



INTERBUS Conformance Test

General Section

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1. Foreword

The procedures for testing the conformance of INTERBUS devices have been further improved. The master hardware has been upgraded to Generation 4, so that the test now covers 90% of practical applications. A further addition is the recognition of modern INTERBUS protocol chips, INTERBUS Loop devices, the alternative transmission rate of 2 Mbaud, and the testing of controlled optical transmission (SUPI3 OPC).

All test procedures have been converted to the new ENVI test environment, which runs under Windows NT. The ENVI test tool administers individual sub-tests and generates and manages the test logs.

This means that the test environment as well as the test tool and procedures correspond to the current state of technology.

With the introduction of version 2.0 of the INTERBUS conformance test for devices with INTERBUS interface, all previous versions are now invalid. There is a 6-month transitional period after publication during which time developments that are being carried out based on previously valid documents must be completed.



2. Introduction

The disclosure of the INTERBUS protocol and the introduction of communication-compatible protocol software have enabled the connection of a large number of devices made by various manufacturers to the INTERBUS system. To ensure that all devices can communicate effectively and that the operation of other bus devices is not affected, all devices must be tested thoroughly.

The scope of the conformance test for INTERBUS devices is described below. The test includes an examination of the basic functions, a function test, and a noise immunity test at the auxiliary energy input (supply voltage), as well as at the signal and data inputs/outputs. Finally, there is an optional conformance test for the protocol software.

These test regulations should primarily ensure system safety for INTERBUS as well as easy and safe implementation and defined handling. The requirements listed below that are placed on devices with an INTERBUS interface are the minimum requirements for devices that conform to INTERBUS. Manufacturers can freely develop products, provided they meet these minimum requirements.

A precondition of the conformance test is that the functions desired by the manufacturer are provided. The functions themselves are not tested, but are presumed to be what is described in the documentation. This means that the functions of the device are required to provide the basis of the test.

2.1. Test Object

All devices, modules, and assemblies, which may be integrated as slaves in an INTERBUS system are subject to this conformance test. This particularly applies to devices on which the PCP communication protocol is implemented. The manufacturer is solely responsible for ensuring that the test laboratory is supplied with the latest version of the device, the required documentation (description, interface circuit diagrams, parts lists, etc.) and the identification characteristics.

2.2. Functions and Features to Be Tested

2.3. General

The test procedure comprises the following steps:

Test step	Feature/description
Basic test	Correct implementation of the INTERBUS device interface and use of approved process data traffic components and special bus functions, which can be activated during operation
Noise immunity test	Random burst testing in accordance with IEC 1000-4-4 and EN 61000-4-4 with regard to bus characteristics
PCP communication	Implementation conformity of PCP communication software

2.3.1. Additions

If circuits, devices or other INTERBUS components are used, which do not or only partly meet the required specifications of the conformance test with regard to the electrical or mechanical specifications, the following steps must be taken to receive certification:

The applicant must provide the INTERBUS Club with the following documents:

- Reason for the need, type and purpose of the modification/addition from the point of view of the system
- General description of the method of operation of the modification/addition
- Specification of the modification/addition
- Definition of the test to evaluate the modification/addition within the framework of a conformance test.

After thorough testing, the INTERBUS Club proceeds as follows on the basis of these documents

- Approves the modification/addition for certification and incorporates the submitted documents in the conformance test
- Requests modifications or additions to the submitted
- Rejects the modification/addition, giving a reason.

2.4. Functions and Features Not to Be Tested

2.4.1. General

The following features are not specifically tested during the conformance test. The manufacturer therefore assumes sole responsibility for:

- Function and operational safety of the application
- Functionality of defined user profiles
- Performance
- Reliability
- Ruggedness
- User-friendliness
- Noise emission (e.g., in accordance with EN 50081)
- Internal noise immunity
- External noise immunity (e.g., in accordance with EN 50082)
- Documentation included (user/installation manuals)

Further exemptions depend on the test method used in the conformance test, and the application or rather the scope of implementation of the protocol software. More details are given in the corresponding test specifications.

2.4.2. Further Development

Due to the ongoing development of INTERBUS technology encouraged by the INTERBUS Club, the following are usually no longer certified, because they no longer correspond to the current state of technology:

- 8-wire devices (remote or local bus)
- Devices with protocol chips with a version earlier than SUP3
- PCP devices with a PCP version earlier than 2.0

This means that a conformance test is not carried out for these devices.



3. Procedure

3.1. Basic Functions Test (Mandatory)

First, the hardware interface is checked in this mandatory test. This design check is not only performed in the test laboratory, but is usually covered by the manufacturer declaration. This is signed by the manufacturer and is submitted with the conformance test.

The manufacturer declaration and device are checked for the following:

- The circuit between the external INTERBUS connections and the protocol chip (calculations may be necessary)
- Specified and implemented configuration
- Protocol chip wiring
- Connection and design of the physical interface
- Diagnostic functions
- Device integration
- Isolation and shielding concept

In the second step, a function check is performed on the INTERBUS system in operation, the main focus of which is testing the identification of the test object, conformance with data from the device description of the configuration tool, process data transfer, and special functions for bus operation. The device is also tested for PCP capability. If the device is compatible, its fundamental data is requested and compared with the specifications in the device description.

3.2. Burst Noise Immunity Test (Mandatory)

A device is subject to mandatory testing of noise immunity to calculate its immunity to fast electric transients (bursts). This applies to conducted interference, which may find its way through the supply voltage connection and through the information inputs and outputs. The efficiency of the protective measures taken, such as shielding, grounding, filtering, etc., can be easily tested by applying the transients using a capacitive coupling clamp.

Testing is carried out in a defined environment, which includes the test equipment and tools, ensuring reproducibility and comparability. The test sequence itself is oriented towards experience in the practical use of INTERBUS components.



3.3. Protocol Software Conformance Test (Dependent)

The conformance test runs automatically and tests the implemented communication protocol software with a part of the application with respect to conformity to the reference implementation (test system). A complete test is neither technically nor economically feasible, thus the scope of this test remains practical and economical. Only the standard functions of PCP version 2.0 are currently tested. The "test readiness" of the test object may lead to further test restrictions, which will be explicitly noted in the report.

This test is only required if the protocol software has been implemented on the device to be tested (dependent).

3.4. Regression Test (Dependent)

If the device's hardware or software is altered during the test phase, e.g., due to identified faults, the series of tests must be repeated. It is absolutely necessary to repeat the test in order to discover any unexpected results, which may have occurred when eliminating the fault.

For measures which lead to an increase in noise immunity and which nevertheless have no effect on performance, it may be possible to reduce the regression test to a noise immunity test.



4. Assessment Criteria

The "basic test", "noise immunity test", and "PCP communication" test (if applicable), must be completed successfully, in order to satisfy INTERBUS conformity. This means that:

1. All binding instructions for the INTERBUS interface hardware implementation must be met and the respective recommendations must be adhered to.
2. All part tests must be carried out for a function test.
3. For a noise immunity test, in accordance with IEC 61000-4-4 with an intensity level of 4, criterion "B" must be reached and for a test with an intensity level of 3, criterion "A" must be reached.
An intensity level of 4 is equivalent to ambient class 4 "Highly industrial environment" and an intensity level of 3 is equivalent to ambient class 3 "Typical industrial environment".
Criterion "B" means that a temporary reduction or failure of a function or a predetermined operation is restored by the device itself. With INTERBUS, the system recognizes an interrupted bus cycle (single error) and repeats the corresponding cycle automatically without external influence. However, this is only permitted up to a defined percentage of single errors.
Criterion "A" means a predefined operation within the fixed limits, therefore no single error with regard to INTERBUS (or only within the specified bus quality).
4. The automatically generated conformance test results should be completed with the overall test result "passed". In case of doubt, the certification committee is consulted for a final decision.



5. Interrupt and Resumption Criteria

It is generally possible to interrupt the test series after each individual test. In practice, this only happens if it is specifically requested by the device manufacturer. For reasons of cost, all part tests should be carried out as far as possible in the test laboratory. This makes it possible to discover errors and weaknesses at an early stage.

If the test object is destroyed during the noise immunity test, all further tests will be stopped immediately. This is also true in the case of "test reluctance" during the conformance test.

If a new version of a device is provided during the test series, a regression test will be started automatically.



6. Test Documents

In order to plan and carry out an INTERBUS conformance test, the user and installation manuals for the device must be provided by the manufacturer.

- The completed and signed conformance test application form
- Comprehensive documentation for the device
- Circuit diagram documentation (for the INTERBUS interface)
- Device description in electronic form
- Necessary manufacturer declarations

All manufacturer documentation must correspond to the status of the series. It forms part of the test protocol and remains with the INTERBUS Club after successful certification.

The following up-to-date documents are also required:

- This conformance test specification with its various parts and appendices
- Description and user guide to software tools
- User manuals for the corresponding INTERBUS protocol chips



7. Tools and Test Environment

The tools required for the respective test series are listed in the table in the appendix. Additional tools are also described in the individual test specifications.

The special requirements for the test environment are also specified.

The ENVI test tool is used for the control, logging, and management of the tests.

The following device classes are currently defined for the conformance test:

- Remote bus/installation remote bus devices
- Devices with optical fiber interface
- INTERBUS Loop devices
- Local bus devices (Inline, etc.) (in preparation)

The baud rate used (500 kbaud/2 Mbaud) is not important for the individual test steps. However, the baud rate must always be specified so that the person carrying out the test can select the correct test setup.