

V1210

KNX Training

Requirements for Training Centres

KNX Certification Department

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KNX Association



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1 Explanation of some basic terms

KNX-certified training centre: training centre with or without ISO-9001 certification, which is accredited by KNX Association for the organisation of basic courses concluded by the KNX exam.

KNX+ certified training centre¹: training centre which is accredited by KNX Association for the organisation of basic courses concluded by the KNX exam as well as advanced courses.

KNX++ certified training centre: training centre which is accredited for the organisation of tutor courses.

'KNX course': can be a basic course, advanced course or tutor course

2 Introduction - Principle aspects as regards KNX-Training

The skilful application of KNX requires sound knowledge of all persons involved. Training measures are therefore required towards:

- ✚ Selection of bus devices and installation material;
- ✚ fields of application and main applications of the KNX bus system;
- ✚ selection of the bus topology in view of the construction of the building and the desired functionalities;
- ✚ planning of the to be installed bus system;
- ✚ installation, thereby taking into account the relevant regulations (e.g. lightning protection, electromagnetic compatibility, etc.);
- ✚ Commissioning and servicing of KNX installations.

Once registered, each training centre receives training documentation² from KNX Association, which will help convey the necessary level of knowledge to various professional groups.

Registered and/or authorised/certified training centres may modify this documentation according to the bus devices used during courses and to their own local and organisational needs. Training centres that are at least authorised or certified have access to the master copies of the KNX exam papers.

¹ Can be with or without ISO 9001

² Can be basic course documentation, advanced course documentation or tutor course documentation

3 General minimum requirements as regards organisation of certified training centres

In order to be able to ensure the quality and topicality of the training, it is recommended that a KNX or KNX+ certified training centre at least organises four KNX training sessions (basic courses which are concluded by a KNX exam or a complete KNX advanced course) within a calendar year.

A certified internal or external tutor shall conduct the theoretical part of the KNX basic course. It is recommended that a KNX certified training centre has at least one KNX certified tutor on the payroll.

At the end of each KNX course each certified training centre shall carry out a written survey to assess the satisfaction of the students as regards the organised course. Prior to each course, a certified training centre shall acquaint the students with the required safety procedures.

The underneath documents shall be archived for at least the underneath specified time:

applications for course participation	3 years
trainee satisfaction surveys	3 years
filled in KNX exam papers ³	Papers of the last two conducted exams

The training centre shall ensure that

- ✚ the revision status is clearly marked on the training documentation and other training accessories (overhead slides...)
- ✚ new versions of the training documentation and training accessories as supplied by KNX Association are immediately used during courses.

³ Results of the practical test can be archived in paper or electronic form (e.g. printed out by Acrobat or similar).

4 General minimum requirements as regards available equipment at KNX training centres

4.1 General

- ✚ Subdivision of all training rooms into tutor and practical areas (recommended)
- ✚ at least one practical training site per every two students

4.2 Media equipment

- ✚ Flip chart/board
- ✚ Large image projection, e.g. beamer

4.3 Personal computer of the tutor/student⁴

- ✚ according to the current system requirements for the valid ETS (minimum requirements as given for the then valid ETS)
- ✚ At least one ETS Professional Full version installed on the tutor's PC respectively ETS Lite versions at the available student PCs

4.4 Equipment of the practical training sites

4.4.1 Basic course

- ✚ Laboratory working tables with KNX system or similar mobile installation
- ✚ KNX devices and components fit for practical courses. Devices for the following functions must be available for basic courses:
 - switching
 - dimming
 - drive control
 - connection of at least two TP1 lines (couplers must be available for each laboratory working table)

4.4.2 Advanced course

- ✚ For advanced courses, the tutor shall at least have a laboratory demonstration table with products available on the market for the underneath specified functions:
 - Heating (individual room control and fan coil control)
 - Security technology (logical modules and input devices with monitored cables)

⁴ The tutor shall at any rate have a personal computer. The PC equipment for the students may be rented or brought along to the course by the student him/herself.

5 Requirements for tutors

Successful attendance of a KNX tutor course

KNX - tutor courses are organised by KNX++ certified training centres. Persons interested in attending a KNX tutor course should contact the training centre which will organise the next tutor course. A list of the training centres can be found in the KNX Association web pages. It shall be possible to inspect the acquired KNX tutor certificate at all times.

Teaching experience

KNX - tutors should be able to present proof of educational knowledge and experience in technical adult training.

Practical experience in conventional electrical installation techniques

The KNX tutor should be familiar with the conventional electrical installation techniques. Only in this way is he able to assess the application of the KNX bus and spell out convincingly its advantages.

Knowledge of other bus systems in Building System Engineering and building automation

As the KNX bus system is frequently compared to other bus systems in building system engineering and building automation, KNX tutors should be capable of explaining similarities and differences between different bus systems and be able to convey this to the students.

Update of tutor knowledge

The tutor shall keep him/herself continuously up to date with the latest KNX developments in any or several of the underneath ways:

- ✚ Study of any new versions of the KNX tutor documentation made available electronically to certified training centres;
- ✚ Participation in the annual KNX conference for training centres;
- ✚ Study of the bi-annual KNX journal;
- ✚ Study of KNX related product documentation;
- ✚ Visits to national or international fairs;
- ✚ ...

The level of qualification of all tutors shall be documented to allow inspection.

6 Requirements as regards KNX courses

6.1 KNX basic courses concluded with a KNX certificate

Training documentation is put at the disposal of training centres that have applied for KNX certification. This training documentation offers material on such topics as:

- ✚ KNX System arguments
- ✚ KNX Communication
- ✚ KNX Topology
- ✚ KNX TP1 Telegram
- ✚ KNX TP1 Bus devices
- ✚ KNX PL 110 Powerline
- ✚ KNX TP1 Installation
- ✚ KNX Project Design ETS Professional: Basic
- ✚ KNX Project Design ETS Professional: Advanced (only for informative purposes)
- ✚ KNX Commissioning ETS
- ✚ KNX Diagnostics & Trouble Shooting ETS

A KNX basic course can be concluded with a KNX certificate if the following conditions are met:

- ✚ if a course comprised at least 40 training hours⁵;
- ✚ if the trainee attended at least 75% of the total course;
- ✚ if the course conveyed all topics dealt with in the KNX basic course documentation;
- ✚ when the theoretical part was taught by a tutor, who has successfully attended a KNX tutor course (a tutor attending practical classes must at least hold a certificate of a basic course;
- ✚ at least one tutor shall be available for every 16 trainees during practical classes;
- ✚ when the proportion of practical classes added up to at least 50% of the entire course duration⁶;
- ✚ when the student has successfully passed the KNX exam (exam regulations see paragraph 8).

The compliance to the above mentioned requirements shall be documented for each held KNX basic course to allow inspection (a.o. by means of a **course program**).

Should the training centre on the basis of the KNX training documentation establish own documentation, a cross reference list must be available, showing how the subjects of the KNX training documentation are dealt with in the own documentation. Such a list must be kept up to date with new releases of the KNX and own training documentation.

⁵ One training hour equals 45 minutes – 40 hours include the duration of the KNX-exam

⁶ Consequently, the course duration can only be reduced at maximum half the duration by distant learning. The practical training as well as the exam shall at any rate be organised at the training centre itself.

6.2 KNX advanced course concluded with a KNX certificate

KNX Association offers training centres that have applied for KNX+ certification, advanced course documentation on the following topics:

Nr.	Topic	Hours
1	Fail-safe planning	2
2	Flags	2
3	Heating	4
4	Integrated applications	4
5	Interworking	2
6	Couplers	6
7	Lighting control	4
8	Security technology	4
9	Logic operations	4
10	Visualisation Systems	4
11	Supplementary Tools ETS	2
12	Practical exam	2

Persons interested can only apply for an advanced course if they meet the following requirements:

- ✚ Submission of a KNX basic course certificate

A KNX advanced course can only be concluded with a KNX certificate when underneath requirements have been met:

- ✚ If the course comprised at least 40 training hours⁷
- ✚ if the course conveyed all topics dealt with in the KNX advanced course documentation;
- ✚ when the theoretical part was taught by a tutor, who has successfully attended a tutor course (a tutor attending practical classes must at least hold a certificate of a basic course);
- ✚ at least one tutor shall be available for every 16 trainees during practical classes;
- ✚ when the proportion of practical classes of KNX courses added up to at least 50% of the entire course duration;
- ✚ if the trainee attended at least 75% of the total course;
- ✚ When the student passes the final exam (practical). The exam regulations are identical to those of the basic course (see paragraph 8), however only consists of a practical exam (error finding, telegram/device analysis, project design).

⁷ One training equals 45 minutes – 40 hours include the duration of the KNX exam

The compliance to the above mentioned requirements shall be documented for each held KNX advanced course to allow inspection (a.o. by means of a **course program**). Should the training centre on the basis of the KNX training documentation establish own documentation, a cross reference list must be available, showing how the subjects of the KNX training documentation are dealt with in the own documentation. Such a list must be kept up to date with new releases of the KNX and own training documentation.

6.3 KNX tutor courses concluded with a KNX tutor certificate

KNX Association offers training centres that have applied for a KNX++ certification⁸, tutor documentation for underneath mentioned topics:

- ✚ KNX Requirements for training centres
- ✚ Structure and Scope of KNX Association
- ✚ KNX Software
- ✚ History of Bus systems
- ✚ Serial data transmission & KNX Protocol
- ✚ Microcontrollers
- ✚ KNX application program
- ✚ IP Communication
- ✚ KNX certification scheme for products

Remarks:

- ✚ The tutor course includes:
 - NO pedagogical or didactical training of the course participant
 - NO KNX marketing training
- ✚ In order to prepare the course participants, the tutor documentation must be sent at least 2 weeks prior to the course.

Persons interested can attend a tutor course if they meet the following conditions:

- ✚ Submission of a KNX certificate proving successful participation to an advanced course or successful completion of the practical exam of the advanced course prior to the tutor course;
- ✚ Experience with the current version of ETS (consequently, it is recommended that the above certificate was acquired a maximum of two years before participating to a tutor course);

⁸ Dependent on the market situation, KNX Association has the right to refuse the application

A KNX tutor course can only be concluded with a KNX certificate when the following requirements have been met:

- ✚ When the course comprises at least 24 training hours⁹;
- ✚ if the course conveyed all topics dealt with in the KNX tutor documentation;
- ✚ when the theoretical part was taught by a KNX certified tutor¹⁰, who has successfully attended a KNX tutor course (a tutor attending practical classes must at least hold a certificate of a basic course;
- ✚ at least one tutor shall be available for every 16 trainees during practical classes;
- ✚ when the proportion of practical classes of KNX courses added up to at least 50% of the entire course duration;
- ✚ when the course participant has passed his exam (theoretical) with 60% of the marks. Identical exam regulations as the exam for basic courses (see paragraph 8), however only theory, which shall be passed with 60% of the marks.

The compliance to the above mentioned requirements shall be documented for each held tutor course to allow inspection (a.o. by means of a **course program**).

Should the training centre on the basis of the KNX training documentation establish own documentation, a cross reference list must be available, showing how the subjects of the KNX training documentation are dealt with in the own documentation. Such a list must be kept up to date with new releases of the KNX and own training documentation.

6.4 Other courses (not basic courses, advanced courses or tutor courses)

For all other KNX courses, which do not comply with the above requirements a training centre may only hand out an attendance confirmation.

Prerequisite for KNX attendance confirmations shall be a documented presence of the trainee of at least 75% of the entire course duration.

⁹ A training hour equals 45 minutes – 24 hours include the duration of the KNX exam

¹⁰ tutor must have passed his tutor exam with an overall mark of 75%

7 Minimum requirements as regards the KNX basic, advanced and tutor certificate

Since the introduction of the KNX Online Shop authorised/certified training centres are not obliged to issue KNX paper certificates anymore to students who have passed their KNX exam. However, if the training centre decides to issue such a paper certificate, it must do so on uniform KNX paper according to the sample certificate in annex. If the training centre decides to issue a KNX Certificate it must contain the following details:

- + name, date and place of birth of the student
- + title and contents of the course
- + duration and time of the course
- + date of issue, name of training centre (with logo of the training centre)
- + place of examination
- + signature of Head of Training and KNX certified tutor

A basic course certificate is a prerequisite for the partnership contract. Passing the advanced course gives the student the right to an extra entry of this qualification in one's KNX partner details.

8 KNX basic course exam

Objective	<ul style="list-style-type: none"> + Proof of the KNX knowledge conveyed during the KNX basic course + proof of self-acquired KNX knowledge + proof of KNX knowledge acquired at courses at non-certified training centres
Prerequisites	<p>The KNX exam may only be held by KNX authorised or certified training centres. These training centres also have the right to offer this KNX exam separately for students of non-certified training centres or for KNX self-educated persons. In this case the course participant should always receive a copy of the latest version of the basic course documentation.</p>
Contents	<ul style="list-style-type: none"> + Theoretical exam made on the basis of the standardised KNX examination papers <ul style="list-style-type: none"> ▪ the duration of theoretical exam equals 90 minutes; ▪ prior to each held theoretical exam, the training centre shall select 50 questions from the theoretical KNX examination paper, thereby taking into account that at least 20% of the questions shall differ from the questions of the previous exam. Each correct answer counts for one point. + Practical exam: planning, commissioning and diagnostics of a predetermined KNX project. <ul style="list-style-type: none"> ▪ the duration of the practical exam equals 90 minutes

	<ul style="list-style-type: none"> ▪ the maximum marks that can be given per question are reflected in the exam papers.
additional regulations	<ul style="list-style-type: none"> ✚ any documentation may be consulted by the student during the exam; ✚ the minimum marks for both the theoretical as well as the practical examination equals 50%; ✚ after termination of the exam, the exam papers may be consulted <u>personally</u> by the individual students in the presence of the KNX tutors. The exam papers may however never leave the KNX certified training centres, whether on paper or on an information medium; ✚ the training centres must offer each student the possibility to consult his/her exam papers up to three months after he/she took the KNX-exam. The KNX training centre shall at least archive the papers of the last two performed exams; ✚ when the student does not pass the exam, merely an attendance confirmation may be handed out to him/her; ✚ the exam may be repeated unrestrictedly; ✚ The theoretical as well as the practical part shall always conclude the KNX basic course.
Target group	<ul style="list-style-type: none"> ▪ students of the KNX basic course ▪ students of non-certified training centres or KNX self-educated persons
Degree	KNX - certificate after passing the exam (optional)
Duration	180 minutes

9 The KNX Certification procedure for training centres – procedure

9.1 Registration phase:

The interested training centre completes the KNX questionnaire for certification and returns it to KNX Association (with a statement whether it's an application for KNX certification or - when desired – KNX+ certification¹¹). The training centre is subsequently registered and has access to the current electronic version of the KNX training documentation. Registration status expires after one year and can be extended.

9.2 Authorisation phase (right to hand out KNX certificates):

When the registered training centre has supplied a copy of the KNX tutor certificate as acquired by its KNX tutor as well as lists/photos of the KNX equipment and media equipment in place to KNX Association, the training centre shall be subsequently authorised for the organisation of basic courses with KNX exam and/or (when applied for) advanced courses. The authorisation phase is restricted to 2 basic courses with KNX exam or 2 advanced courses and lasts one year.

9.3 Inspection phase:

Compliance to the ISO 9001 standard is recommended.

On the basis of supplied documentation, the entire set of KNX requirements is checked for compliance.

Note: Training centres that have already been KNX certified for the organisation of basic courses can apply for extension of their certification to advanced courses by the submission of documents showing the compliance of the additional requirements.

9.4 Certification phase:

KNX Association grants the respective KNX certificate after successful assessment of the requested documentation.

9.5 Surveillance phase:

When the training centre is certified according ISO 9001, the continued compliance to the requirements is checked by a renewed submission of an ISO 9001 certificate after three years.

When the training centre has not been certified according ISO 9001, KNX Association has at any time the right to request documentation at the certified training centre showing the continued compliance to the KNX requirements. These documents must reach KNX at the latest 3 weeks after KNX' request. KNX Association has the right to organise surprise inspections at KNX certified training centers.

¹¹ A KNX++ certification requires a separate application

10 KNX Certification Procedure for training centres – Annual Fees

- ✚ 500 EUR for the continuous update of the KNX training documentation

11 KNX Certification Procedure for training centres – advantages

11.1 Privileges without ISO 9001 Certification

- ✚ right to use the KNX training centre logo according to the KNX guidelines
- ✚ price for purchase of ETS Professional: **1/3 of the normal price**
- ✚ right to hand out KNX certificates (optional)
- ✚ right to receive KNX training documentation in electronic form
- ✚ purchase of paper copies of the KNX training documentation at KNX Association for 9,90 EUR

11.2 Additional privileges with ISO 9001 Certification

- ✚ Price for the purchase of ETS Professional licenses: **1/4 of the normal price**

12 Possibilities for co-operation for non-certified training centres

- ✚ purchase of paper copies of the KNX basic/advanced course documentation as a basis for the preparation of course participants for a KNX exam at a certified training centre, at a price of 11,30 EUR per copy.
- ✚ Price for the purchase of ETS licenses: **1/2 of the normal price**

Annex I

KNX Training center



Certificate

Mr. John Jones
born on 15 May 1952
in London

has successfully attended the

KNX basic course concluded by the KNX exam

The KNX-basic course was organised at the above mentioned training center from xx.xx.20xx till xx.xx.20xx. The KNX exam consisted of:

- ✚ **Theoretical exam** based on the uniform KNX training documentation (KNX System Arguments, KNX Communication, KNX TP1 Topology, KNX TP1 Telegram, KNX PL 110, KNX Bus Devices, KNX TP1 Installation, ETS Project Design, ETS Commissioning, Diagnostics & Trouble Shooting ETS)
- ✚ **Practical exam** - planning, commissioning and diagnostics of a predetermined KNX project

Examination location: Tinseltown, 20 February 20xx

.....
Head of Training Center

.....
KNX certified tutor

Annex II

KNX Training center



Certificate

Mr. John Jones
born on 15 May 1952
in London

has successfully passed the

KNX basic course exam

The KNX-exam was held at the above mentioned certified training center on xx.xx.20xx and consisted of

- ✚ **Theoretical exam** based on the uniform KNX training documentation (KNX System Arguments, KNX Communication, KNX TP1 Topology, KNX TP1 Telegram, KNX PL 110, KNX Bus Devices, KNX TP1 Installation, ETS Planning, ETS Commissioning, Diagnostics & Trouble Shooting ETS)
- ✚ **Practical exam** - planning, commissioning and diagnostics of a predetermined KNX project

Examination location: Tinseltown, 20 February 20xx

.....
Head of Training Center

.....
KNX certified tutor

Annex III

KNX Training center



Certificate

Mr. John Jones
born on 15 May 1952
in London

has successfully attended the

KNX advanced course with concluding exam

The KNX advanced course was organised at the above mentioned training center from xx.xx.20xx till xx.xx.20xx and consisted of the following topics:

- ✚ Fail-safe planning
- ✚ Flags
- ✚ Heating
- ✚ Integrated applications
- ✚ Interworking
- ✚ Couplers
- ✚ Lighting Control
- ✚ Security technology
- ✚ Logic Operations
- ✚ Visualisation Systems
- ✚ Supplementary tools ETS
- ✚ Practical test (error finding, telegram/device analysis, project design)

Examination location: Tinseltown, 20 February 20xx

.....
Head of Training Center

.....
KNX certified tutor

Annex IV

KNX Training center



Attendance confirmation

Mr. John Jones
born on 15 May 1952
in London

has attended the training session

KNX

Course title: KNX Basic course

Contents:

- + KNX System arguments
- + KNX Communication
- + KNX TP1 Topology
- + KNX TP1 Telegram
- + KNX Bus devices
- + KNX PL 110
- + KNX TP1 Installation
- + ETS Planning
- + ETS Commissioning
- + Diagnostics & Trouble Shooting ETS

Duration: 12.02.20xx – 15.02.20xx
40 training hours

Tinseltown, 20 February 20xx

.....
Head of Training Center

.....
KNX certified tutor