



MATCH Test and Simulation Environment

Special features

- Enables implementation of various levels of software tests in accordance with demanding safety and quality standards
- Shortens the development times
- Improves continuous test quality

Configuration

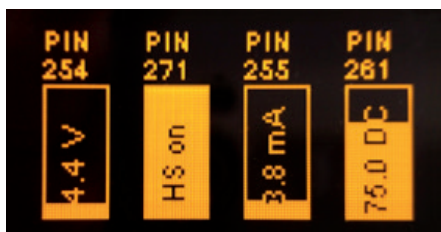
- Import of application data from the PDT project definition
- Allocation of controller pins to respective plug-ins on the test bench
- Set-up and monitoring of all RTBs
- Automation of test configuration and test sequences with Python®

“Software in the loop”

- Complete simulation of the RTB on the PC
- Stimulation of input and output pins with little effort and at an early stage of development
- Virtual function and error tests from “pin to pin” (application can run on the PC)

“Hardware in the loop”

- Stimulation of the electrical behaviour of the input and output pins on the RTB from the PC
- Pin information display (e.g. equipment ID) live on the test bench
- Function and error tests at machine level
- Automation of test sequences with Python®



The image shows the integrated OLED display, e.g. to indicate test settings, pin numbers and equipment IDs

Description

The “Test and Simulation Environment” (TSE) program is a piece of PC software used to test application software and to simulate the hardware and software of different operating states on the controllers’ inputs and outputs. In addition to function tests, the tests include error case tests and test evaluation. In this regard, the TSE is ideal for use with the PDT and the MST. Projects created in the PDT can be transferred for subsequent testing with ease. Parallel diagnosis can also be carried out using MST.

You can use one or more Remote Test Benches (RTBs – remote controllable test benches) for practical tests directly on the controller hardware. In this way, you stimulate the controller’s inputs and outputs and can thus simulate the machine’s behaviour.

Besides the real RTB, the TSE also provides a “virtual” test bench, which is another software engineering reproduction of the RTB functionality. You carry out tests on the virtual test bench in connection with a version of the application software translated for the PC (PC simulation). MATCH Core enables PC simulation of application software as standard.

With the TSE – in its entirety – you can run through all the necessary test levels of the software development cycle:

- Unit or module test,
- Integration test, and
- Validation or system tests

Four basic versions of the TSE are available:

• Basic Bench Control

This free version is included in the scope of delivery for the RTB.

This version can be used:

- For controlling an RTB,
- For testing a controller.

The following restrictions apply: no project import from the PDT, no CAN residual bus simulation, no automatic tests;

For application developers, tests of individual controllers.

• Standard Bench Control

This version corresponds to the Basic Bench Control version without being limited to one controller or to just one RTB, with project import from the PDT including CAN residual bus simulation, with Python test script environment for automatic tests;

For test engineers, automatic system tests at machine level.

• Virtual Test Environment

This version corresponds to the Standard Bench Control version, with the difference being that instead of the RTB, only virtual test benches are supported.

For test engineers and developers working with virtual “pin to pin” tests and integration and module tests.

• Automated Test & Simulation Environment

This version is the complete solution which enables control of several RTBs, as well as of the virtual test bench. It supports automated software tests for all test levels.

For the Trial/Testing department and application developers.

Technical data

Software system requirements

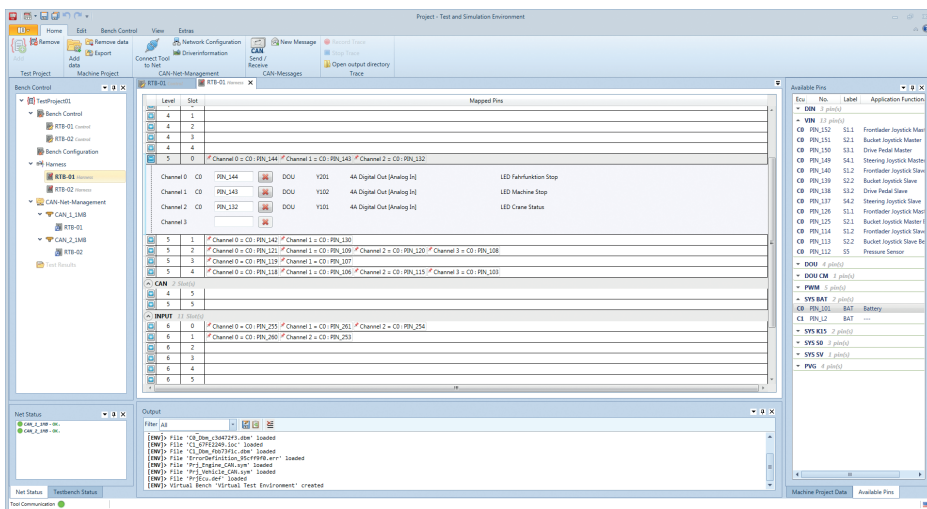
Supported operating systems	Windows® 7, 8 or 10 (32-/64-bit)
Other software	.NET 4.6 Framework, Python 3.x

Hardware system requirements

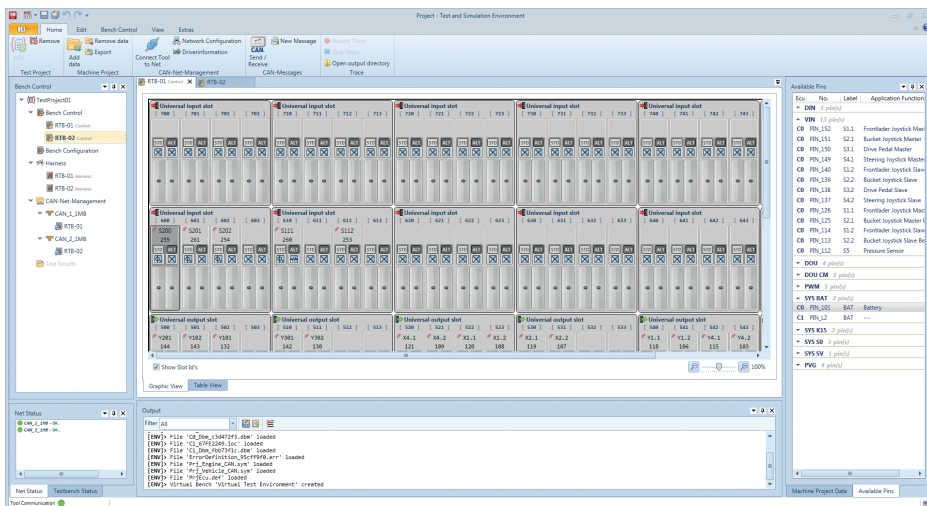
Processor	Minimum dual-core processor with 1.6 GHz
RAM memory requirements	Minimum 2 GB (4 GB or more recommended)
Hard drive memory requirements	Minimum 300 MB available memory
Connections	One free USB port
Screen resolution	Minimum 1,024 x 768
CAN-USB interface	PCAN USB or PCAN USB Pro interface

Controller test bench

Remote Test Bench (RTB) for the Bench Control versions	ZBS RTB-RACK-43-VGKS-A0-00-000 ZBS RTB-RACK-63-VGKS-A0-00-000
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Automated test environment



RTB's Remote Control view

Additional special features

Supports all test levels

- Unit or module tests based on test frameworks generated from the source code with Python integration testing
- Integration tests are carried out in a similar way to the unit and module tests based on the MATCH Core functions
- Residual bus simulation on the CAN bus

Test automation

- Create automatic test cases with Python integration testing
- Python integration testing provides all the project and test bench data, incl. CAN residual bus simulation
- Generate and monitor automatic tests

Automatic generation of test documentation

- Test results as XML or PDF
- Test documentation as PDF

Test sequence

Sequence of the unit/module and integration tests

You carry out the unit/module tests and the integration tests of your C source code by implementing the following steps:

- Generate the unit test frameworks from the C files
- Program the test cases in the TSE with Python
- Carry out the tests and check the results log

Sequence of the validation/system tests

Use the Test and Simulation Environment (TSE) for the following work steps of the validation or system tests:

- Simulation of the entire machine's controller inputs and outputs at early stages of the development process
- Performance of function and error tests
- Use and control of the remote controllable controller test benches (RTBs) with the TSE
- Or software emulation of a complete machine project with the Virtual Test Environment
- Residual bus simulation on the CAN bus

TSE basic version model code

MATCH TSE – XX – G10 – 000

Program variant

BB = Basic Bench Control
SB = Standard Bench Control
VT = Virtual Test Environment
AE = Automated Test & Simulation Environment

Software version

G10 = Current version

Modification number

000 = Standard

TSE add-on model code

MATCH TSE – XX – G10 – AO – YYY – 000

Program variant

BB = Basic Bench Control
SB = Standard Bench Control
VT = Virtual Test Environment
AE = Automated Test & Simulation Environment

Software version

G10 = Current version

Add-on

Extension variant

UIT = Python Unit and Integration Testing Interface
SQT = Test Sequence Table
TCR = Test Cases and Results Specification
RIF = Test Cases ReqIF Import / Export
PKG = Specification package
DBC = DBC File Import

Modification number

000 = Standard

Software variants

The table below shows the add-ons available for the different program versions. The corresponding part numbers have been entered for available options. Unavailable options are marked with “–” and options already included are marked with “✓”. The “Basic Bench Control” version is not included in the table; it controls only one RTB with one controller and only allows output of the RTB settings.

Performance characteristics	Standard Bench Control	Virtual Test Environment	Automated Test & Simulation Environment
RTB control	Multiple RTBs	–	Multiple RTBs
Number of plug-in controllers on the RTB	Multiple controllers	–	Multiple controllers
Virtual test bench	–	Multiple virtual controllers	Multiple virtual controllers
Python® module and integration tests	–	9530 (UIT)	9553 (UIT)
Generation of test sequences	9523 (SQT)	9531 (SQT)	9554 (SQT)
Output of test cases and results	9525 (TCR)	9544 (TCR)	✓
Import/export of test cases via ReqIF	9528 (RIF)	9587 (RIF)	✓
Specification Packet	9524 (PKG)	9543 (PKG)	9550 (PKG)
DBC file import	9526 (DBC)	9533 (DBC)	9588 (DBC)

Scope of delivery

Installation program

Accessories

(Not included in the scope of delivery; please order separately)

- PCAN dongle ZBS PCAN-USB Connector
Part number: 6163719
- Controller test bench (RTB)
ZBS RTB-RACK-43-VGKS-A0-00-000
ZBS RTB-RACK-63-VGKS-A0-00-000
Corresponding controller fitted



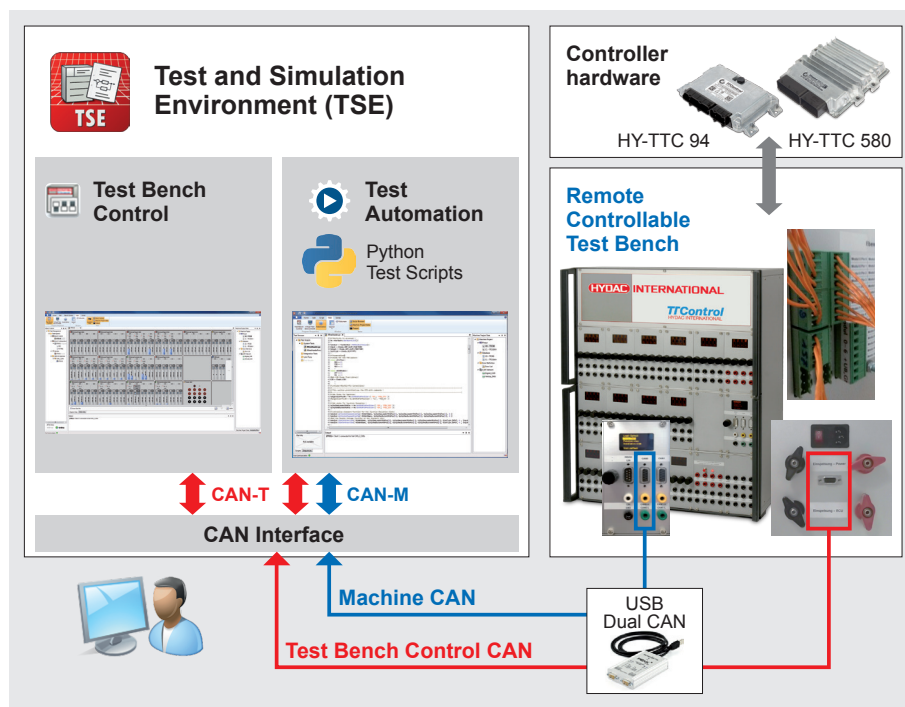
Remote-controlled controller test bench (RTB)

The CAN bus from the PCAN dongle is connected to the RTB either directly or with a cable with a nine-pin D-Sub male connector.

Sample overview of possible TSE applications

The following diagram shows a typical example of how to use the TSE in connection with an RTB:

- The user controls the RTB from the PC with the Test Bench Control (left).
- At the PC, two CAN buses are connected with a PCAN dongle:
 - A “Test Bench Control CAN” (CAN-T) bus is used to control the controller test bench. The connection is located on the rear of the test bench (bottom right, shown in red in the diagram).
 - The other bus, “Machine CAN” (CAN-M), is connected to the controller via the controller test bench. The connection (or connections) is/are made on the CAN module (part number 6163719) on the front of the test bench (bottom right, shown in blue in the diagram).
- The controllers on which the application is executed are shown in the top right. They can be connected to the controller test bench using an adapter cable harness (green plug) on the rear.



TSE with controller test bench und controllers

The test bench UI (far left) can be used to perform validations and system tests. Test Automation (on the right in the TSE box) is suitable for module and unit tests. As you can see, the tests for the test levels required for the software development cycle can be performed independently of each other with the TSE. The high degree of flexibility in the interaction between the TSE and the controller test bench is also clear.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications and corrections.

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