How To Pick And Choose KNX Equipment?

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SMARThome.eu

CONTENTS

Which KNX subsystem to choose?

The KNX system

The KNX is a wholly new installation system, existing since 1990, devised by top European manufacturers. The KNX installation (previously EIB) is the nervous system of the building, incorporating in itself all building management systems. It serves to actuate, control, signal, adjust and oversee electrical equipment installed in commercial construction. It replaces the classic electric installation that cannot cope with the users' growing demands.

At any time, the user can alter the functions of any component (i. e. change the function of a switch - from turning on the main light to rolling down the window blinds) without the need to introduce any changes to the electric installation! Such a system has ample advantages in utility buildings as well as houses/flats without clear divisions (open space). In place of control consoles one can at any time install a display informing on the state of each component (i. e. alarm system on, window blinds closed, temperature 22 $^{\circ}$ C), the combination lock keypad, motion detector, special system management software, etc.

Currently over 300 manufacturers participate in KNX (overseeing the keeping to unified technical parameters and coordinating development work), delivering products comprising the broadly understood KNX offer. The European Installation Bus, jointly developed and promoted, had become standard in the countries of the European Union, de facto dominating among intelligent electric installations. For users of the system this means access to services independently of the manufacturer, options of upgrades at any time, and avoiding the danger of having to use a local home automation system that had been unsupported for years - as well as security of operation, proven through hundreds of executed installations.

KNX appliances can be found in a growing number of office or commercial buildings, as well as homes. In recent years they had been driving conventional solutions used in home automation equipment off the market. Our experience shows they are the better both technically, functionally as well as economically.

KNX device selection

Scope of information required to select KNX equipment

- determination of the count and power of lighting circuits (switching, dimming - also for CFLs, transformer type for halogen lamps)
- determination of the count and power of individual controlled outputs (to which i. e. standing lamps will be connected)
- determination of the count and power of all other circuits which we want to control (heating of floors, mirrors, driveway; fans, blinds, etc.)
- maximum dimensions of places for junction equipment (height, width, depth)
- power rating assigned to site (current and target value)
- determination of functions to be started from a given console to pick the type of control console and the button count.

Types of equipment by use

- System devices (power supply, communication connection, surge protector)
- Lighting control devices (switching and dimming)
- Devices controlling external and internal window blinds, marquees, roof windows and curtain motors)
- Devices controlling heating - radiators, floor heating, pump heating, thermal heat pump, collector, furnace, air conditioners, ventilators
- Sensors of air parameters, atmospheric conditions, alerts, emergencies
- Devices to integrate the KNX system with the alarm system, the audio/video system, the entry phone and the Internet
- Devices for management of energy, remote and central control

System units

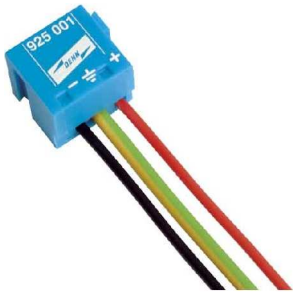
Power supply

Other names: Spannungsversorgung (German). Net prices from 157 €

The power unit supplies 24 V DC to the bus cable and the units connected to it. Thanks to the built-in battery (option) it ensures protection against power cuts lasting up to two hours. If i. e. we had set different temperature values in various rooms we can rest assured that in case of a temporary power cut the system will still remember our settings.

Power supplies of power: 160mA (Lingg & Janke, Zennio), 320mA (Gira), 640mA (Berker)

Surge protection connector



Other names: Surge protection for signal systems

Serves to protect all devices in the line against the effects of electric power surges, which often may be irreparable damage to the equipment, which in turn makes their replacement essential.

Surge protection connectors are recommended in particular for:

- bus equipment connected to the 230 V grid or other systems (i. e. heating or water system);
- devices placed on walls in which other networks are routed, i. e. water, heating, gas lines;
- for line and field connectors in both lines;
- at ends of KNX bus lines;
- at wire outputs to outside of building or at wire input from outside.

USB/LAN Communication connector

Installed in the switch cabinet, it allows the maintenance personnel of the execution company to program the system directly from the main switch room. In case of i. e. wanting to change the functions of a given console, the maintenance specialist using a computer and a USB/LAN connection can reprogram it without needing to disassemble it. Also, changing the function of a console can take place remotely from the offices of the company if we also have a remote update server installed apart from a home LAN. In effect, the customer can change the parameters and functions of a system indefinitely without ever needing to physically alter the system.

USB Communication connectors (Siemens, Busch-Jaeger, b+b Automation)

In case of large distances between the seat of the contractor and the executed investment, the option of remote system updates is useful. Thanks to a proper module, the investor may save on costs of changes and updates, which are cheaper when done remotely than having specialists drive a long way. For this purpose, a LAN connection is required, with an Internet connection having a fixed IP address.

LAN connector (ABB) and bus power supply unit with LAN connector, PC-controlled (Elsner)

Line coupler

Other names: Linienkoppler (German). Net prices from 350 €

This unit divides the lines of the KNX bus. It blocks telegrams addresses to modules installed on the same line (telegram filtering).

System update lock

Other names: EIBWächter (German). b+b Automation, net price approx. 500 €

Locks software changes in a given KNX system (reconfiguration, programme readout, adding and configuring devices).

More in the document Update_lock.pdf

Diagnostic module (ABB DSM/S 1.1 – net price 55 EUR)

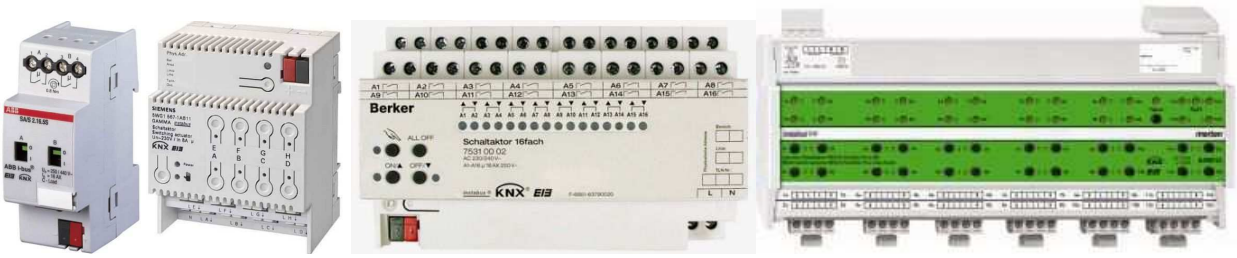
Allows quick diagnostics of the KNX system, displaying the communication load status. A communications error may be reported by contact shorting (a connected signal unit will be actuated). In addition, the module includes a choke to suppress short circuits and interference on the KNX bus. Together with a complete surge suppression unit from ABC (general, intermediate, precision fuses) provides complete protection of the KNX bus.

Actuators

Binary outputs

Other names: binary actuator, binary ausgang, Schaltaktor

Outputs play a vital role in the transmission of electric current to each device. In the switch cabinet, usually outputs with 1-16 terminals are installed necessary i. e. for switching lighting or outlets on and off, and for control of heating and air conditioning.



Binary output 2x 16A (ABB), 8x2A (Siemens), 16x16A (Berker), 24x 10A (Merten)

Binary outputs produced by Busch-Jaeger (2x, 4x, 6x, 8x)

Binary output s mounted in backbox 1x, 2x (Siemens)

Binary output (ON/OFF)	DIN rail	Backbox

1x		114 €
2x	229 €	134 €
4x	236 €	
6x	399 €	
8x	382 €	
12x	438 €	

Net prices depend on producers.

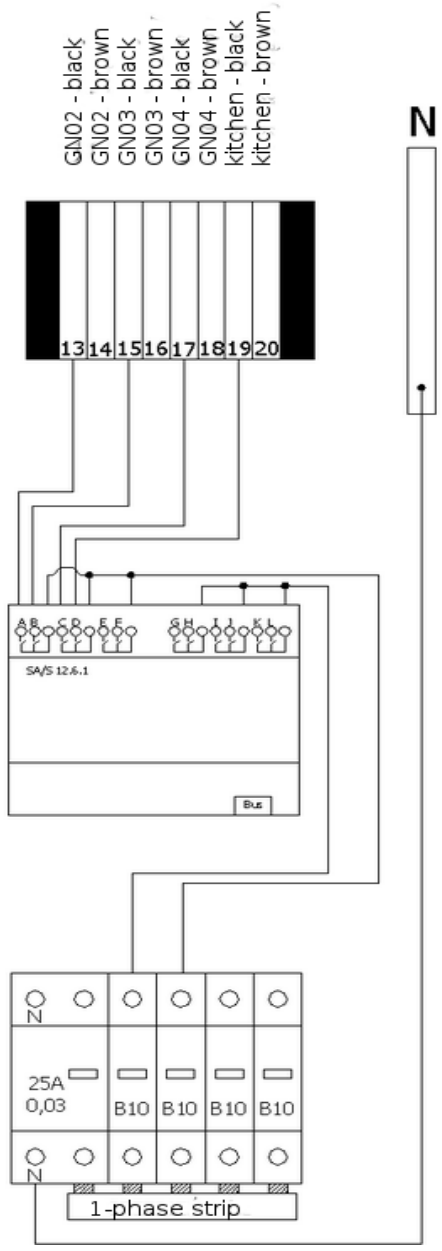


Diagram of typical use of binary outputs and their connection in the junction cabinet

Heating actuator

Other names: Heizungsausgang (German)

Devices to provide voltage to actuating drive (after receiving signal from thermostat, drives are described below). It fulfils thus the same task as a binary (relay) output, however there is no relay, thus there is no noise (important when controlling the bedroom radiator) and fail-safe (a relay usually lasts approximately 100.000 cycles, which amounts to 3-10 years of work in case of heating).

Heating actuators: 1x (Jung to backbox), 4x (Theben Din-rail) i 6x (Hager Din-rail)

Actuating drive

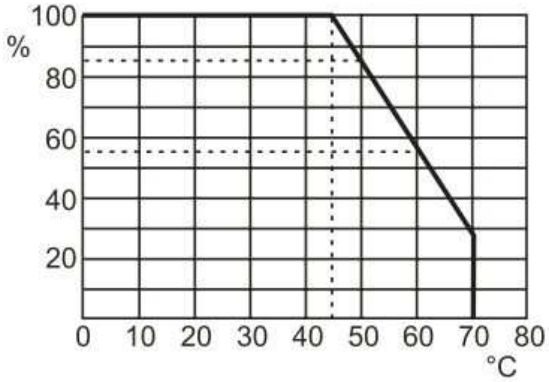
Other name: Stellantrieb (German)

Actuating drive installed on heater valve (or valve in heating splitter), with an oil-filled chamber. When the actuating drive receives voltage (there are versions for 230 V AC and 24 V DC), the oil is heated and expands, thus the valve is pressed in, the water flow closed, and the radiator temperature is reduced.

Actuating drives (net prices approx. 30 €)

Advices

- for control of lamps on nightstands or the desk lamp - they are only required when we are within arm's reach of them, so turning them on by hand does not differ from pressing a smart button, which may be a hundred times more expensive than the switch on the lamp's cable. It's worth controlling them, however, if they are to be part of light scenes, that is why lamps standing i. e. in the living room, despite having their own switch on their power cable, should rather, I would say, be included in the system.
- in bedrooms, guest rooms having 1-2 lamps - there is simply no way for the 'intelligence' in these rooms to present its merits (light scenes, multifunctional consoles). Rather leave the smart consoles to rooms having above three lamps, a window blind and/or heating we really want to control.
- During determination of required dimmer power, the temperature around the dimmer needs to be considered - the higher it is, the lower the maximum dimmer power. Dimmer power is diminished by 10% with each 5 °C over 25 °C of ambient temperature; by 15% in case of installation in wooden, plaster or empty walls; by 20% in case of assembly in multiple sets. See the sample diagram:



- Actuating outputs should not be used in heating splitters i. e. in the bedroom, because the 'clicking' of the relay may be irritating - it's better to use contactless heating actuators.
- Valves cutting off the water supply to the radiators (done via actuators) is better located at splitters, not at the radiators, because during opening/closing the water running through them tends to 'hiss' loudly, which might be irritating for anyone in the room.
- In bathrooms, toilets, wardrobes, where one only has floor heating, I advise against controlling it via the smart home system - it's cheaper and better to use popular thermostats by DEVI which adapt very well to the inertia of the heated area (usually 2-3 cm of concrete).

Control consoles in rooms

What are the types of control consoles?

The KNX systems offers the comfort of free selection of the devices visible in the rooms (control consoles, motion detectors, LCD panels, etc.), so that they fit your needs and possibilities in terms of functionality and aesthetics. On our offer you will find products by world market leaders (among others by ABB, Berker, Gira, Hager, Jung, Merten), which warrants highest quality. Apart from standard, typical devices, our offer is constantly supplemented with new items following the most modern trends.

Available in a variety of colours and shapes, they can have any number of buttons, a thermostat and a display. One of their main tasks is the control of lighting, meaning - the switching of lamps in the room. Specific light control zones can be assigned to each button, i. e. the first button can control the sconces, the second one lamps, etc., all depending on our wishes. Another function of the consoles is control of the heating and air conditioning. In case the temperature in the room drops below a value set by us, the thermostat embedded in the console will cause it to be raised again; in a reversed case it will switch on the air conditioning. Depending on the programming, the display can show the current temperature, the mode of operation, data on the operation of the heating or air conditioning equipment, etc.

Which control consoles to choose?

First of all, one needs to determine, which functions should be implemented in them. Typical functions are (in brackets the number of buttons required by a specific function):

- switching of a lamp or outlet (1)
- switching of a lamp + light intensity adjustment (2)
- window blind (curtain rail) control, or control of a group (2)
- opening/closing of a gate, door, roof window (1)
- selection of a scene, switching on of a central function (1)
- OFF function - to turn of all lamps, i. e. when exiting the room or before a scene is selected (1)

Examples of scenes and central functions:

- ***scenes*****:** guests, cleaning, coffee break, film, reading, dinner party, cooking, dinner, date, sleep (turns off all lamps, rolls down the blinds, arms the alarm system), wake-up, alarm (turns on all outside lamps to scare the intruder away)
- ***when exiting the room*** - turns off all lights
- ***when exiting the house*** - turns of all lights, rolls down the blinds, decreases the heating
- ***when entering the room*** - turns on a few lamps, raises selected blinds, increases the temperature
- ***raising/lowering of all window blinds***
- ***switching of all external lamps*** - automatic start-up at dusk is also possible

What can be controlled?

Practically everything can be controlled, in particular: lighting, ventilation, heating, air-conditioning, air humidifier, window blinds, marquees, curtains, gates, doors, roof windows, rainspout and driveway heating (to protect against frost), and arming of the alarm system (disarming is effected by entering a code on the keyboard).

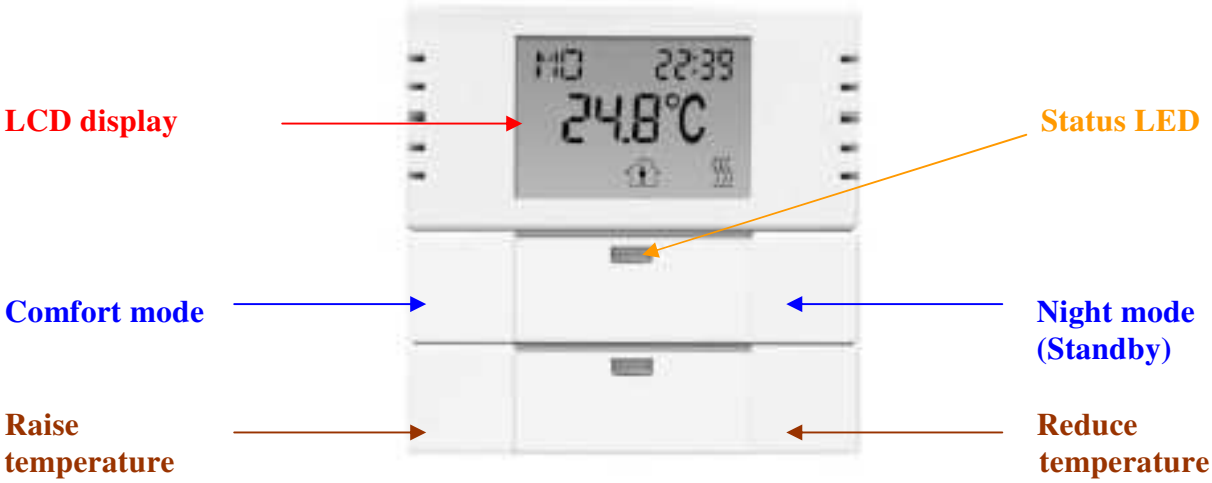
Examples of useful additional functions:

- septic tank overflow notification
- open window notification (to remember to close it before leaving the house)
- pump failure notification

One should calculate the number of buttons that are required to effect all functions planned for a room, and then select a console option of your choice, considering one large one or several smaller ones. When calculating, do not forget the lamps outside of the house that have to be controlled i. e. from the living room (and optionally via a radio remote control

Functions and capabilities of consoles

Solo LCD Console



Sample button functions shown above

The LCD screen provides information on current temperatures and mode of operation, as well as the date and time. Illumination is optional, it can be switched on or off.

Mode of operation. The Thermostat has four operation modes programmed:
- comfort mode: the temperature is set to a value providing normal (comfortable) use of the room. This mode is selected by pressing the top left button.
- night mode (standby): the room is not used for a longer time during the night, so the thermostat reduces the temperature, returning to the comfortable value in the morning. This mode is selected by pressing the top right button.
- protection against freezing: the thermostat is not controlled manually in this mode. Heating is engaged only when the temperature in the room is so small that there is a risk of freezing of the heating system. This mode is selected during programming of the thermostat.

Temperature adjustment is possible via the bottom button. Pressing its left side we raise the expected temperature value, pressing the right side - we reduce it, irrespective of the current mode of operation of the thermostat.

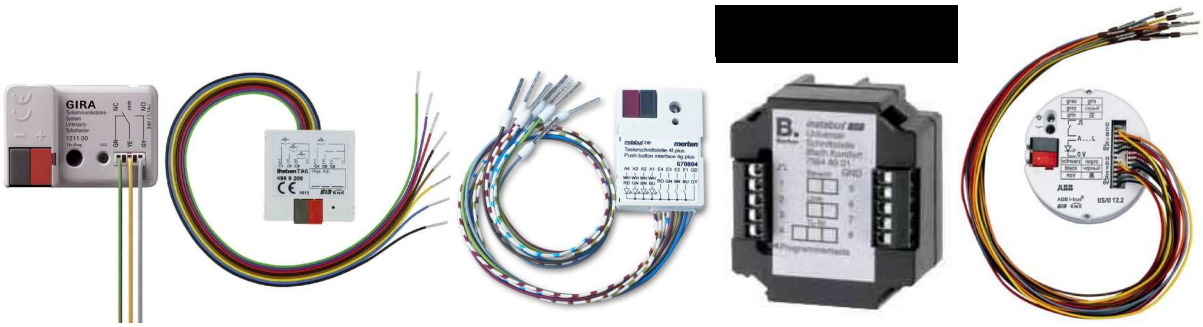
Status LEDs - the diodes serve as an illumination light, enabling readout of the data in the night. They can be on or off continuously, depending on the options programmed.

Connectors to traditional switches

Backbox inputs

Other names: switch inputs, binary inputs, Tastereingang (German)

Used to connect traditional switches to the KNX bus (in such cases they act like multi-button consoles). They are installed in boxes behind the switch, and connected to the KNX bus.

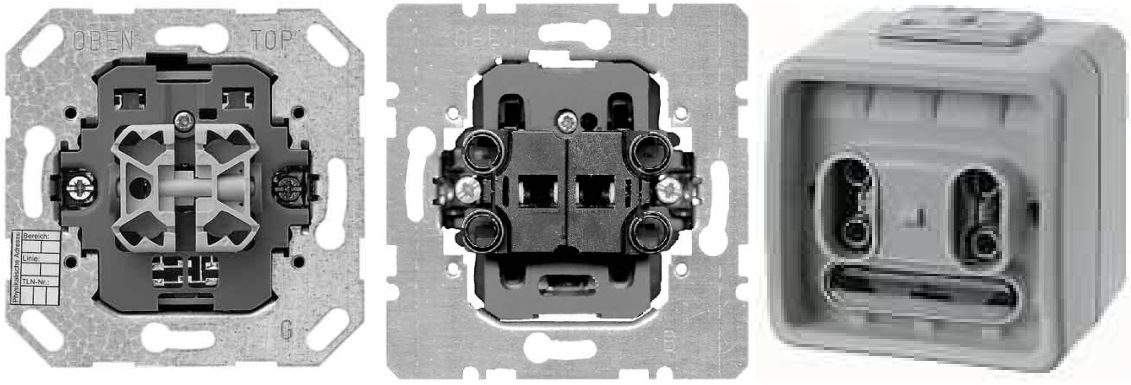


Connectors to traditional switches: 2x (Gira), 4x (Theben), 8x (Merten, Berker), 12x (ABB)

No. of channels	Price
2x	57 €
4x	102 €
8x	120 €
12x	212 €

Net prices depend on producers.

Traditional switches with KNX interface



Switches with KNX interface: 2x (Gira, Berker)

Wall-mounted displays and panels

Name: **Message display**

Functions: **informs about events in the house**

Material: **plastic**

Versions (colours): **18**

Additional features:

Net price (set): **264 EUR**

Name: **SMARTtouch Panel**

Functions: **informs about events in the house, allows control of all functions**

Material: **plastic+metal**

Versions (colours): **3**

Additional features: **creation of scenes, clock, timer, recording of messages for the family (also by hand - with stylus), thermostat, remote control unit sensor, reminder**

Net price (set): **751-1292 EUR**

Name: **Message display**

Functions: **informs about events in the house, enables control of dimmed lighting**

Material: **plastic**

Versions (colours): **1**

Additional features: **background can be a colour image, fully customisable message display scheme**

Net price (set): **656 EUR**

LCD displays (Arcus-eds)

Motion detector

Other names: Movement sensor, Movement detector, Wächter-Sensor (German)

Turns on the light if a person passes. They often have locks - switches allowing manual light switching irrespective of motion detection. Net set price: 140-190 € (or 230 €, with adjustment of sensitivity, field of view or divergence)

Motion detectors with blockade: ABB, Berker, Busch-Jaeger

Motion detectors: Gira, Jung, Merten, Theben

Weather stations and sensors

Weather station

Other names: weather sensors, Kombi-Wettersensor (German)

The use of a weather station (net price approx. 500-900 €) provides the system with details of weather conditions. Weather stations contain diverse sensors: light, sunlight, twilight, wind, rain, snow, fog, dew, temperature, position (GPS), sun position, atomic clock signal...

More in the file WeatherStation.pdf

Weather stations (Berker, Elsner, Jung, Merten)

Weather station with 4-8 independent sensors connectors (Siemens)

Weather condition sensor

Provide the user with information and amend control equipment with reactions to changing weather conditions. The rain sensor will i. e. close the roof windows so that our attic doesn't get flooded. At the same time the signal can stop the watering of the garden. The wind sensor will roll back any marquees or external blinds so as to reduce the risk of them being damaged. Sunlight intensity sensors can alter i. e. the angle of the slats of the blinds and the position of the marquees. Depending on the sunlight the station can also optimise the amount of light and heat admitted into the rooms. The use of a light intensity sensor provides control of building external lighting.

Sensors: brightness (ABB), rain (Berker), sun (Elsner),

Sensors: temperature (Jung), wind (Somfy)

Remote and central control

Infrared remote controls

These units allow free control of selected functions and provide comfort i. e. when watching TV one can switch the light in the room without having to get up from the armchair and approach the console.

Console remotes: ABB i Busch-Jaeger, Merten

RF remote control units

Useful especially outside the house (eg. to control garden lightnings, car gate during the barbecue). A small remote unit in the car will not only open the gate, but also turn on the lamps or raise temperature in the house or arm the alarm system (disarming is not recommended from remote).

RF receiver and remote control units (also with optional Bluetooth connection) 2x, 4x, 8x, 24x (Hager), 24x (Berker)

TV communication unit

This device allows the presentation of data from the KNX system on a TV screen. Sitting comfortably in an armchair one can freely change the ambient temperature in rooms, control the blinds and even adjust the lights using a remote control or PC. Any disturbing events or faults of the system are reported via an alarm signal. The TV communication unit also operates together with the house cameras, thus enabling the viewing of the building from the inside and outside, and controlling the execution of commands by the system, i. e. one can check whether the blinds were rolled down and the garage driveway lamp lit after dusk.

Net prices 400 – 1200 € Gira

Alarm and access control system integration

Connectors 32x and 8-4x

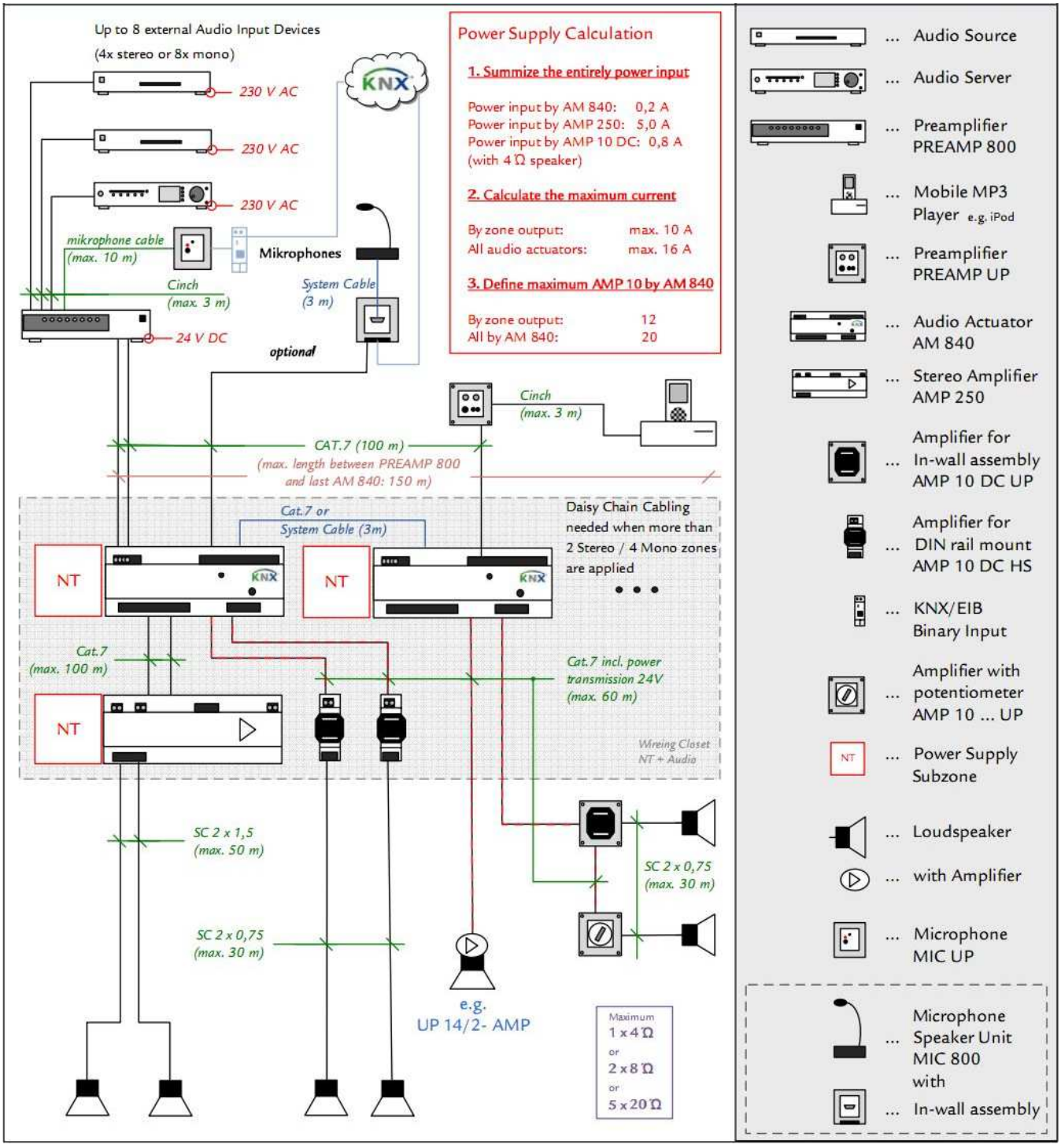
Other names: 32x input/output, Universal Concentrator, universal input/output

Integration of the KNX system with the alarm system allows i. e. automatic turning on of lamps or blinds if the sensor detects an intruder, and automatic notification of the police or site security. Co-operation with the alarm central unit allows using signals from door and window opening sensors, motion, smoke, floor detectors, etc. Thanks to this, the system will react automatically to any arising hazard, and shall notify appropriate services. One can also control emergency lighting inside and outside of the building. When the alarm is actuated, the KNX system starts up lamps lighting the entire area around the building. Data on window states, collected by the alarm central unit, are also transferred to the system. Thanks to this, opening a window causes inflow of air from the HVAC system to be locked, which brings energy savings.

32x connector (Merten, ABB). net price approx. 500 €

More in the file Connector_32.pdf

Diagram of connection of Multiroom Audio system components in the KNX system



arcus-eds
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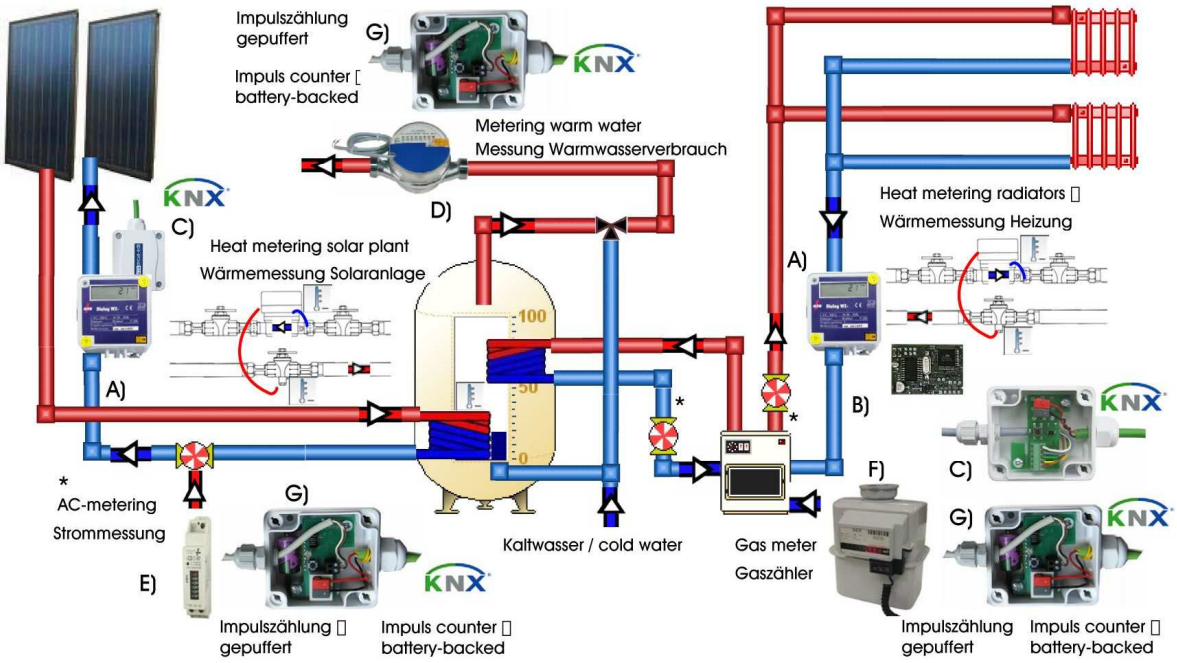
KNX Smart Metering



KNX Wärmemessung WMZ	
A) Elektronischer Wärmezähler Dialog WZ-CD (NZR)	/ Heat meter Dialog WZ-CD (NZR)
B) KNX-Bus Interface WMZ (arcus-eds)	/ KNX-Bus Interface WMZ (arcus-eds)
C) KNX-Anschlußbox (arcus-eds)	/ KNX-Connector box (arcus-eds)

KNX Impulszählung (Wasser, Strom, Gas) IMPZ	
D) Wasserzähler Modularis (NZR)	/ Water meter Modularis (NZR)
E) Wechselstromzähler EcoCount® (NZR)	/ Single-phase meter EcoCount® (NZR)
F) Gaszähler, regeneriert GZ-reg (NZR)	/ Gas meter, regenerated GZ-reg (NZR)
G) KNX-Impulszählmodul IMPZ (arcus-eds)	/ KNX-Impuls counter modul IMPZ (arcus-eds)

Other guidebooks by this author

How to make your house intelligent? (an e-mail training course in 20 parts)

This is the only free publication on the market to gather all basic information about intelligent home systems in a reader-friendly guide form. The guide is targeted primarily at persons building or designing a house or flat, but also at specialists and designers who would like to get to know the basics or have them all together in one publication. The guide has over 160 pages and is distributed via e-mail in 20 parts (with the option of downloading it in whole). You can read more and sign in at www.smarthome.eu/a/general-guide.html

How not to forget that one little cable?

Do you know that forgetting one little cable can cause you to break down your walls again and cause the family to complain that you weren't diligent enough to read the list of over 200 cables that you need to account for when designing the installation for your house? Learn more about this guide and order it at www.smarthome.eu/a/order-cables-guide.html

How to create a KNX design and installation?

Installation specialists and smart home system designers often seek answers to these and many related questions regarding the design and implementation of KNX systems. Browsing hundreds of pages of general material is time-consuming and ineffective. This, however, can be avoided. Learn more about this guide and order it at www.smarthome.eu/a/order-design-guide.html

How to Pick and Choose KNX Equipment?

There are now over 5000 devices and appliances for the KNX system offered by 165 manufacturers. How to handle all of this? How to pick the device to best suit user expectations? From among over 5000 units, this guide, on over 100 pages, contains descriptions and/or images of over 200 or the most interesting devices and their uses, including a handful of practical tips. Find out more about this guide and order it at: www.smarthome.eu/a/order-units-guide.html

How to build an electric switch cabinet for the KNX system?

Step by step we will guide you through the process of assembly and construction of large electric switch cabinets. We will also tell you what you definitely cannot forget, and where you should take particular care. Learn more about this guide and order it at www.smarthome.eu/a/order-cabinet-guide.html

How to Start Up a KNX System?

A guide on programming KNX devices in the ETS application, or starting up a system. This guide will provide You with the knowledge You expect. It will replace a programming training seminar, and having read it, you will be able to single-handedly programme and start-up a KNX system i. e. for a small house. Learn more about this guide and order it at: www.smarthome.eu/a/order-startup-guide.html

How to win customers for premium products?

Solid information for everyone offering Premium-class products to their customers - expensive, luxury components for the home that are not required by most people, who still dream of them, and yet are available for the few who consider them absolutely necessary :) Learn more about this guide and order it at: www.smarthome.eu/a/order-clients-guide.html

Installations - document templates

I am providing templates of documents, designed by experts from SMARTech in consultation with lawyers. Apart from a contract draft for the execution of an installation, available are, among others, commissioning protocols, system verification documents, even calls for payment. Learn more about this guide and order it at www.smarthome.eu/a/order-documents-guide.html

The set of guidebooks about KNX systems and installations

All guidebooks above in one set you can buy with 30% discount.

www.smarthome.eu/a/knx-system-the-set-of-guidebooks.html

Ready Design Plans

A KNX system design for a house of 200 sq m

Based on this design you will learn how to execute other smart home designs and installations. The smart electric installation on its own (the design includes others as well) for a house of 200 sq m contains 171 modules in the switch cabinet, 130 cables running from the cabinet to the building, and several thousand connections. An experienced designer needs about 112 hours of work to create such a design. The time and money saved through the use of ready elements - this would be enough to calmly recommend the smart system design specifically to you.

Learn more about this guide and order it at www.smarthome.eu/a/order-plans-pdf.html

KNX system design - ETS files

Thanks to this, you can implement changes and load ready programmes to devices according to your system within a few hours. You can be certain that everything will work correctly. This set consist ETS database and project files and list of functions implemented in typical 200m2 house.

Learn more about this guide and order it at www.smarthome.eu/a/order-plans-ets.html

