# System Conformance Testing

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## Introduction

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Summary

This document gives a general introduction to KNX System conformance testing.

This document is part of the KNX Specifications v2.1.

Version 01.01.01 is a KNX Approved Standard.

## Document Updates

| Version | Date | Modifications |
|---|---|---|
| 1.0 | 2001.06.14 | Approved Standard |
| 1.1 | 2005.05.31 | Approved Standard – integration of AN 020 – relevant parts of AN041 |
| 1.1 | 2009.02 | Finalisation in preparation for release of 2.0 of KNX Specifications |
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# 1 General

It is the ultimate goal of KNX Association to ensure that for any system requirement in Volume 3 appropriate test requirements are available in Volume 8.

It is also KNX' goal that any requirements documented in either volumes giving rise to conflicts during certification are eliminated by the elaboration of Application Notes.

Therefore in case of conflict between Volume 3 and 8, KNX Certification Department shall be contacted. If necessary, KonCert and/or the KNX System Group can be contacted. If no agreement between both before-mentioned groups can be reached, the KNX Technical Board shall take the ultimate decision.

# 2 KNX Test Classes

## 2.1 Test Class Table

For certification, KNX devices can be divided according to their construction into several test classes: for each class another range of tests shall be carried out. This is reflected in the tables in Figure 3 to Figure 5.

The tables can be used for establishing the depth of the certification tests for any kind of KNX device (including gateways and interfaces). On the basis of the data supplied in the KNX data sheet for hardware, KNX and/or the KNX accredited test lab will determine the device test class: the hardware datasheet is submitted during the registration phase.

## 2.2 Minimum requirements

This table below just names the type of test to be carried out, not the extent of the test as such. For this, one has to consult the list of minimum requirements for the various KNX profiles (as laid down in Volume 6 of the KNX Specifications) and the PICS proforma as supplied by the KNX applicant.

## 2.3 Further conventions and definitions with regard to Test Tables

### 2.3.1 Certified Chip set

A certified chip set denotes a certified combination of a physical layer implementation and a system stack (mostly implemented on a controller). A chip set can be certified [1)] on the basis of a declaration, stating that the chip set is derived from an already certified BIM, BAU or BCU.

If certified BIM's, BAU's or BCU's using the chip set are not yet available, the manufacturer shall present his chip set to KNX in a testable form, so that compliance to the requirements as regards physical layer [2)] and system software can be checked.

In order to be able to waive the physical layer tests, when this chip set is used in products either by the original manufacturer and/or OEM manufacturers, the original manufacturer shall submit to KNX at the time of certification of the chip set the following declaration (below called "chip set declaration")

- a circuit diagram of the certified physical layer implementation in combination with the processor.
- a list of extra components and their tolerances to be used together with the certified physical layer implementation and controller.

### 2.3.2 Use of certified chip set - General

Physical layer tests can only be waived when using a certified chip set, if compliance to the chip set declaration of the original manufacturer can be declared in the KNX HW datasheet [3)] by the manufacturer using this certified chip set in his products.

The cross in the test class table below (Figure 3 to Figure 5) denotes full testing, while @ denotes that the confirmation of compliance to the chip set declaration of the original manufacturer (in the KNX datasheet) suffices for certification.

1) Certification does not imply that the chip set is commercially available on the OEM market

2) Compliance to hardware requirements related to the physical layer (e.g. bus power consumption) is declared in the KNX datasheet for hardware.

3) To be submitted at the time of registration of the product.

### 2.3.3 Use of certified chip set – Specific case: TP1

In the case of TP1, the use of a certified system stack allows to waive the physical layer collision tests/coding/decoding, while the use of a certified transceiver allows to waive all physical layer tests but collision/coding/decoding. In order to be able to waive any of the tests, the condition as stated under 2.3.2 shall be fulfilled.

### 2.3.4 Layer Tests

The following types of layer tests are defined:

- Black box testing of layer features of the implemented stack via the bus interface;
- Testing of the declared and supported Internal Layer Interfaces between the implemented layers. If these are however the identical or converted copy of the messages provided External Message interface, the tests of the Internal Layer Interfaces can be waived.

The following figure shows the various cases of layer tests and the required test depth.

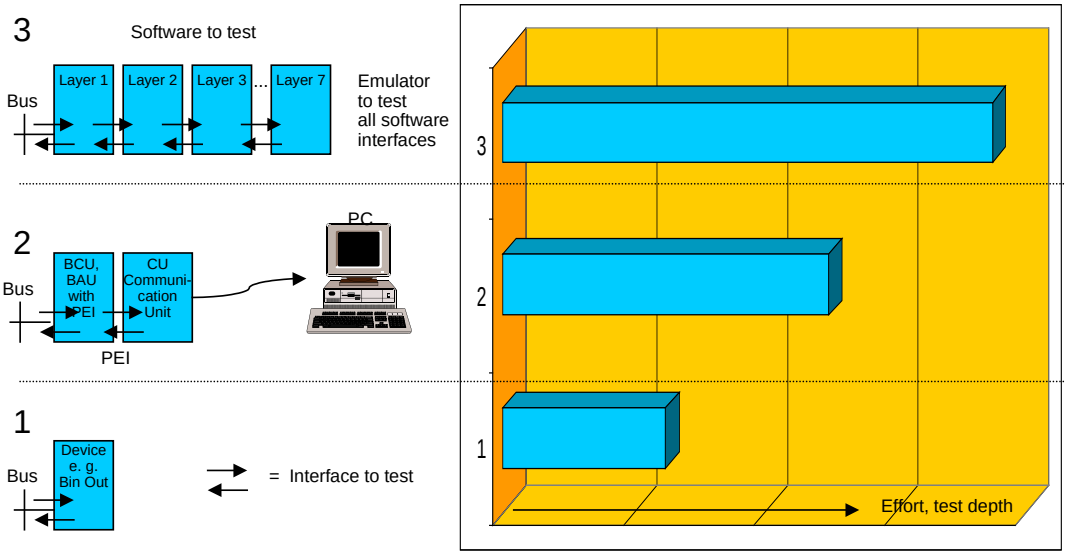


**Figure 1: Different cases for layer testing**

The following possibilities of declaration for Internal Layer and External Message Interfaces can be distinguished:

| No. | External Message Interface (EMI) declared | Internal Layer Interfaces (ILI) declared | Example | Extend of Testing |
|---|---|---|---|---|
| 1 | Yes | Yes[4] | BCU 2 | Full testing of EMI |
| 2 | Yes | No | BCU 1 | Testing of EMI only |
| 3 | No | Yes | CU | Full testing of internal layer interface |
| 4 | No | No | BAU, device | No tests required |

**Figure 2: Declaration of internal and external message interfaces (with examples)**

If internal layer interfaces are declared, the applicant shall specify whether they support communication in both (to upper and lower layers) or only in one direction (eg. to lower layers). Appropriate test programs shall be provided, which allow to switch to the to be tested layer and evaluate the in- and outputs.

The documented source code of the test programs shall be made available.

If the declared External Message Interfaces (EMI) do not support a standard protocol, the applicant shall make a suitable protocol driver available.

In case of closed devices, implementing a not yet certified KNX protocol stack, merely the features of the KNX Protocol stack shall be submitted to the black box layer tests via the bus interface.

### 2.3.5 Miscellaneous

- In some cases, even though marked with a cross, testing of a particular aspect can be superfluous e.g. as is the case
  - for management testing when using the BCU 2 controller and connecting to a layer lower than application layer. If in this case the FT 1.2 serial protocol is used, management is maintained and shall not be re-tested;
  - testing of user management, when the co-processor in a device containing an already certified system stack, which is not (entirely or partly) deactivated by the co-processor.

♦ The non-shaded areas in the underneath test class tables (Figure 3 to Figure 5) denote the to be tested aspects, for which uniform KNX test specifications are not yet available. For showing compliance to these aspects, the applicant may carry out the tests at his own discretion and present the results to KNX in the form of internal company test reports.

♦ The shaded areas in the tables (Figure 3 to Figure 5) denote the to be tested aspects for which uniform test specifications are available. Testing of these aspects shall be carried out in the presence of an KNX auditor (witness testing) on the basis of the draft KNX test specifications or in an KNX accredited third party test house on the basis of released KNX test specifications.

♦ Specific tests related to the actual profiles are for the time being not defined (i.e. testing of features called ‘resources’). These will be added at a later date.

♦ The source code of any test application used for system testing shall be appended to the test report. In the case of S-mode devices, the accredited test lab is allowed to accept unregistered applications, which have been exported by the manufacturer by means of ETS+ inside a project file and can in this way be integrated in ETS end user databases. This application shall be archived for traceability reasons.

[4] Testing of the internal layer interfaces can in this case be waived, as they are identical to (or converted to) the supported and already tested external message interface.

- Any test sample of a system platform (transceiver and microcontroller), which is used during system testing and which is not commercially available, shall be sealed by the lab that carried out the system tests and archived by the manufacturer for a period of minimum 10 years.

# 3 Actual Test class tables

## 3.1 Test class BCU[5]

| KNX Test Class | required tests → | 8/2[6] | 8-3-3 + 8-3-4 + 8-3-7-1 | 8-3-7-2 + 8-3-7-3 | 8-6-3 | 8-6-1 | 8-7 | 8-6-2 electr.[7] | Mech[8] |
|---|---|---|---|---|---|---|---|---|---|
| 1a | BCU based on certified BIM | - | - | - | - | - | - | X | X |
| 1b | BCU based on certified KNX chipset | @ | - | - | - | - | - | X | X |
| 1c | BCU based on certified physical layer implementation, uncertified system stack | @ | X | X | X | X | - | X | X |
| 1d | BCU based on uncertified physical layer implementation, certified system stack | X | - | - | - | - | - | X | X |
| 1e | BCU based on uncertified chipset | X | X | X | X | X | - | X | X |

**Figure 3: Test class BCU Table**

[5] for definition see Clause 2 Volume 5

[6] In case of TP1, some tests can be waived – see clause 2.3.3

[7] tests to verify correct voltage and current levels at each PEI pin against the specifications – test of correct support of stated PEI types – test of the maximum current available at the PEI for the application – test of correct PEI R-type recognition.

[8] test to verify mechanical compatibility of new BCU to KNX specifications (e.g. PEI, dimensions, programming button and LED, …).

## 3.2 Test class BAU[9]

| KNX Test Class | required tests → | 8/2[10] | 8-3-3 + 8-3-4 + 8-3-7-1 | 8-3-7-2 + 8-3-7-3 | 8-6-3 | 8-6-1 | 8-7 | 8-6-2 electr. | Mech |
|---|---|---|---|---|---|---|---|---|---|
| 2a | BAU based on certified BIM | - | - | - | - | - | - | - | - |
| 2b | BAU based on certified KNX chipset | @ | - | - | - | - | - | - | - |
| 2c | BAU based on certified physical layer implementation, uncertified system stack | @ | X | X | X | X | - | - | - |
| 2d | BAU based on uncertified physical layer implementation, certified system stack | X | - | - | - | - | - | - | - |
| 2e | BAU based on uncertified chipset | X | X | X | X | X | - | - | - |

**Figure 4 : Test class BAU Table**

[9] for definition see Volume 5 Clause 2 ‘Definitions’

[10] In case of TP1, some tests can be waived – see clause 2.3.3

## 3.3 KNX device

| KNX Test Class | required tests → | | | | 8/2[11] | 8-3-3 + 8-3-4 + 8-3-7-1 | 8-3-7-2 + 8-3-7-3 BCU Manag. | 8-3-7-2 + 8-3-7-3 User Manag[12]. | 8-6-3 | 8-6-1 | 8-7 | 8-6-2 electr. | Mech |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | with BCU/BAU | Ph. Impl. | System Stack | co-processor[13] | | | | | | | | | |
| 3a | C[14] | | | no | - | - | - | - | - | - | X | - | - |
| 3b | | C | C | no | @ | - | - | - | - | - | X | - | - |
| 3c | | C | NC[15] | no | @ | X | X | - | - | - | X | - | - |
| 3d | | NC | C | no | X | - | - | - | - | - | X | - | - |
| 3e | | NC | NC | no | X | X | X | - | - | - | X | - | - |
| 3f | C | | | yes | - | - | - | X | - | - | X | - | - |
| 3g | | C | C | yes | @ | - | - | X | - | - | X | - | - |
| 3h | | C | NC | yes | @ | X | X | X | - | - | X | - | - |
| 3I | | NC | C | yes | X | - | - | X | - | - | X | - | - |
| 3j | | NC | NC | yes | X | X | X | X | - | - | X | - | - |

**Figure 5: KNX device Test Class Table**

[11] In case of TP1, some tests can be waived – see clause 2.3.3

[12] Test only applicable if User Management is implemented.

[13] If a co-processor deactivates part of the system stack, the features of all re-implemented layers also have to be tested. The Figure 5 only covers the case, where the co-processor does not deactivate already certified system stack.

[14] certified

[15] not certified

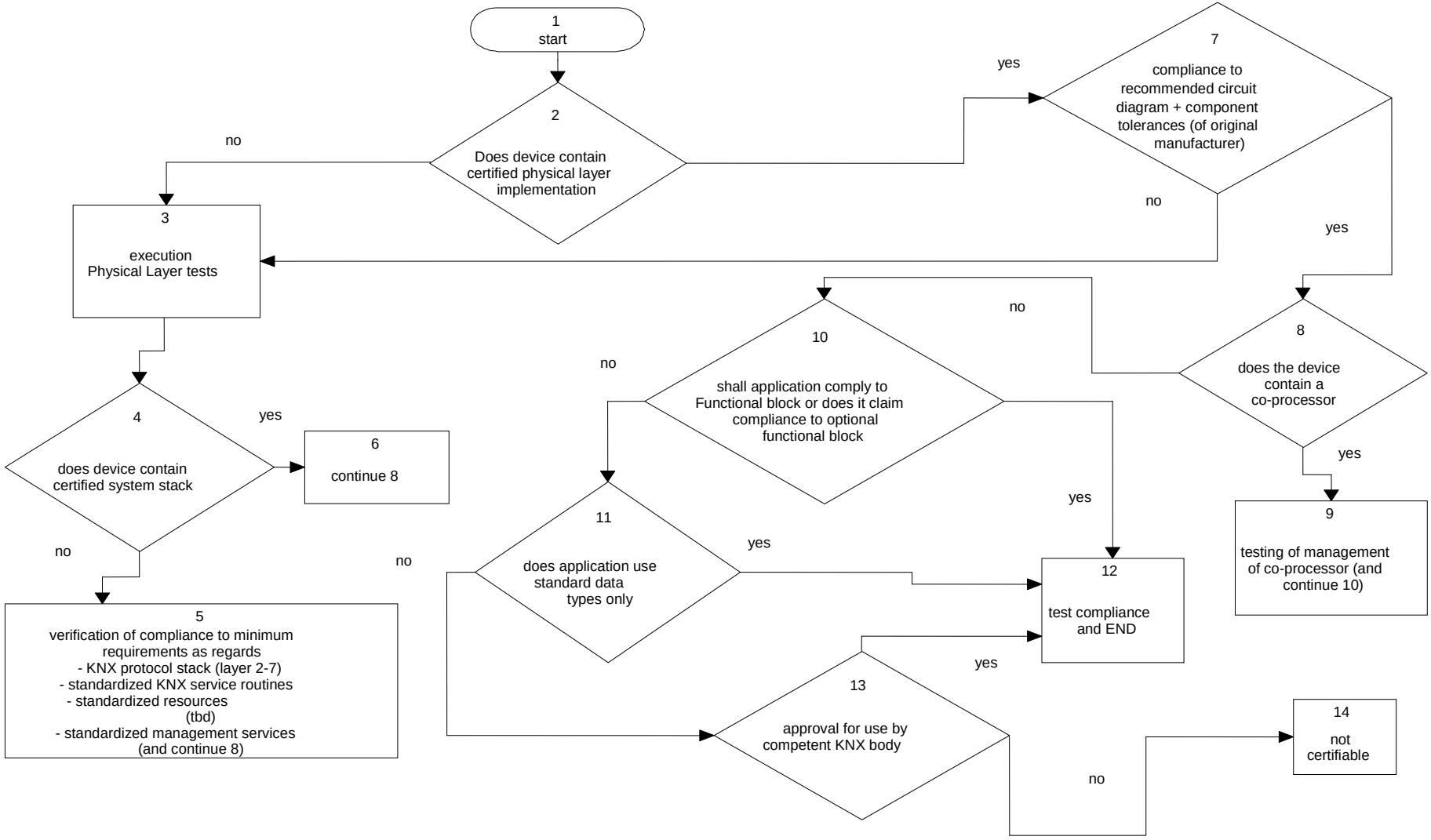


**Figure 6: 'Summary of the KNX System Conformance Requirement**