B.E.G. LUXOMAT® net

KNX®

KNX RF manual

KNX

Subject to technical changes.

All device data can also be found here:

https://www.beg-luxomat.com/en-in/solutions/the-knx-occupancy-detector-generation-7/

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Content

1 Introduction

The B.E.G. KNX RF radio system offers enormous advantages in building automation with KNX due to its typical wireless topology. Especially in the renovation and retrofitting of existing installations, the advantages are obvious:

- No chiselling work is required, as the additional laying of a KNX bus line is not necessary.
- The typical „3 wires“ for power supply are sufficient.
- Product diversity on a KNX basis is guaranteed.
- The simple retrofitting of KNX RF media couplers makes an installation immediately „radio-compatible“.
- Even with critical radio links, reliable signal transmission can be ensured via integrated repeater functions of the KNX RF devices.
- The comfort of a KNX installation remains guaranteed.

2 System description

2.1 Functionality

The KNX RF system is a manufacturer-independent KNX radio standard that operates with a medium frequency of 868.3 MHz. The data transmission rate is 16 kBit/s, with a packet size of 8 bytes to 23 bytes. Due to the low frequency, compared to WLAN and Bluetooth, it is particularly suitable for communication in buildings. The actual advantages lie in the better penetration of materials and building materials as well as in the range of the radio signals. Despite the low transmission power that KNX RF manages with, the short telegrams are transmitted quickly and reliably.

KNX RF is a bidirectional radio system. Devices can communicate with each other independently within an RF line. An RF media coupler is used to connect KNX RF to KNX TP and vice versa.

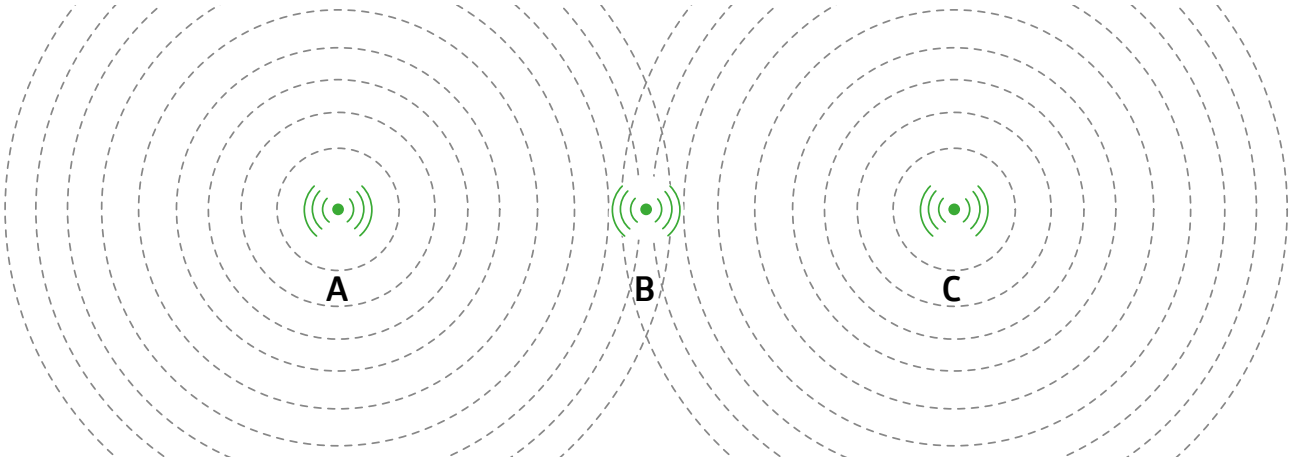
Commissioning is done through the ETS, as with TP devices.

2.2 Properties

By using a frequency from the SRD frequency band (Short Range Device), KNX RF gets by with a low output power and thus offers high electromagnetic compatibility. KNX RF also does not interfere with other systems.

The licence-free frequency range of 868 MHz is not reserved for KNX RF, it is also used by other systems in building technology. However, mutual interference can be ruled out due to the different protocol structure.

A special feature of KNX RF is the LBT (Listen Before Talk) function, which means that each transmitter first listens to the radio channel to see if it is free before sending anything. Furthermore, a randomly changing time is waited before sending. Devices that are not in the common reception range could theoretically transmit to a receiver at the same time and cause a radio collision. The LBT method largely eliminates signal collisions.



2.3 Range

In buildings, the maximum range of KNX RF radio signals is approx. 30 m, depending on the type of surrounding materials. In open spaces, the transmission distance can be up to 150 m. When planning a KNX RF installation, all conditions of the material properties and the mounting types must be checked in any case.

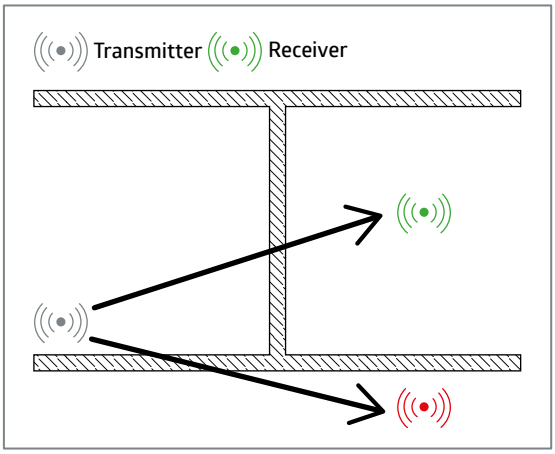
Since the different materials and conditions have different effects on the behaviour of the radio waves in each project, each installation must be planned individually.

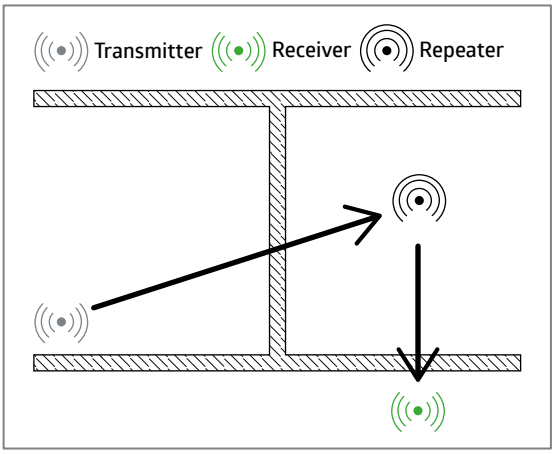
The following negative effects can occur at any time and must be considered:

- Signals are reduced ➞ Attenuation
- Signals are lost ➞ Absorption
- Signals are reflected back ➞ Reflection
- Signals are deflected ➞ Refraction
- Signals are multiplied ➞ Scattering

2.4 Attenuation of radio waves

Material	Damping	Examples
Wood	low	Furniture, ceilings, partition walls
Plaster	low	Partition walls without metal mesh
Glass	low	Window panes
Water	medium	People, damp materials, aquarium
Bricks	medium	Walls, ceilings
Concrete	high	solid walls, steel-reinforced concrete walls
Glass, coated	high	glass coated with metal
Plaster	high	Partition walls with metal mesh
Metal	very high	Reinforced concrete structures, fire doors, lift shaft





3 Planning and installation

3.1 Selecting the mounting location

With regard to mounting locations, there are a number of things to consider when planning KNX RF devices:

- The structural conditions must be checked with regard to attenuation, shadowing, reflection, absorption, scattering and refraction.
- Sufficient distances to metallic surfaces and objects as well as grid structures must be maintained.
- Sufficient distances must be kept from devices that emit electromagnetic waves (e.g. power supply units, microwave devices, motors, transformers, all other radio-operated devices (WLAN, DECT, Bluetooth, etc.)).
- Always penetrate ceilings and walls by the shortest route.
- In the case of non-mobile devices, ensure that the antenna is aligned in the same way, otherwise the signals may be absorbed.
- Do not install near the floor or in metallic switch cabinets.

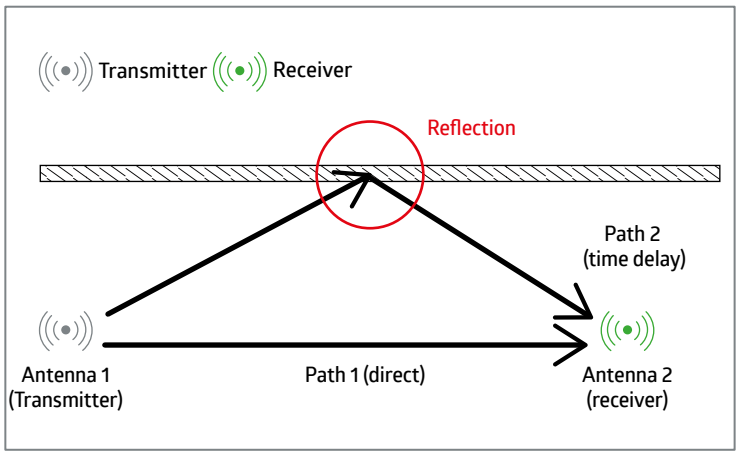
3.2 Interference factors

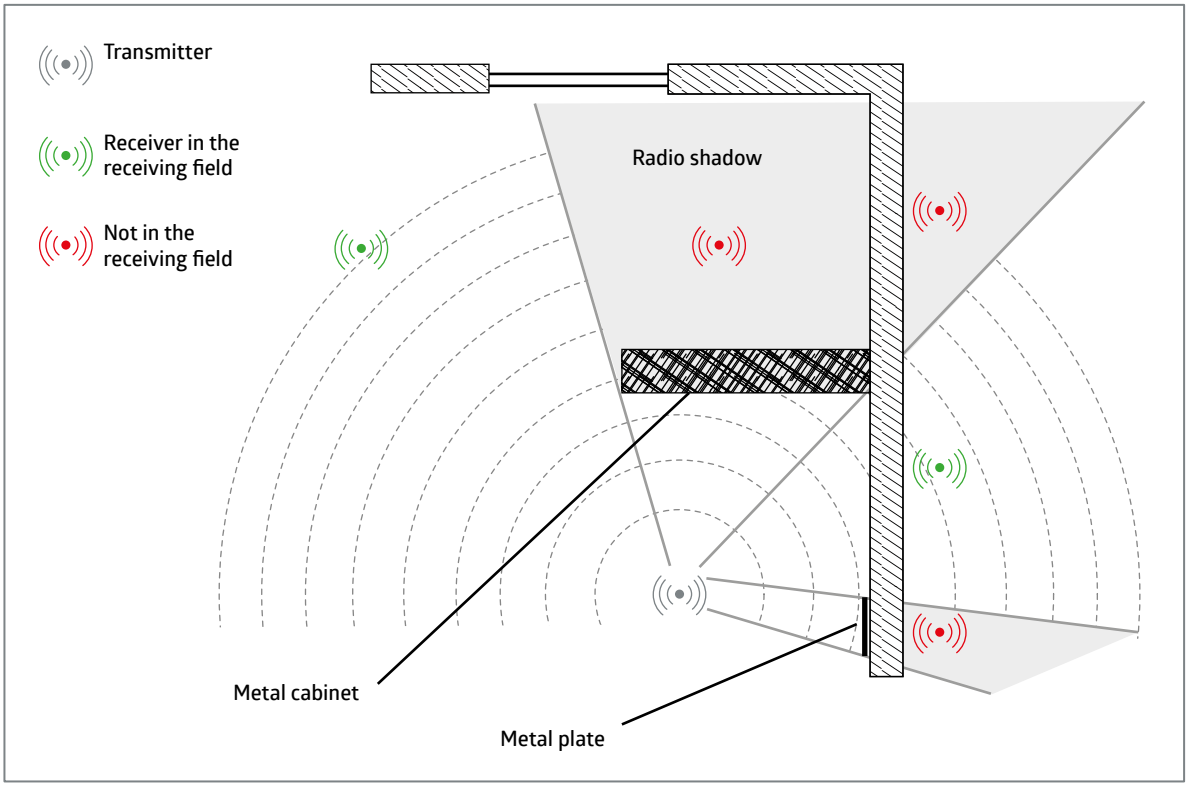
If radio signals hit obstacles and are reflected in a different direction, interference can occur in the radio transmission. The directly transmitted waves and the reflected waves can overlap (interference) and generate a signal for the receiver that can no longer be reliably evaluated. In the worst case, the signals cancel each other out and are lost. For this reason, radio signals that propagate along long walls should be avoided.

Interference can also occur in connection with other radio frequencies, detached from the KNX RF topology. Often, however, the installation locations of these devices are not known during planning, so that their effect on the KNX RF installation cannot be foreseen or estimated.

Likewise, care should be taken to avoid radio shadows, such as those caused by metal parts and grid constructions (steel mesh, expanded metal, complex metal sculptures, etc.).

During planning, the direction of communication should be thoroughly considered in connection with the mounting locations of the KNX RF devices in order to prevent failures in the radio link. In most cases, there is hardly any possibility to change anything in the installation during or after commissioning of the system.

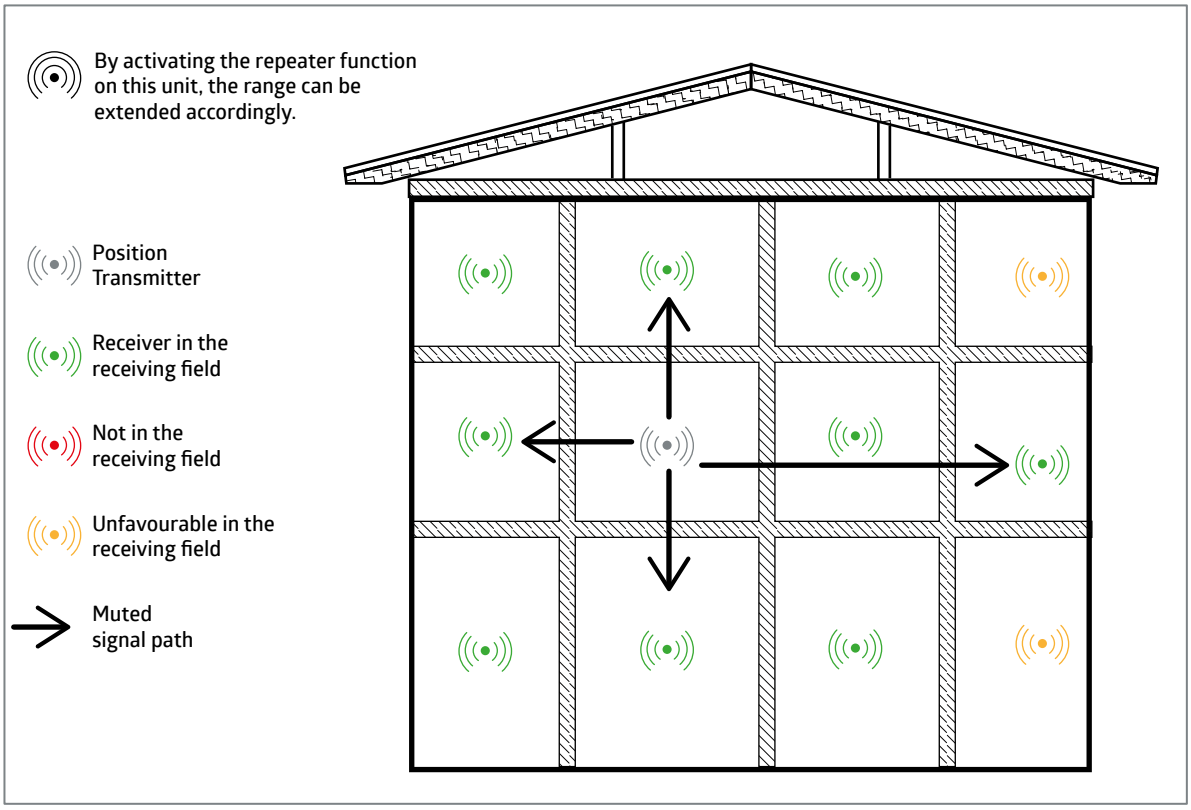




3.3 Placement of the KNX RF media coupler

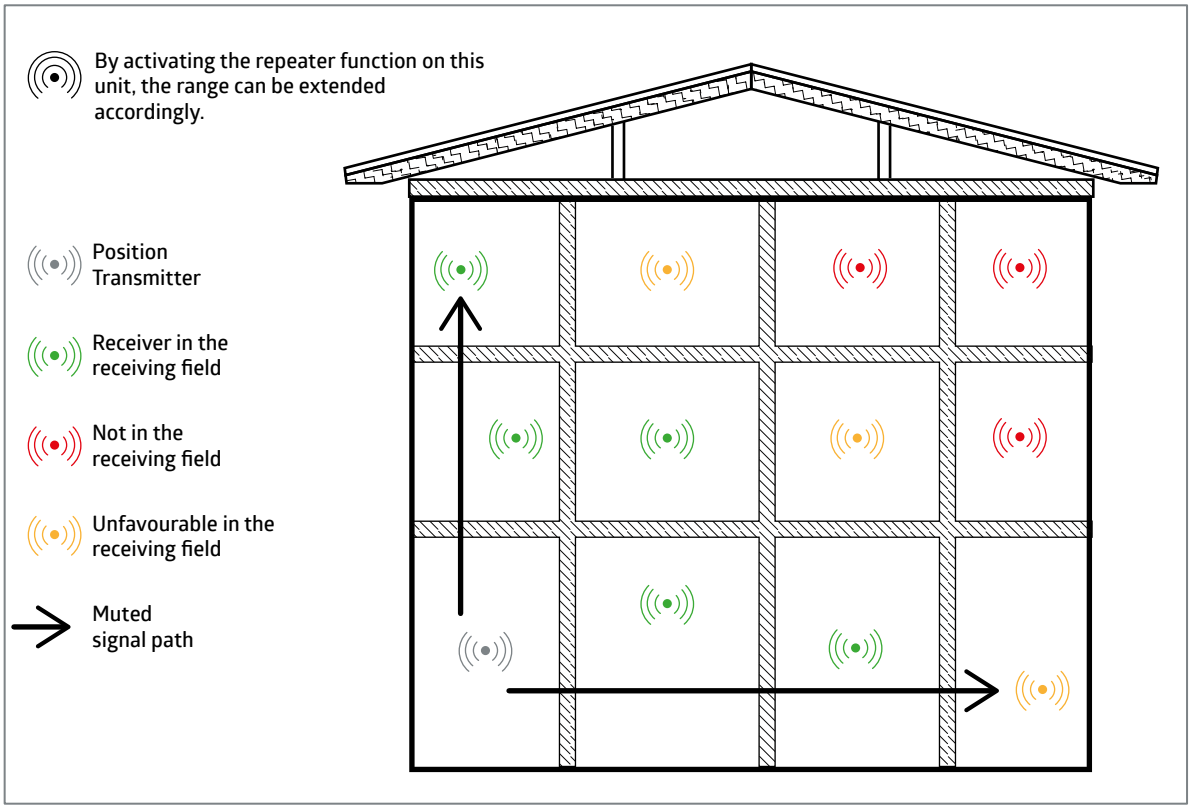
Example:

Preferred placement of the KNX RF media coupler (transmitter)



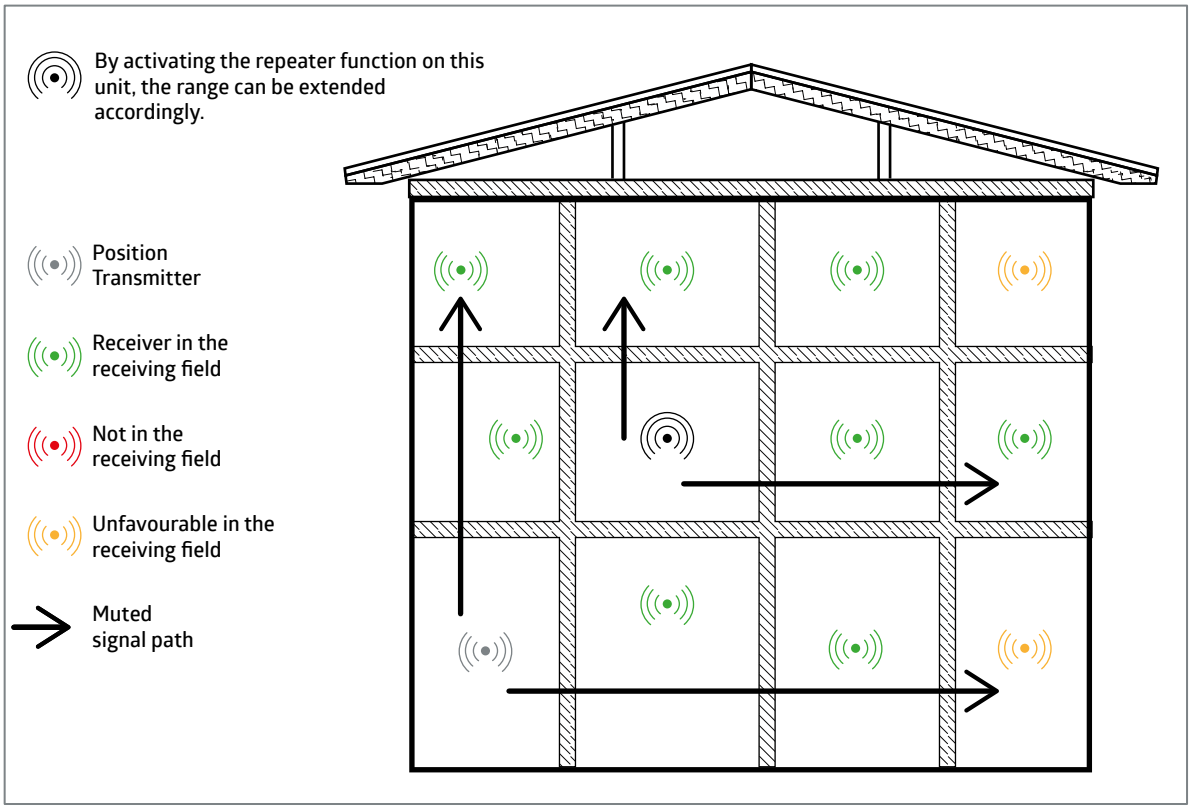
Example:

Unfavourable placement of the KNX RF media coupler (transmitter)



Example:

Unfavourable placement of the KNX RF media coupler (transmitter), but with activated repeater function in the KNX RF device



3.4 Repeater or retransmitter function

Individual RF devices can additionally be used as repeaters to amplify the RF signal in the installation and thus ensure largely reliable radio transmission. This repeater function can be activated in the ETS. However, it does not make sense to activate the function randomly in the RF devices. It is recommended to know the spatial arrangement of the devices and to use the repeater function only when necessary. Some RF media couplers can also be activated as repeaters in order to receive telegrams from other RF devices that are installed on the opposite side of the media coupler, for example.

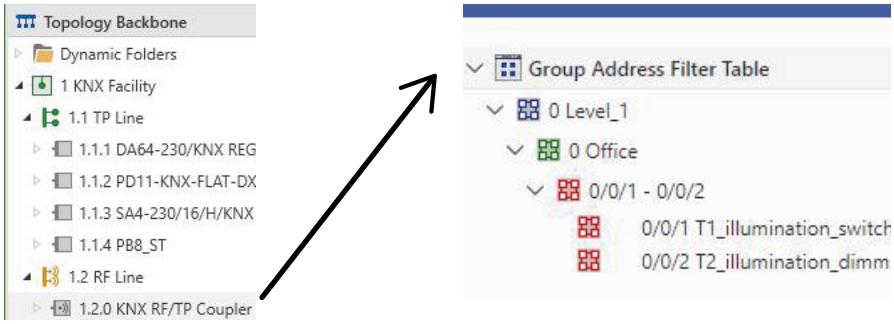
3.5 Telegram repetition

Sent telegrams are not acknowledged with KNX RF, in contrast to KNX TP. On the one hand, the LBT method (Listen Before Talk) attempts to ensure data transmission to RF devices. On the other hand, there is the option to activate telegram repetitions in the ETS for some KNX RF devices. With this function, various telegrams can be configured within repeat blocks and triggered for retransmission. This additionally increases the probability that the telegrams will be transmitted and received reliably.

The aforementioned methods can be used to establish a fairly reliable data transmission security. However, there is no one-hundred-percent guarantee of transmission reliability with radio solutions.

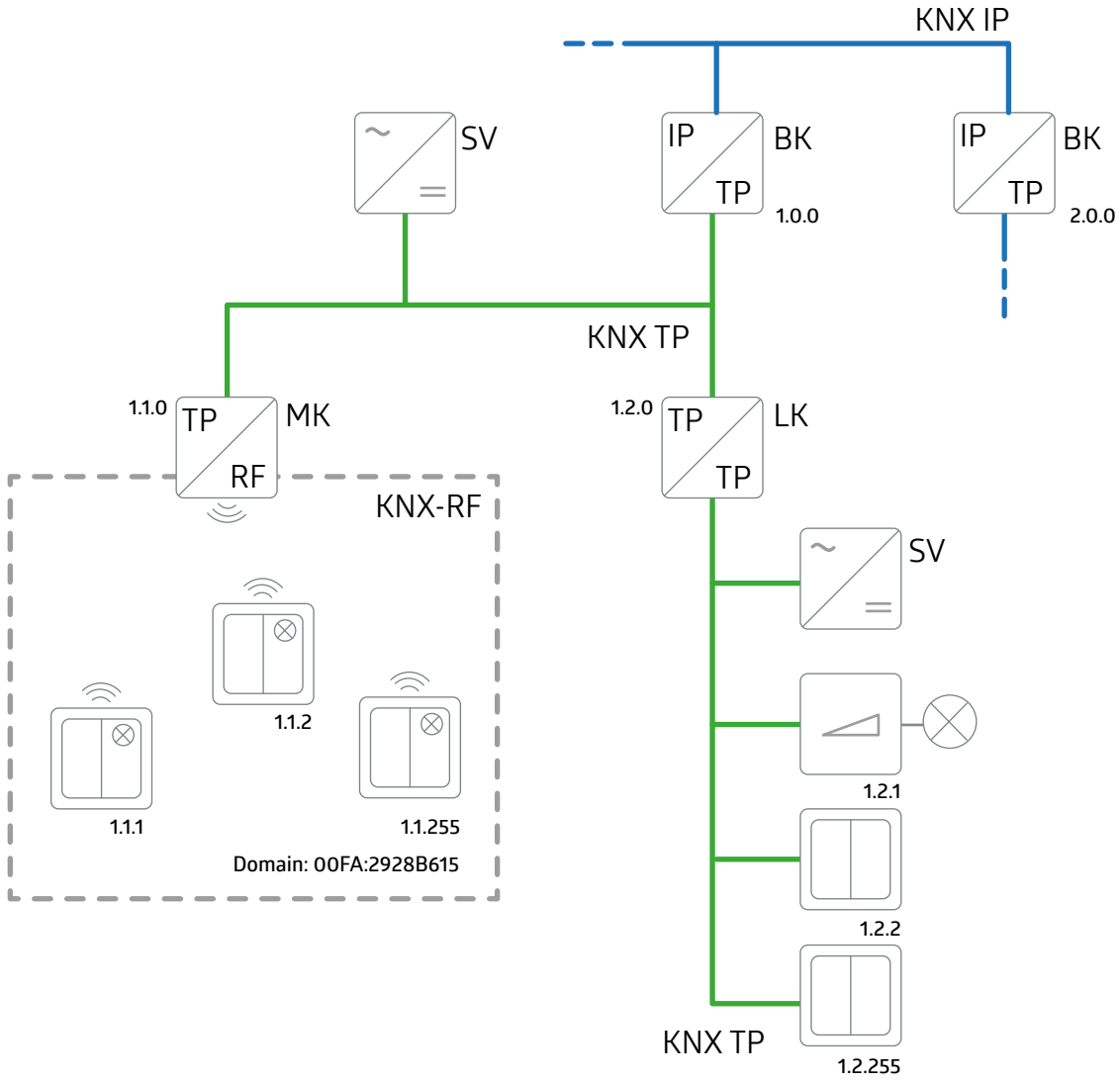
3.6 Topology

KNX RF runs in a self-sufficient RF line of the area topology and is separated from the TP line by a filter table. The filter table defines which telegrams the media coupler releases from TP to RF and vice versa. By means of an extended group address, which also contains the domain address of the radio line, it is not possible to send telegrams from another radio line into this line.



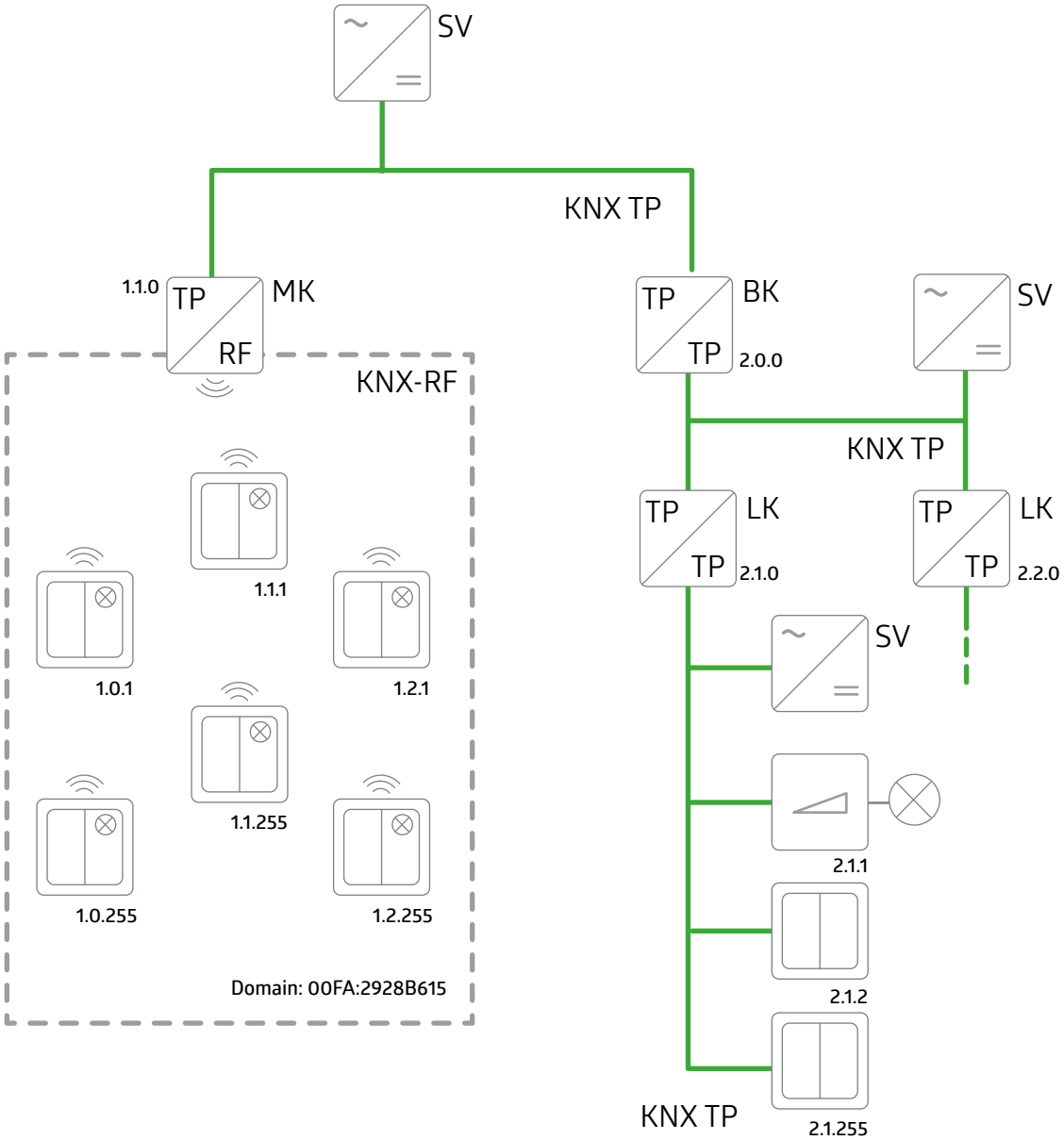
3.7 Media coupler as line coupler

When using an RF media coupler as a line coupler, several lines can be set up together with TP line couplers.



3.8 Media coupler as an area coupler

When using an RF media coupler as an area coupler, a topology backbone with TP media type is mandatory. Each range may contain only one RF media coupler, unless the RF media coupler is configured as a repeater.



4 Security

4.1 KNX Data Secure

As with KNX TP devices, suitable KNX RF devices also support Data Secure. The procedure for integration and reset can be found in the application description of the respective device.

4.2 Domain address

Each area line that is configured in the ETS as an RF media type receives its own domain address. This ensures that only the devices in this line communicate with each other. External influences, even from neighbouring systems, are excluded.

The domain address is automatically generated and assigned by the ETS (example: 00FA:2928B615). If necessary, it can be changed manually to avoid random double assignment. Together with the physical address, the domain address is programmed into the KNX RF devices.

4.3 System security

In the context of system security, critical group addresses (e.g., access controls) should not be transmitted by radio, but always wired.

4.4 Important notes on programming

Whenever changes are made in the project or in the topology of the RF line, the application program of the media coupler must first be retransmitted. Then all devices affected by the change must also be reprogrammed via the application program.

With the aforementioned programming, the filter table with the group addresses to be transmitted is regenerated and adapted to the installation.

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