 partly parameterizable rules have already been implemented that can be combined into individual rule sets. The add-on functions are seamlessly integrated into the **e!COCKPIT** development environment.



Advantages:

- Avoid errors during program creation
- Save time-consuming troubleshooting during application development
- Ensure that the program code conforms to the defined rules and is easily readable

Main Functions:

- Check the application explicitly via menu command
- Alternatively: automatic verification during code generation
- Control pre-processor instructions, and determine which parts of the code will be analyzed

Rules and Naming Conventions:

Within the **e!COCKPIT** project settings, a standard set of programming rules and naming conventions can be configured in the standard version:

- Unused variables
- Overlapping memory areas
- Simultaneous access
- Multiple write access to output
- Multiple use of the name

Additionally, the following analytics can be performed with **e!COCKPIT** Static Analysis:

- Discover unreachable parts of the code
- Find empty objects
- Find empty instructions
- Find useless declarations
- Conversions
- Write access to input variables
- Rules for operators
- Rules for FOR and CASE instructions
- Strict testing of IEC rules

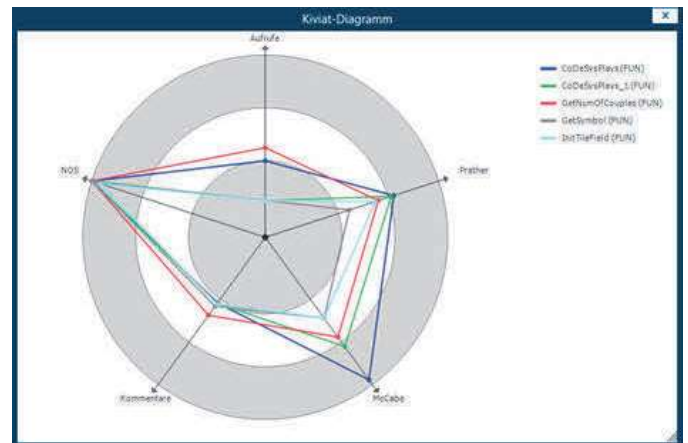
Result of the Analysis:

The result of the analysis is displayed in the message window. Each violation has a unique number and can be uniquely associated with the configured rules and naming conventions.



Metrics:

Various metrics, such as the number of code lines, memory consumption or the evaluation of software complexity, as well as the upper and lower limits to be observed, can be configured for evaluation of the code quality. The results of the applied metrics can be displayed in tabular and graphical form as a Kiviati diagram.



Item Description	Item No.
e!COCKPIT Static Analysis; Single License	2759-403/1420-1000

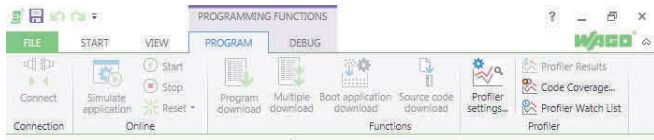
Single license allows installation on one computer.

Minimum e!COCKPIT version	V1.4.0
Hard disk space	30 MB
Delivery type	Installation file (download)
Data sheet and further information, see:	wago.com/2759-403/1420-1000

Internet connection may be required for license activation.

e!COCKPIT Profiler Runtime Behavior Analysis

The e!COCKPIT Profiler add-on allows programmers and application developers to measure and evaluate the processing times and code coverage of different blocks in an IEC 61131-3 application at an early stage. This add-on can be seamlessly integrated into the e!COCKPIT Engineering Software. Measurement may be performed parallel to the application development in the standard development environment.



Advantages:

- Measure both machine code's runtime behavior and code coverage right at the beginning of the development phase
- Early detection of runtime problems
- Identify both time-consuming program parts and unused programming blocks
- Overall and individual measurement of all application blocks
- Identify the code efficiency by comparing historical and current measurements
- Increase the software quality

Main Functions:

- Implicit binary code extension during translation, without changing the program code of a project
- Dynamic measurement via code instrumentation at each function entry and exit
- Only during measurement: temporary code enlargement and runtime extension of 10 to 50%
- Measurement start via variable or command
- Overview of the measurement results in the development environment

Functions:

- Control the runtime measurement via freely selectable Boolean variable
- Measure the runtime of individual programming blocks and function block instances within the "profiler watch list"
- Measure the percentage of missed instructions per block via code coverage
- Measurement results show the time-critical path

Setting Options:

- Select the task to be measured
- Select the unit base (tick, milliseconds or microseconds)
- Define the memory size required for the measurement
- Adjust the measurement behavior (next or maximum cycle)
- Select the calls to be measured in the monitoring list
- Select the program blocks to be measured to determine the code coverage

Detailed Results:

- Percentage of time spent in the call
- Total time spent in call
- Average time of all POU calls in a single cycle
- Minimum and maximum processing time over multiple cycles
- Number of calls
- Time spent for each call
- Standard deviation of average measured time
- Percentage of the iterated code

Display the Results as:

- Summary table
- Call tree (time- or process-oriented)
- Tables
- Watch list

Function	Percentage	Time (µs)	Calls	Avg (µs)	Min (µs)	Max (µs)
MAINTASK	100,00 %	246,344 µs	1 Call			
PLC_PRG (PRG)	99,99 %	246,324 µs	1 Call			
CoDeSysPlays (FUN)	95,34 %	234,876 µs	2 Calls	117,438 µs	9	
GetNumOfCouples (FUN)	76,85 %	189,324 µs	485 Calls	0,390		
SelectableTile (FUN)	35,34 %	87,059 µs	51526 Calls	0,002		
SelectableTile (FUN)	6,20 %	15,265 µs	9056 Calls	0,002 µs	Min	
TILEFIELD_TYPE_FB_INIT	0,60 %	1,472 µs	2 Calls	0,736 µs	Min	
STF_ENTRY_FB_INIT	0,59 %	1,443 µs	200 Calls	0,007 µs	Min	
CoDeSysPlays_1 (FUN)	3,93 %	9,676 µs	1 Call			

Item Description	
	Item No.
e!COCKPIT Profiler, Single License	2759-404/1420-1000

Single license allows installation on one computer.

Minimum e!COCKPIT version	V1.4.0
Hard disk space	30 MB
Delivery type	Installation file (download)
Data sheet and further information, see:	wago.com/2759-404/1420-1000

Internet connection may be required for license activation.