System Conformance Testing

8

Interworking & Functionality Tests

7

KNX Interworking

1

Summary

This document contains test specifications for Testing of KNX Interworking.

Version 01.02.01 is a KNX Approved Standard.

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

Document Updates

Version	Date	Modifications
1.0	2001.03.13	Approved Standard
1.1a	2003.02.04	Update of the document to cater for functional block testing – working document – integrated comments from SBT
1.1RfV	2003.02.25	Finalisation of the document for RfV
1.1FV	2003.09.18	Preparation of document for RfV – integration of comments from RfV – deleting of checking of used addresses for E and A-mode in accordance to KSG resolution September 2004
1.1AS	2005-02-24	Publication as AS – no comments during FV cycle
1.2 WD	2008-10	Proposal for update of the document: clarifications of test depth and possible test rationalisation – removal of A-Mode
1.2 RfV	2008-11	Integration of Comments following KonCert November meeting
1.2 FV	2009-04	Integration of Comments following RfV – preparation for submission to FV
1.2 AS	2009-06	Resolution of comments from FV – readying document for publication in V2.0 of the KNX specifications
01.02.01	2013.10.24	Editorial updates for the publication of KNX Specifications 2.1.

Filename: 08_07_01 System Conformace Testing - Interworking Tests v01.02.01 AS.docx
Version: 01.02.01
Status: Approved Standard
Savedate: 2013.10.24
Number of pages: 17

Contents

1 Introduction

This document describes the way the conformity of standardised and non-standardised KNX data types as realized in KNX application programs shall be assessed by KNX accredited test labs. Hints are given as regards ancillary test equipment (be it hard-or software) depending on the used medium of the KNX device to be tested or needed to attribute links and set parameters depending on the supported configuration mode (Easy or System mode).

The description of the interworking tests predominantly focuses on the testing of standardised and non-standardised data types as realised in Group Objects (GO), as this is thought to be the more frequent test case. However, the document also gives requirements on how to test data types if realised as polling values or properties of a KNX interface object.

The purpose of this document (as also reflected in its structure) is to streamline the Interworking tests as carried out in KNX accredited test labs by

- specifying the general requirements for Interworking tests of standardised and non-standardised data types (e.g. test set-up) and
- Laying down an Abstract Test Suite (ATS) applicable to all existing KNX standardised data types, regardless of their implementation as Group Objects, polling values or properties of an interface object.

In view of the multitude of KNX standardised data types, the document does not provide any Executable Test Suites (ExTS). These have to be drawn up by the accredited test labs themselves on a case by case basis: the aptitude of the accredited test labs to establish such ExTS is verified during the KNX accreditation procedure of candidate test labs.

The document has to be read in conjunction with the Interworking parts of the KNX specifications, i.e. Volume 3 Part 7 as well as any application notes related to that same Handbook part.

2 Interworking Tests

Some test tools allow KNX Conformity testing of implemented standardised and non-standardized variable types is carried out by means of a uniform test set-up (for further details see item 3.1). Although interwoven, it is correct to assert that these tests consist of two distinct parts:

1. Functional Testing: These tests do not only check whether implemented (non-) standardised data types correctly communicate on the bus, but also check their respective functionality. However, the purpose of these tests is not to judge the performance of the product but to ensure that the functionality of the product corresponds to what is stated in the specifications supplied along with the product (i.e. what is laid down in a.o. the PIXIT-Proforma).
2. Actual Interworking Testing: These tests shall ensure that tested data types will interwork with data types of the same type and/or that implemented non-standardized data types do not disturb normal bus operation.

3 Test Set-Up Description

Several KNX test tools have been approved for Certification Tests by KNX: contact the KNX Certification Department for information.

The test tools in the test set-up shall be used to test the interworking capability of the BDUT as well as its functionality. The same test set-up can also be used to check standardized as well as non-standardised data types.

The test tools, as part of the test environment, shall emulate:

- a Reference Sensor or a Reference Actuator in case of realisation of data types as Group Objects.
- a polling master or polling slave in case of realisation of data types as polling values;
- a property server or property client in case of realisation of data types as properties.

When the *communication way* of the tested Datapoint is IN, the BDUT (Bus Device Under Test - e.g. binary output, analogue output) receives telegrams and brings about actions. The test tool shall then assumes the role of

- KNX reference sensor in case of Group Object Datapoint;
- polling slave in case of realisation of data types as polling values;
- property client in case of realisation of data types as property values;

When the *communication way* of the tested Datapoint is OUT, after stimulating the BDUT (e.g. push button, temperature sensor) it will send telegrams via the bus. The test tool shall then assume the role of

- KNX reference actuator in case of Group Object Datapoint;
- polling master in case of realisation of data types as polling values;
- property server in case of realisation of data types as property values;

and should trigger an acknowledgement on receipt of the correct telegram.

Note: In case a data type is implemented as a Group Object, it is possible that its use is bi-directional: then this Datapoint can both receive and send information (not recommended according to volume 3/7/1).

The test set-up described below enables the testing of these functions:

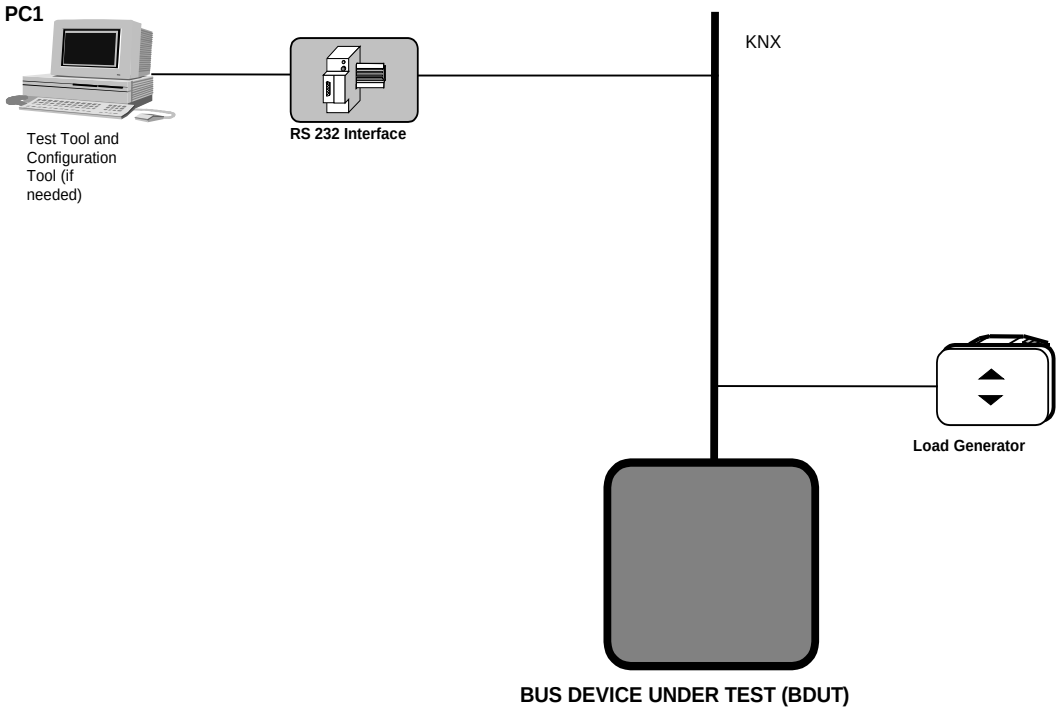

Figure 1: Test Set-Up for testing of (non-) standardised data types

3.1 Hardware

The test set-up is depicted in the above figure and consists of:

- one Bus Device Under Test (BDUT)
- one RS232 interface [1]connected to a PC. Characteristics of the PCs shall fit to the requirements as stated in the user manuals of the used test/configuration tools.
- Medium specific components, e.g. when testing TP1 devices, a power supply and choke module will have to be added to the above test set-up
- a Mains artificial network 50 Ω / 50 µH + 5 Ω according CISPR 16 (Second Edition, Clause 8.2.1) shall only be installed next to the BDUT when the relevant Power Line medium does not provide other means of separation of the test circuit, e.g. standardized PL-filters or mains separation transformer
- Configuration Mode specific components, e.g. an Easy (when testing Easy controller products) Configurator to attribute link information to the BDUT and/or set/modify parameters

Note

a) If necessary, the KNX accredited test lab may incorporate a KNX reference sensor (or polling master/property client) in the test set-up to stimulate IN functions, provided it ensures that this sensor (or polling master/property client) has been duly certified (i.e. certificate issued!) by KNX. For traceability reasons, KNX strongly recommends that telegrams generated by such reference devices are archived, especially if the BDUT for some reason fails the test. Moreover, the use of reference devices shall be documented in the resulting test-report (e.g. in the test set-up description).

[1] will be gradually replaced by USB interfaces. When testing functionality and interworking of KNX IP devices, instead of a serial interface a KNXnet/IP tunnelling server shall be used.

b) An IACK generator, if this is not already generated by the used test tool.

c) A Bus Load Generator[2]: If the Bus Device Under Test consists of a KNX standardized Bus Access Unit (BAU), KNX Conformity testing can be restricted to testing of the BDUT without activated Bus Load Generator.

If however, the Bus Device Under Test contains a non-standardised Bus Access Unit (i.e. a BAU of which the system software has not (yet) been tested) or if a non- standardised Bus Access Unit is tested separately, KNX Conformity testing shall be carried out once with and once without activated Bus Load Generator. This test shall have a purely qualitative and not quantitative nature.

3.2 Software

Different types of software are required. Contact the KNX Certification Department for information on the available KNX Conformity test tools and ancillary test software (e.g. ETS for linking and parameterisation of S-Mode compatible products) for price and provider. Other software packages may also be needed and be provided by the manufacturer.

For S-Mode compatible products, the applicant shall moreover supply the test house with an ETS database containing the product data and the product application(s) to be tested (for E-Mode, this requirement is for the time waived). Prior to its use, the test house shall check whether the BDUT data has been registered by KNX (status of the product shall have been set to “registered” – in case of OEM it is allowed that the manufacturer of the BDUT differs from the actual applicant), in order to ensure compatibility between the tested data and the data on the market.

3.3 Documentation

3.3.1 Required paper input from manufacturer

According to Volume 5 (for further information, see this volume), the manufacturer shall supply additional documents such as:

- PIXIT Header[3]
- for each in/output Datapoint, a filled in Datapoint description form (regardless whether they have been implemented as Group Objects, polling values or properties of interface objects)[3]
- the initial reaction tables of the BDUT[3]
- If desired, the applicant may supply test proposals (e.g. in a form executable by standardised KNX test tools used in the KNX accredited test lab), be it to test standardised or non-standardised data types implemented in the BDUT.

3.3.2 Validation of documentation

Prior to starting the test, this documentation shall be compared to the KNX specifications, as regards compliance to the Interworking Model of Volume 3/7/1, Standardised data types of Volume 3/7/2 and (conditionally) compliance to a standardised functional block of Volume 7 and any application notes that may exist to the before-said documents.

[2] The Bus load generator is available from KNX Association as an application program dowloadable in UP bus coupling units, on which a single push button is mounted. Pushing the rocker plate on top causes the application program to cyclically transmit telegrams, while it halts transmission when pushed at the bottom. The time duration between telegrams can be set via parameters.

[3] This documentation style may deviate from the KNX standardised PIXIT proforma, provided the manufacturer’s documentation provides the same information.

Any submitted test proposal shall also be carefully validated. If necessary, the KNX accredited test lab can make suggestions to modify such files and even has the authority to reject them overall, if they are not considered apt to thoroughly test the BDUT.

In case a product is submitted to certification, for which the applicant claims conformity to a standardised functional block, all features of the functional block shall be checked against the functional block specifications, i.e. in the supplied PIXIT it shall be checked whether:

- all mandatory in/output and parameters are implemented;
- any supported optional in/output and parameters are implemented as given in the functional block specifications;
- the correct identifiers are used;

In case of realisation of Functional blocks as interface objects, via property description read the above shall also be checked by sample tests via the bus.

3.4 Final Test preparation

3.4.1 General test depth rules

The following general rules as regards test depth apply:

1. All Group Objects supported by the BDUT shall be manipulated in the test. If sending, the Group Object shall have been stimulated once in order to verify the resulting telegram. If receiving, an appropriate telegram shall have been sent to the Group Object to check the reaction of the product as declared by the manufacturer.
2. All implemented parameters shall have been tested in at least the default setting and in one other setting different from the default.

Recommendations on how the tests can possibly be rationalised for more complex applications are given in clause 3.5.1.3.

3.4.2 Software Implementation in the Test Set-Up

On the sole PC in the test set-up (PC1), in normal cases one of the standardised KNX test tools is run. For S-Mode compatible products, in addition also the ETS will be needed in order to configure the BDUT and/or change, whenever necessary, parameters of the BDUT by means of download (although in some cases, parameters may only be modifiable via hardware settings).

Any file used in the test tools for KNX conformity testing shall be archived by appropriate means for traceability reasons.

3.4.3 Addressing

Define individual, Group Addresses and all other required parameters of the BDUT.

Note: If addresses must be attributed to all available objects or to a specific object, the manufacturer shall declare this in the PIXIT Proforma and in the product information as supplied along with the application software. If not, the application program has failed the conformity tests.

Recommended test set-up addressing rules are as follows:

a) *as regards Group Addresses:*

- for any mode:

between F000h and F3FFh for Datapoint types with Functions of Common Interest (FOCI)

- for S-Mode to be set via the ETS:

	S-Mode
Group Object 0	0001h
Group Object 1	0002h
…	
Group Object n	000n (+1)h

- in the case of E-Mode devices, the Group Addresses will be automatically set without user interaction.

b) as regards Individual Addresses,

- in S-Mode, the PC1 connected to the EDI shall preferably have the Individual Address 1.0.240, whereby the BDUT 1.0.245. If a manufacturer opts to implement the setting of the Individual Address for S-Mode products with other means than a programming button or LED, these other means shall be properly documented in the PIXIT proforma in order to be able to set the appropriate Individual Address by means of ETS.
- in E- mode, the Individual Address is mostly either set by default or attributed without user intervention. If the Individual Address can be set via user intervention (e.g. code wheels), it is recommended that Individual Addresses are chosen as in S-Mode.

3.4.4 Creating test sequences

Based on this information and in the case where the applicant did not provide a test proposal, the KNX accredited test lab shall create a test set-up, thereby taking into account the default parameter settings of the BDUT, Individual Address, Group Addresses and associations.

In case of S-Mode products, an ETS project shall be created and downloaded in the BDUT, after which telegram sequences for the various OUT and IN functions implemented in the BDUT shall be created and this for the various possible parameter settings (which are then again downloaded into the BDUT by means of ETS).

For E-Mode devices, the addresses shall be attributed by means of the local user interface or other respectively via the appropriate configurator. Subsequently, telegram sequences for the various OUT and IN functions supported by the BDUT shall be defined and this for various possible parameter settings (either via local settings on the BDUT or via the appropriate configurator).

The initial reaction descriptions, which form part of the PIXIT proforma, shall be used as a basis during testing of the reaction of the BDUT after configuration, reset and power failure.

3.5 Validation of Test Equipment

In order to ensure that the Test Set-up properly functions, KNX recommends that prior to starting the KNX conformity tests, the testing body validates its test equipment. This can be done by installing an already certified sample product (e.g. a push button) into the test set-up, by configuring it and by verifying whether transmitting the appropriate telegrams triggers the correct reaction of the sample product and stimulating it generates the appropriate telegrams.

3.5.1 Setting Parameters

3.5.1.1 Default Configuration

In case of S-Mode compatible products, the default configuration is stored in the ETS database as supplied by the manufacturer. These default settings shall be downloaded into the BDUT by means of ETS on PC1.

In case of E-Mode compatible products (Controller mode), it shall be ensured that during the default test, the default settings are configured by the configurator. For all other E-compatible products, parameters can only be set locally (e.g. E-Mode Push button).

3.5.1.2 Parameter Change

Most BDUT's behaviour can be modified by means of parameters, e.g. locally on the device, via parameters that are downloaded in the device, etc. If an application has several parameters, additional tests will therefore be required in order to check the BDUT behaviour in other settings than the default settings and on limit conditions. Such additional tests shall therefore be performed after the default configuration test suite procedure described above.
Important: The BDUT shall be tested in a number of parameter settings, in order to guarantee a profound test of the implemented functionality other than the default setting. It lies in the responsibility of the KNX accredited test lab to assess on a case-by-case basis how often this is necessary. The modification of parameters shall thereby however effectively change the BDUT's behaviour.

Notes

1. Practical experience has shown that in some cases a test lab might be obliged to modify a parameter more than once in order to guarantee a profound test of the submitted application.
   In other cases it might not be necessary to modify all parameters (e.g. if a manufacturer uses the same timer subroutines for different outputs).
   It therefore lies in the responsibility of the KNX accredited test labs to assess on a case-by-case basis how often parameters shall be changed.
2. In case of S-Mode compatible products, note that the settings of parameters may influence the visibility of other parameters as well as available Group Objects.
3. Be sure to document the various parameter settings either separately in the test report or (for S-Mode compatible products) by using the possibility in ETS to print-out a device detail. For traceability reasons KNX recommends that parameter names are given in the language of the used product database (for S-Mode compatible products) or product description supplied by the manufacturer.
4. For time delays it is advised to select a high time factor and a low time base, instead of vice versa.

3.5.1.3 Recommendations for Test rationalisation

1. In some cases, the test of a BDUT in its default parameter setting might show only limited functionality. In that case, the KNX accredited test lab may as a first test step immediately change the BDUT's default parameter settings, if this contributes to testing more of its implemented Datapoints and/or functionality.
2. In the case where functionality of a product is repeated in the form of multiple identical channels (e.g. 16-fold binary out), the KNX accredited test lab
   a. May deviate from the general rule that all implemented objects shall be manipulated at least once, provided the product is tested in its default parameter settings and in at least one other parameter setting.
   b. must not necessarily select the same parameter settings for all channels during a test case. In order to be able to test more functionality, it is recommended to choose different parameter settings for different channels.
3. The testing of parameter settings, of which the functionality can only be tested with considerable effort (large time delays), may be skipped.

3.5.2 Telegram Sequences

Elaborate (a) telegram sequence(s) for the respective parameter settings.

Test steps depend on the product's functionality. Some products act either as actuators (receiving mode) or sensors (transmitting mode) or both. For instance, even a push button may act as an actuator (e.g. its LEDs). Normally, when stimulated, it acts as a sensor and will transmit one or more telegrams on the bus. The general test step running is described above.

a) Test of IN Function

To test the IN function, a telegram sequence shall be created and subsequently used to provoke reaction from the BDUT. This reaction shall then be compared to what the manufacturer laid down in the PIXIT-Proforma (or specified in the comment line next to the telegram). The correct or incorrect behaviour shall subsequently be recorded.

Note

a) As specified in Part 3/7 "Interworking" of the KNX Specifications, partial implementation of any data type in a Datapoint with a communication way in (IN functions) is neither acceptable nor can it be declared as a non-standardised data type. For this reason, be sure to test the entire interworking functionality in Datapoints with a communication way in (e.g. in case of data type 1.001 both switching on *as well* as off).

b) In case of binary bi-directional functions (not recommended according to the KNX Interworking Model but allowed for dimming actuators), when sending the appropriate frame to the IN function, it shall be checked whether the Datapoint generates the expected OUT telegram.

b) Test of OUT Function

To test the OUT function, some of the available standardised KNX Test Tools allow the creation of telegram sequences, which are compared by the tools with the transmitted telegrams resulting from a stimulation of the sensor. The correct or incorrect behaviour shall subsequently be recorded.

Note

1) As specified in Part 3/7 "Interworking" of these KNX Handbook Series, partial implementation of data types is *only* permitted in Datapoints with a communication way out (in general OUT functions). However, when the manufacturer declares full implementation of a data type in a Datapoint with communication way Out, the device shall be stimulated in a sufficient number of settings in order to guarantee a profound test of the implemented Datapoint. It lies in the responsibility of the KNX accredited test lab to assess on a case-by-case basis how often this needs to be done.

4 Running the KNX Interworking Tests

4.1 Start-Up Test Suite Procedure - Configuration

Download the BDUT default product data into the S-Mode compatible BDUT using ETS on PC1.

For E-Mode devices, attribute the addresses via the setting of local user interface or other respectively via downloading with the appropriate configurator. Set the default behaviour either locally or by downloading with the appropriate configurator.

4.2 Checking the BDUT's Reaction after Configuration

Compare the BDUT's reaction after configuration with what the manufacturer has specified in the appropriate BDUT's initial reactions description (as part of the supplied PIXIT-proforma). Behaviour of the BDUT after configuration denotes

- for products commissioned via download the reaction of the BDUT after the complete download procedure[4] of the data ***and*** restart, without disconnecting the device from the KNX system. This download task can be achieved by means of ETS (S-Mode) respectively an E-Mode configurator.
- For any other products not commissioned via download, this reaction of the BDUT may be checked after the (local) assignment of the addresses or even as early as after the connection of the device to the network.

4.3 Checking the BDUT's Reaction after Reset

Compare the BDUT's reaction after reset with what the manufacturer has specified in the appropriate BDUT's initial reactions description (as part of the supplied PIXIT-proforma). Behaviour of the BDUT after reset denotes the reaction of the BDUT after disconnecting and reconnecting the bus voltage from and to the BDUT (e.g. by pulling the connector between device and KNX-bus and reconnecting it).

Note: the behaviour of the BDUT during reset could be different from its behaviour after reset (after the bus voltage has returned to its normal level).

4.4 Checking the BDUT's Reaction after Power Failure

Compare the BDUT's reaction after power failure with what the manufacturer has specified in the appropriate BDUT's initial reactions description (as part of the supplied PIXIT-proforma). Behaviour of the BDUT after power failure denotes the reaction of the BDUT after disconnecting and reconnecting the ancillary power from the application module; the bus shall however not be removed during this operation. This test only relates to BDUT's with an application module powered by an ancillary power supply and not by the bus.

[4] In some cases (e.g. when the BDUT immediately transmits telegrams after download), testing of the BDUT's reaction after configuration might imply that one has to cater for a test set-up with two PC's and two data inferfaces or one PC with two interfaces.

Note

1. The behaviour of the BDUT during power failure could be different from its behaviour after power failure (after the ancillary power has returned to its normal level).
2. Checking the BDUT's reaction after configuration, reset, power failure does not denote checking the state of its various Datapoints (e.g. by sending a Group Value Read to the respective Group Objects). It only denotes checking whether the BDUT's reaction after configuration, reset and power failure corresponds to what the applicant has laid down in the BDUT's initial reactions description (as part of the supplied PIXIT-proforma).
3. If the manufacturer has declared in the supplied PIXIT proforma that the reaction of the BDUT is different when reset and power failure occur simultaneously than when they occur separately, this shall additionally be tested.

4.5 Checking the KNX Interworking Standards

Run the elaborated test sequence(s). In case of an IN-function, check its behaviour on receipt of telegrams with what the manufacturer laid down in the PIXIT-proforma (expected behaviour). In case of an OUT-function, record the transmitted telegrams.

4.6 Test Cases with modified Parameters

Modify the parameters of the BDUT to other settings than the default.

For S-Mode compatible products, run ETS on PC1. Deactivate the ETS software after download of the new settings to the BDUT.

For E-Mode compatible products, other parameters in the BDUT shall be set via local means or via the configurator.

Run the tests of chapter 4.2 till 4.5 with these new parameter settings and with the elaborated telegram sequence(s) for this respective test case.

4.7 Possible additional Tests

4.7.1 Requirements for the Bus Load

4.7.1.1 Repetition Rate

When a BDUT cyclically generates telegrams (this also applies for devices periodically requesting a current state of a Datapoint) the repetition rate shall *always* be limited, either by means of special hardware (strap) or a software feature (parameter).

When a BDUT cyclically transmits telegrams, it shall first be checked in the PIXITs if a telegram limitation has been implemented.

If limitation of the repetition rate is implemented by means of a parameter, it shall be checked if the BDUT halts transmission after the parameterised number of telegrams during the parameterised time delay were sent. This test shall have a purely qualitative and not quantitative nature, thereby using no other special equipment than the tools normally used during testing.

4.7.1.2 Debounce time

Debounce time implemented in a BDUT (e.g. in case of binary inputs) shall be checked by parameterising a high debounce time and evaluating (again qualitatively) whether the BDUT halts transmission of telegrams when the debounce time is lower than the one parameterised.

4.7.1.3 Transmission Priority

By default the transmission priority shall be low (represented by the word "Auto" in ETS), unless the functional block specification allows other settings for some Datapoints.

Testing can include checking the default values of these flags by reading the product description in ETS (in case of S-Mode products) or verification of the values in the control byte of the telegrams generated by products in their default settings (in case of E-Mode products).

4.7.2 Requirement on Data Integrity - Interpretability of Telegrams

Standardised functional blocks always comply with this requirement. Special attention shall be paid in case of non-standardised (structured) Datapoint types, whereby different parts of the Datapoint are evaluated at different moments in time. In this case, it is necessary to split the realised function in different sub functions.

Testing will include analysing the PIXIT pro-forma (especially the non-standardized data type descriptions).

4.7.3 Requirements for an Application Module powered by secondary Power Supply

KNX products, where the application modules have a power supply independent from the bus shall be so conceived that in case of power failure of this supply, it shall not disturb the operation of the bus in any way, e.g. by generating BUSY telegrams. The manufacturer shall indicate in the PIXIT the value state after the secondary power returns (e.g. default) and what will be the device reaction.

Testing will include analysing the PIXIT pro-forma and checking whether the BDUT does not transmit busy signals in case of de-energisation of the secondary power supply. This can be done in the following way:

1. Put the application module in power off state.
2. Send telegrams to the BDUT (it shall not return busy signals).
3. Put the application module in a power on state.
4. Send telegrams to the BDUT again (it shall process the received telegrams).

4.7.4 Test of Routing Counter during Interworking Testing

The KNX specifications lay down that the routing counter shall always be lower than 7, except when justified (e.g. in case of visualization software). During Interworking conformity testing, the testing body shall check whether the BDUT complies with this requirement, by checking the appropriate byte in the transmitted telegrams.

4.7.5 Test of ETS plug ins and S-Mode stand-alone tools

In the exceptional case, where an S-Mode device is programmed by means of an ETS plug in or via an S-Mode stand-alone tool (not recommended for future developments), during commissioning a trace shall be made in order to ensure that commissioning is carried out with KNX conforming telegrams.

4.7.6 Ability of BDUT to respond to a Read Request

The ability of a BDUT to respond to a Read Request is merely an additional test during KNX conformity testing when the box ‘Request’ is ticked in the Datapoint description form.

5 Test Descriptions for (non-) standardised data types

5.1 Introduction

This section consists of: a test description applicable for all available standardised as well as for non-standardised data types consisting of 4 parts:

1. the description and purpose of the test
2. the test procedure
3. the expected results
4. the documentation of test results

5.2 Test Description

5.2.1 Test Step 1 : Test of IN-Function

5.2.1.1 Description and Purpose of the Test

The purpose of the test is to check whether the IN-function of the data type works properly.

5.2.1.2 Test Procedure

If necessary synchronise the BDUT as described by the manufacturer in the submitted documentation.

Elaborate a sequence of telegrams on the basis of the documentation submitted by the applicant. KNX recommends that all telegrams in the sequence are accompanied by details on the expected BDUT behaviour. Be sure to test the entire data type.

Transmit the telegrams.

5.2.1.3 Expected Results

Check whether the telegrams were answered by the BDUT with an ACK (if appropriate).

Check whether each telegram in the sequence has caused the expected reaction of the BDUT. This can be done by comparing the observed reaction of the BDUT with what was documented in the comment field while creating the telegram sequence.

In case of a claimed compliance to a functional block (including a state machine), conformity to this state machine shall be explicitly tested.

5.2.1.4 Documentation of Test Results

Document the correct or incorrect BDUT behaviour.

5.2.2 Test Step 2 : Test of OUT-Function

5.2.2.1 Description and Purpose of the Test

The purpose of the test is to check whether the OUT-function of the data type works properly.

5.2.2.2 Test Procedure

If necessary synchronise the BDUT as described by the manufacturer.

Some standardised KNX Test tools allow the elaboration of sequences of expected telegrams (separated by time delays) on the basis of the documentation submitted by the applicant. KNX recommends that all telegrams are accompanied by instructions how to stimulate the BDUT in a comment field.

Start the prepared test sequence. Prior to the elapsing of the time delay of the first expected telegram, stimulate the BDUT according to the applicant's specifications. Stimulate the BDUT again and again till all expected telegrams in the sequence have been recorded.

5.2.2.3 Expected Results

Some standardised KNX Test tools will automatically compare the received telegrams to the expected telegrams, as defined by the prepared telegram sequence and automatically document the test result. If the tool does not allow the above, manual comparison might be necessary.

5.2.2.4 Documentation of Test Results

Document the correct or incorrect BDUT behaviour or – if necessary - modify the automatic documentation of the result by the standardised KNX Test tool.

