B.E.G. LUXOMAT® net

# KNX RF-TP Coupler


# LK-RF/KNXs

## Operation manual / application description

90407

Subject to technical changes.

**All device data can also be found here:**

https://beg-luxomat.com/qr.php?prtno=90407



**B.E.G. Brück Electronic GmbH**
**Gerberstraße 33**
**51789 Lindlar**
**GERMANY**

**Telefon:** **+49 (0) 2266 90121-0**
**E-Mail:** **support@beg.de**
**Internet:** **beg-luxomat.com**

# Content

# Content

# 1 About this document

## 1.1 Applicable documents

Brief operating instructions (included with the device).

## 1.2 Means of representation used

| | |
|---|---|
|  | Symbol for danger to life due to electric shock |
|  | Symbol for possible danger to persons |
|  | Symbol for possible property damage |
|  | Symbol for useful information and tips |
| **NOTE** | Signal word for possible property damage |
| **CAUTION** | Signal word for possible minor injuries |
| **WARNING** | Signal word for possible serious injuries |
| **DANGER** | Signal word for possible fatal injuries |

## 1.3 Prerequisites for understanding

| NOTE | |
|---|---|
|  | **KNX knowledge**<br>To understand this application description, a KNX commissioning or project planning course (ETS 5) is required. |

# 2 Security

The LK-RF/KNXs has been developed, manufactured and tested in compliance with the applicable safety standards. It corresponds to the state of the art.

## 2.1 Intended use

The device is a KNX radio coupler with a compact design. It connects KNX RF devices of a radio line with the KNX bus twisted pair and is intended for installation in cavity wall and switch boxes.

**CAUTION**

**Observe the intended use!**
The protection of operating personnel and the device is not guaranteed if the device is not used in accordance with its intended use.
→ Only use the device in accordance with its intended use.
→ B.E.G. Brück Electronic GmbH is not liable for damage caused by improper use.
→ Read these operating instructions before commissioning the device. Knowledge of the operating instructions is part of the intended use.

**NOTE**

**Comply with rules and regulations!**
→ Observe the locally applicable legal regulations and the regulations of the employers' liability insurance associations.

**WARNING**

**Work on electrical installations may only be carried out by qualified electricians or by instructed persons under the direction and supervision of a qualified electrician in accordance with the electrotechnical regulations.**

**Danger due to electric shock.**
**Device is not to be used to isolate other equipment from the mains supply.**

**Danger due to electric shock.**
→ Before working on the device or replacing lamps, disconnect the mains voltage and switch off the circuit breaker.

## 2.2 Foreseeable misuse

Any use other than that specified under „Intended use" or any use going beyond that is considered improper use.
The use of the device is not permitted in the following cases in particular:

- in rooms with explosive atmospheres
- in safety-relevant circuits
- for medical purposes

**NOTE**

**Do not tamper with or modify the device!**
→ Do not modify or alter the device in any way. Interventions and modifications to the device are not permitted.
→ The device must not be opened. It does not contain any parts to be adjusted or maintained by the user.
→ Repairs may only be carried out by B.E.G. Brück Electronic GmbH.

## 2.3 Qualified persons / qualified electricians

Connection, assembly, commissioning and adjustment of the device may only be carried out by competent persons.
Requirements for competent persons:

- You have suitable technical training.
- You know the rules and regulations on occupational health and safety.
- You know the operating instructions for the device.
- You were instructed by the person in charge in the installation and operation of the device.

### 2.3.1 Qualified electricians

Work on electrical installations may only be carried out by qualified electricians or by instructed persons under the direction and supervision of a qualified electrician in accordance with the electrotechnical regulations.
Due to their professional training, knowledge and experience as well as knowledge of the relevant standards and regulations, skilled electricians are able to carry out work on electrical installations and to recognise possible hazards independently.
In Germany, qualified electricians must comply with the provisions of the accident prevention regulation DGUV Vorschrift 3 (e.g. master electrician). In other countries, corresponding regulations apply and must be observed.

## 2.4 Disclaimer

B.E.G. Brück Electronic GmbH is not liable in the following cases:

- The device is not being used as intended.
- Reasonably foreseeable misapplications are not taken into account.
- Assembly and electrical connection are not carried out competently.
- Changes (e.g. structural) are made to the device.

# 3 General

## 3.1 Basic information about the KNX bus

A KNX commissioning or project planning course is required to understand these instructions.
In order to work with the B.E.G. application, it must first be imported into the ETS. ETS version 5 or higher is supported.

## 3.2 Symbolism

In the following application description, various symbols are used for a better overview. These symbols are explained briefly here.

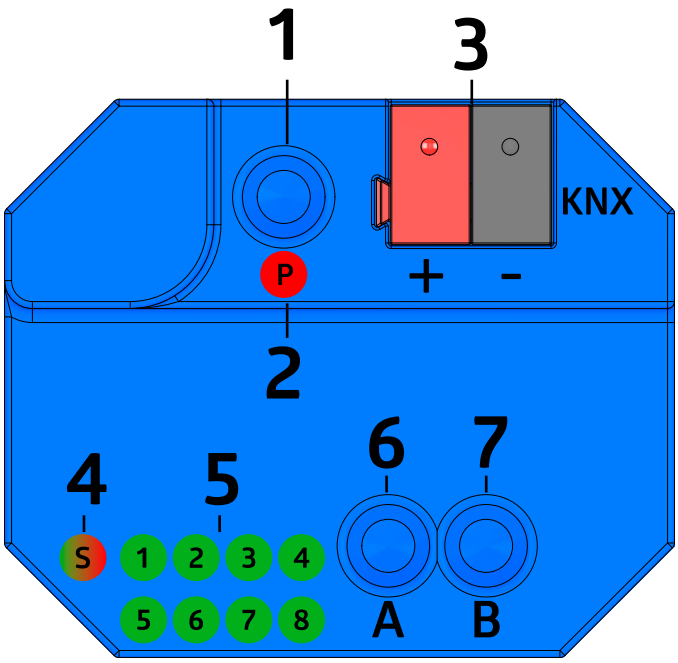
| | |
|---|---|
|  | This symbol indicates text passages that must be read in order to avoid errors during project planning and commissioning. |
|  | This symbol indicates parameter settings that experience has shown to lead to optimal use of the device. |

# 4 Functional description

## 4.1 Application

The device is a compact KNX radio coupler. It connects KNX RF devices of a radio line with the KNX Bus Twisted Pair.
The device has an extended filter table for main group 0 ... 31. The coupler supports KNX Long Frames and is compatible with the ETS® software ETS 5 or higher.
The buttons on the front panel allow disabling the telegram filter for testing purposes. The LEDs indicate operating conditions as well as communication errors on the KNX bus.
The power is supplied via the KNX bus.
The device supports KNX Data Security. The functionality of Security Proxy and Segment Coupler is only supported with the ETS 6 database.

## 4.2 Device structure




| | |
|---|---|
| 1 | Button for programming mode |
| 2 | Programming LED (red) |
| 3 | KNX bus connector |
| 4 | LED Status (multicolor) |
| 5 | LEDs 1 – 8 (green) |
| 6 | **Button A:** Manual operation TP and forwarding telegrams |
| 7 | **Button B:** Manual operation RF and forwarding of telegrams |

**NOTE**

If there is no bus voltage, the device has no function.

# 5 Mounting and electrical connection

| WARNING |
| --- |
| Work on electrical installations may only be carried out by qualified electricians or by instructed persons under the direction and supervision of a qualified electrician in accordance with the electrotechnical regulations.<br>Disconnect the cable from the power supply before installation!<br>This device is not to be used to isolate other equipment from the mains supply.<br>Observe KNX installation guidelines! |

| DANGER |
| --- |
| **Danger to life due to electric shock!**<br>**Electric shock can cause death.**<br>**Before working on the device, isolate the device from the mains supply and cover live parts in the vicinity!** |

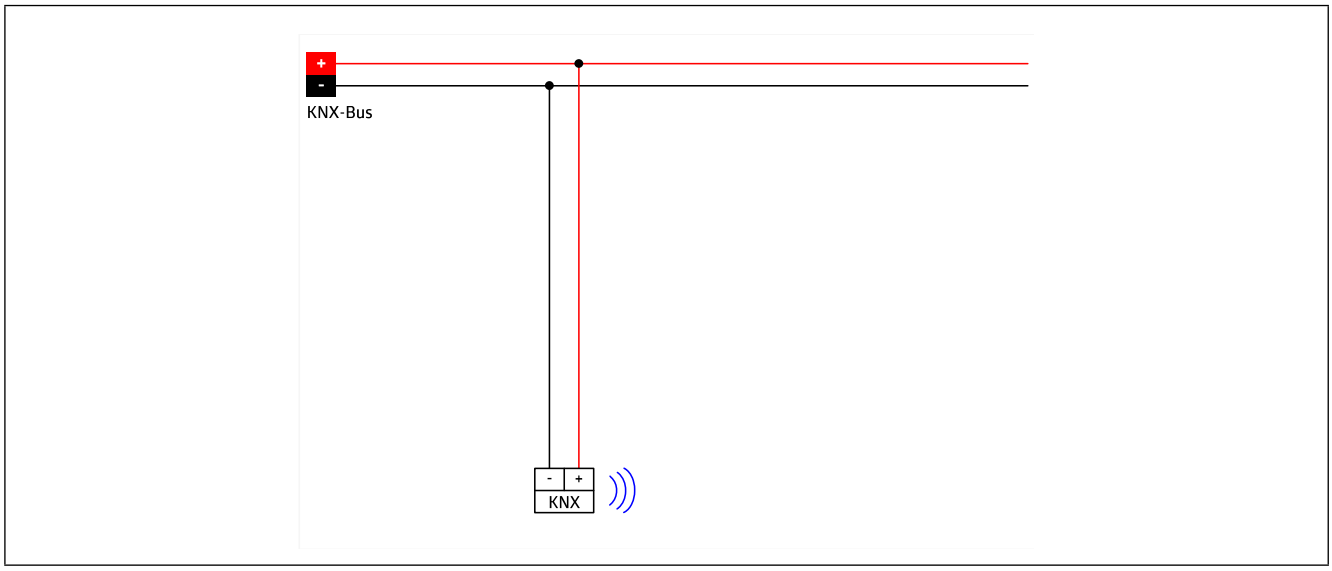
## 5.1 Mounting the device

Mounting can be recessed in the wall and thus almost “invisible”, because the housing has the right size for mounting in a standard flush-mounted box.
When selecting the mounting location, the range of the radio devices to be connected to the device must be taken into account. Shielding objects (e.g. metal cabinets) or interfering transmitters (e.g. computers, electronic transformers, ballasts) near the gateway should be avoided.
The device is connected to the KNX bus using a bus terminal. The correct polarity of the terminal according to the marking on the device must be observed.

## 5.2 Connecting the device

| DANGER |
| --- |
| **Electric shock when touching live parts.**<br>**Electric shock can cause death.**<br>**Before working on the device, isolate the device from the mains supply and cover live parts in the vicinity!** |

Make the KNX bus connection according to the following connection diagram.




## 5.3 KNX connection

| CAUTION | |
|---|---|
| ⚠ | **Observe KNX installation regulations!**<br>This device complies with the KNX guidelines. Detailed knowledge of the KNX system is required for commissioning. |

# 6 Commissioning

After mounting the device and connecting the bus line, the device can be put into operation. The following procedure is generally recommended.

## 6.1 Carry out ETS commissioning

Switch on the voltage supply of the device.
In order to work with the device, the product database must first be imported into the ETS.

| | NOTE |
|---|---|
|  | **ETS from version 5.**<br>ETS version 5 or higher is supported.<br>The ETS 5 database only supports KNX Data Security.<br>The functionality of Security Proxy and Segment Coupler is not supported.<br>The ETS 6 database supports KNX Data Security as well as the functionality of Security Proxy and Segment Coupler. |

➞ Download the product database of the device from the B.E.G. website.
➞ Import the downloaded product database of the device into the ETS.
You can now configure the LK-RF/KNXs in your project.

## 6.2 KNX Programming mode

The KNX programming mode is activated/deactivated either by pressing the recessed KNX programming button **1** . When the programming mode is active, the programming LED **2** lights up red.

## 6.3 Manual operation and status display

The LED Status **4** lights up green when KNX bus voltage is present. This LED flashes red if the application is not running, e.g. after an aborted ETS download. If manual operation is active, this is indicated by the LED Status **4** lighting up orange.

Summary of the states of the LED Status **4**:

| LED Status | Meaning |
|---|---|
| LED lights green | The device operates in normal operating mode. |
| LED flashes red | The device is not loaded correctly<br>e.g. after aborting a download. |
| LED lights orange | Manual operation is active. |
| LED briefly orange | RF telegrams from another domain received. |

LEDs 1 – 4 **5** indicate TP telegram traffic.
LEDs 5 – 8 **5** indicate RF telegram traffic. If RF telegrams are received from another domain, the LED Status **4** flashes orange briefly in addition.

Summary of the states of the LEDs 1 – 8 **5**:

| LED Status | Meaning |
|---|---|
| LEDs 1 – 4 briefly green | Manual operation is not active.<br>Telegram traffic via KNX TP. |
| LEDs 5 – 8 briefly green | Manual operation is not active.<br>Telegram traffic via KNX RF. |

### 6.3.1 Manual operation TP

Briefly pressing button A **6** activates manual operation for mode TP.
Pressing button A **6** briefly deactivates/activates the forwarding of the group telegrams. This is indicated by LEDs 1 and 2 **5**.
Pressing button B **7** briefly deactivates/activates the forwarding of the physically addressed telegrams and the broadcast telegrams. This is indicated by LEDs 3 and 4 **5**.
Pressing button A **6** or button B **7** for a long time exits manual operation.
Manual operation can be locked in the ETS database.

Summary of the states of the LEDs 1 – 4 **5**:

| LED Status | Meaning |
|---|---|
| LEDs 1 and 2 light green | Manual operation is active.<br>Forwarding of group telegrams via KNX TP is active. |
| LEDs 1 and 2 off | Manual operation is active.<br>Forwarding of group telegrams via KNX TP is not active. |
| LEDs 3 and 4 light green | Manual operation is active.<br>Forwarding of physically addressed telegrams and<br>broadcast telegrams via KNX TP is active. |
| LEDs 3 and 4 off | Manual operation is active.<br>Forwarding of physically addressed telegrams and<br>broadcast telegrams via KNX TP is not active. |

### 6.3.2 Manual operation RF

Briefly pressing button B **7** activates manual operation for mode RF.
Pressing button A **6** briefly deactivates/activates the forwarding of the group telegrams. This is indicated by LEDs 5 and 6 **5**.
Pressing button B **7** briefly deactivates/activates the forwarding of the physically addressed telegrams, the broadcast telegrams and the system broadcast telegrams. This is indicated by LEDs 7 and 8 **5**.
Pressing button A **6** or button B **7** for a long time exits manual operation.
Manual operation can be locked in the ETS database.

Summary of the states of the LEDs 5 – 8 **5**:

| LED Status | Meaning |
|---|---|
| LEDs 5 and 6 light green | Manual operation is active.<br>Forwarding of group telegrams via KNX RF is active. |
| LEDs 5 and 6 off | Manual operation is active.<br>Forwarding of group telegrams via KNX RF is not active. |
| LEDs 7 and 8 light green | Manual operation is active.<br>Forwarding of physically addressed telegrams, broadcast telegrams and system broadcast telegrams via KNX RF is active. |
| LEDs 7 and 8 off | Manual operation is active.<br>Forwarding of physically addressed telegrams, broadcast telegrams and system broadcast telegrams via KNX RF is not active. |

# 7 Reset to factory default settings

It is possible to reset the device to its factory default settings.
➜ Disconnect the KNX bus connector **3** from the device.
➜ Press the KNX programming button **1** and keep it pressed down.
➜ Reconnect the KNX bus connector **3** to the device.
➜ Keep the KNX programming button **1** pressed for at least another 6 seconds.
➜ A short flashing of all LEDs (**2 4 5**) visualizes the successful reset of the device to factory default settings.

See „4.3 Device structure“ auf Seite 9.

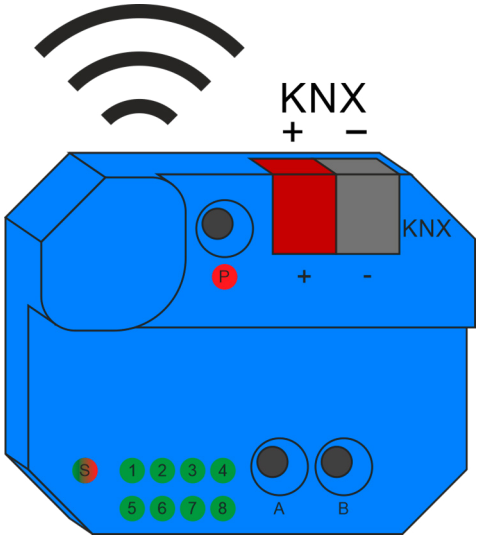
## 7.1 Factory default settings

In the factory default settings, the device has the physical address 15.15.0. Also, KNX Data Security is disabled and the initial key (FDSK) must be used for secure commissioning.

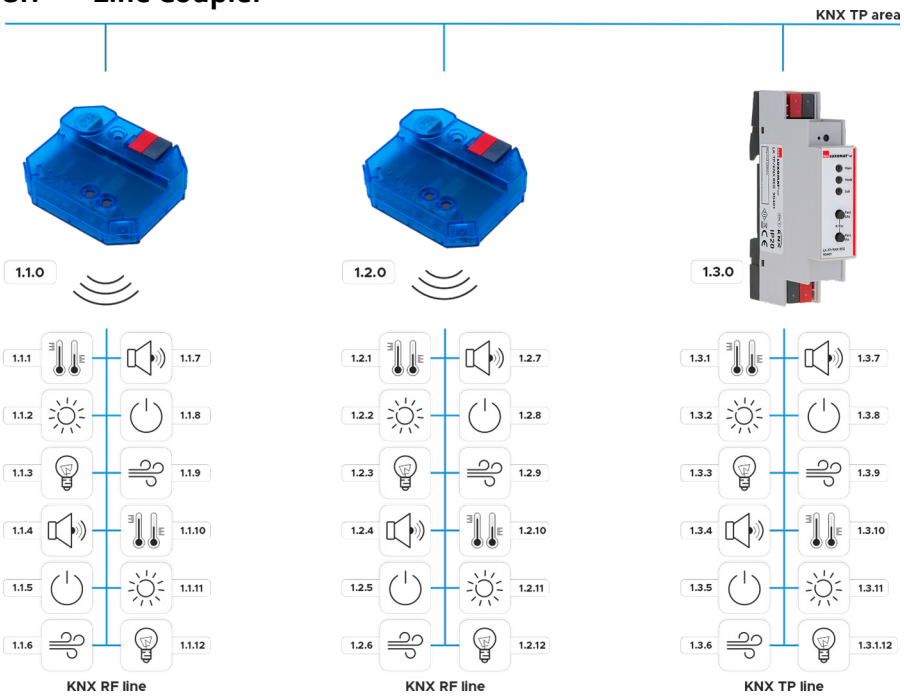
**Routing TP->RF**
Group telegrams: Filter
Individual addressed telegrams: Filter

**Routing RF->TP**
Group telegrams: Filter
Individual addressed telegrams: Filter

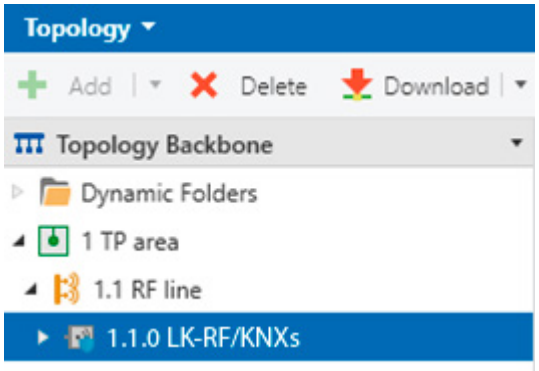
# 8 Wiring scheme




## 8.1 Line Coupler




The individual address of the LK-RF/KNXs corresponds to the form x.y.0 (x, y: 1 ... 15). Thus the device functions as a line coupler.



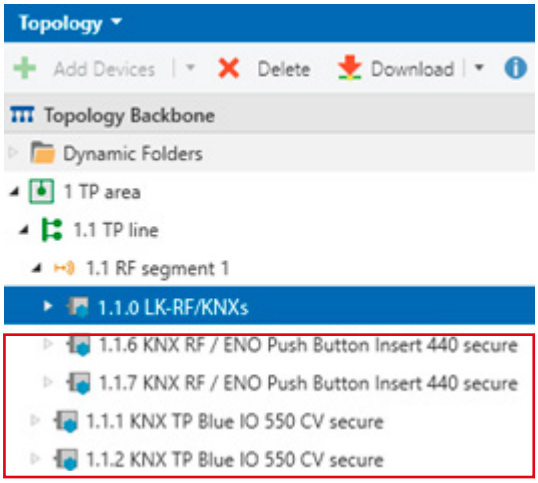
| NOTE | |
|---|---|
|  | The device functions as a line coupler only if its individual address has the form x.y.0. |

The LK-RF/KNXs has a filter table and therefore helps to reduce the bus load. The filter table supports the extended group address range (main groups 0 ... 31) and is automatically generated by the ETS.

**Wireless extension of a KNX line**


## 8.2 Segment Coupler

The individual address of the LK-RF/KNXs corresponds to the form x.y.z (x, y: 1 ... 15, z: 1 ... 255). Thus the device functions as a segment coupler.




*– Example devices from other manufacturers*

| NOTE | |
|---|---|
| | The device functions as a segment coupler only if its individual address has the form x.y.z. |

# 9 KNX Security

The KNX standard was extended by KNX Security to protect KNX installations from unauthorized access. KNX Security reliably prevents the monitoring of communication as well as the manipulation of the system.
The specification for KNX Security distinguishes between KNX IP Security and KNX Data Security. KNX IP Security protects the communication over IP while on KNX TP the communication remains unencrypted. Thus, KNX IP Security can also be used in existing KNX systems and with non-secure KNX TP devices.
KNX Data Security describes the encryption on telegram level. This means that the telegrams on the twisted pair bus or via RF (radio frequency) are also encrypted.

| | NOTE |
|---|---|
|  | Encrypted telegrams are longer than the previously used unencrypted ones. For secure programming via the bus, it is therefore necessary that the interface used (e.g. USB) and any intermediate line couplers support the so called KNX Long Frames. |

## 9.1 Security Proxy

A Security Proxy translates secure group communication from one side (e.g. secured KNX RF line) into unsecured group communication on the other side (e.g. unsecured KNX TP area) and vice versa.

# 10 ETS database

The ETS database (for ETS 5.7 or newer) can be downloaded from the LK-RF/KNX product website (www.beg-luxomat.com) or via the ETS online catalogue.
LK-RF/KNXs supports KNX Data Security to protect the device against unauthorized access from the KNX bus. If the device is programmed via the KNX bus, this is done with encrypted telegrams.

## 10.1 ETS 5

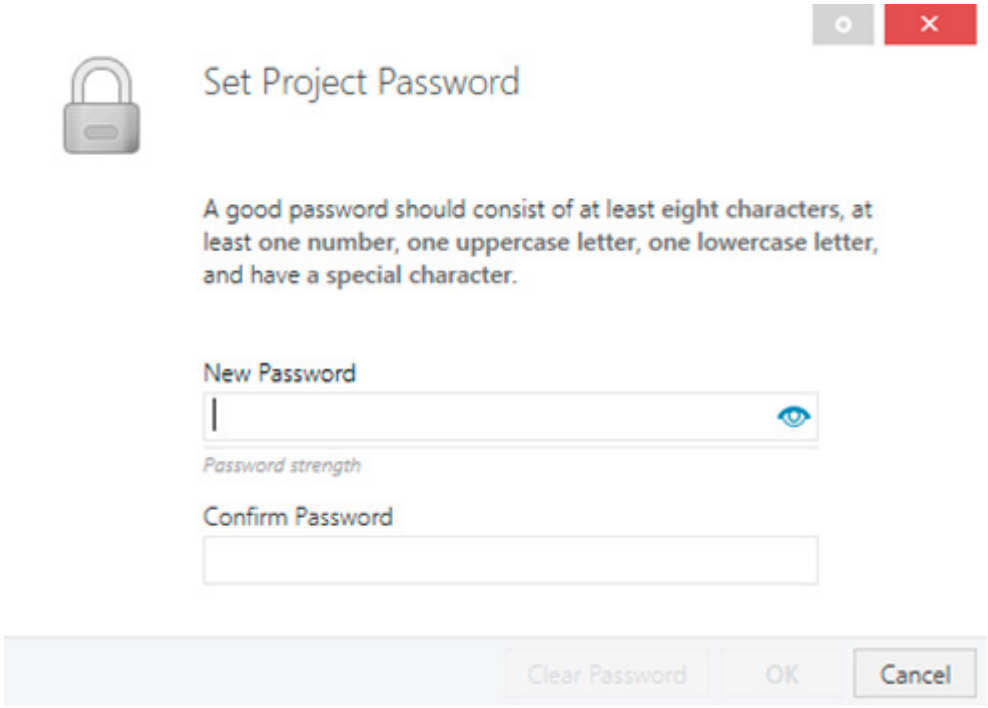
The ETS 5 database supports only KNX Data Security. The functionality of Security Proxy and Segment Coupler is not supported.

## 10.2 ETS 6

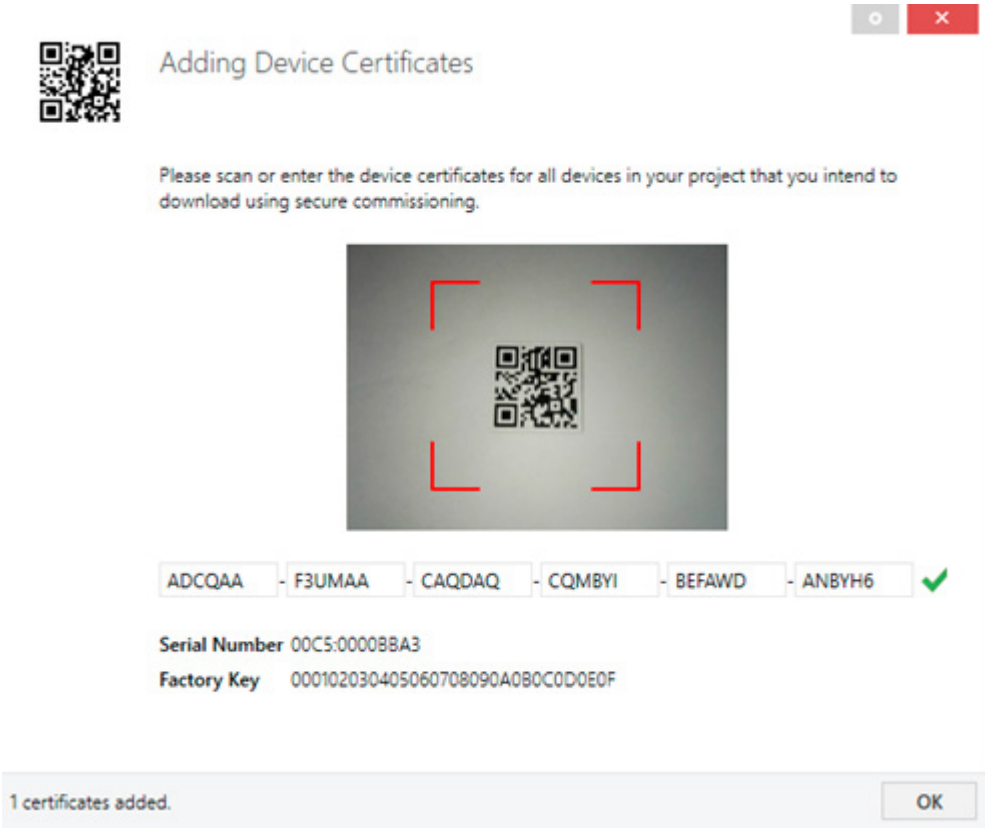
The ETS 6 database supports KNX Data Security as well as the functionality of Security Proxy and Segment Coupler.

## 10.3 Secure commissioning

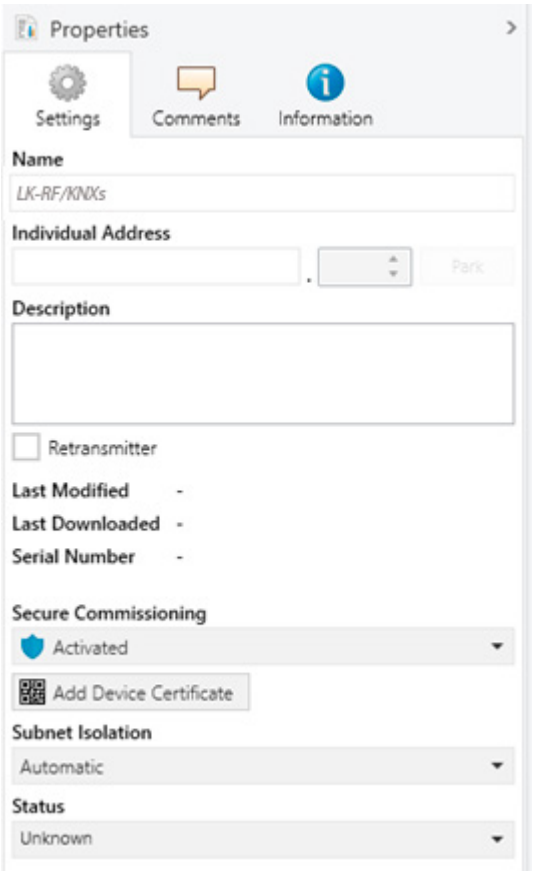
If the first product is inserted into a project with KNX Security, the ETS prompts you to enter a project password.



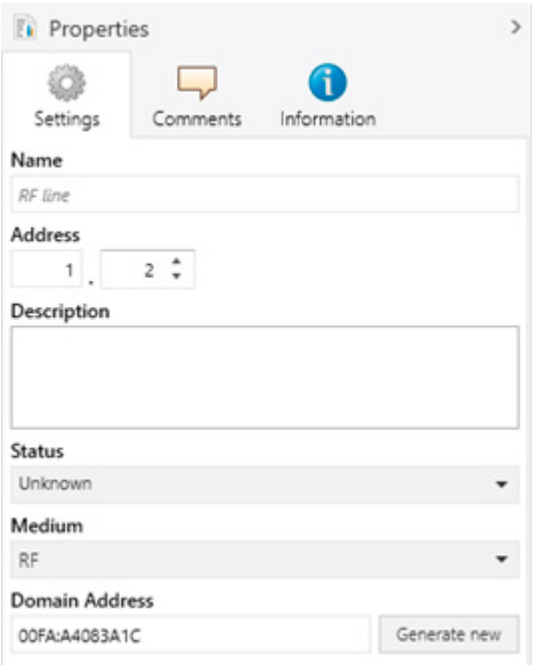

This password protects the ETS project from unauthorized access. This password is not a key that is used for KNX communication. The entry of the password can be bypassed with “Cancel”, but this is not recommended for security reasons.
ETS requires a device certificate for each device with KNX Security that is created in the ETS. This certificate contains the serial number of the device as well as an initial key (FDSK = Factory Default Setup Key).




The certificate is printed as text on the device. It can also be scanned from the printed QR code via a webcam.
The list of all device certificates can be managed in the ETS panel Reports – Project Security.
This initial key is required to safely put a device into operation from the start. Even if the ETS download is recorded by a third party, the third party has no access to the secured devices afterwards. During the first secure download, the initial key is replaced by the ETS with a new key that is generated individually for each device. This prevents persons or devices who may know the initial key from accessing the device. The initial key is reactivated after a reset to factory default settings.
The serial number in the certificate enables the ETS to assign the correct key to a device during a download.
In the ETS project in the properties of the device, secure commissioning can be activated and the device certificate can be added. Furthermore, the device name can be changed here, as well as the retransmitter mode (repeater mode) can be de-/activated in the device. In this mode the received telegrams are retransmitted to increase the RF range. With Subnet Isolation it can be set whether transmission and point-to-point communication is allowed into the subnet. It is recommended to set this to “Automatic”. Thus the telegrams are forwarded or filtered as configured in the database.

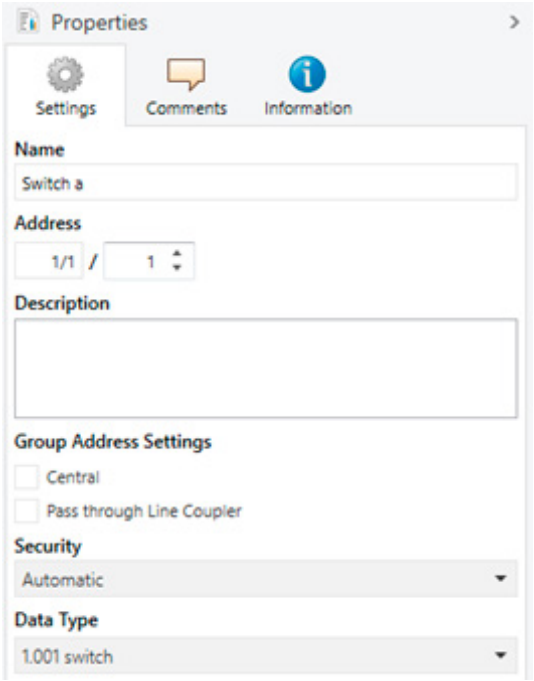



By marking the RF line in the tree structure of the topology view of the ETS project, the overview “Properties” appears on the right side of the ETS window. Under Properties menu item “Settings” the domain address of the line can be changed.



## 10.4 Secure group communication

Each object of the device can communicate either encrypted or unencrypted. The encryption is set under “Security” in the properties of the used group address:




The setting ”Automatic” activates encryption if both objects to be connected can communicate encrypted. Otherwise encrypted communication between the objects is not possible.
In the overview of communication objects in the ETS project, secured objects can be recognized by a shield symbol:

| Security | Number | Name | Object Function | Description | Group Address |
|---|---|---|---|---|---|
| | 11 | Button A0: Object a | Switch | Switch a | 1/1/1 |
| | 12 | Button A0: Object b | Switch | Switch b | 1/1/2 |
| | 21 | Button A1: Object a | Switch | Switch a | 1/1/1 |
| | 22 | Button A1: Object b | Switch | Switch b | 1/1/2 |

A separate key is automatically generated by the ETS for each secured group address. These keys can also be checked in the ETS panel Reports – Project Security. To enable all devices to communicate with a secure group address, the keys must be known to all. Therefore a download must be made into all devices that use this group address when a key is created or changed. A key is changed by the ETS e.g. when the encryption of a group address is switched off and on again.

| | NOTE |
|---|---|
| | Telegrams from the bus that do not address the KNX RF/TP Coupler 673.1 secure as a device are forwarded or blocked according to the filter settings (parameters and filter table). It does not matter whether the telegrams are unencrypted or encrypted. The forwarding is done exclusively on the basis of the destination address. The security properties are checked by the respective recipient. |

## 10.5 General settings


**Device name** *(30 characters)*
Any name can be assigned to the LK-RF/KNXs. The device name should be meaningful, e.g. “Living room EG”. This helps the clarity in the ETS project.

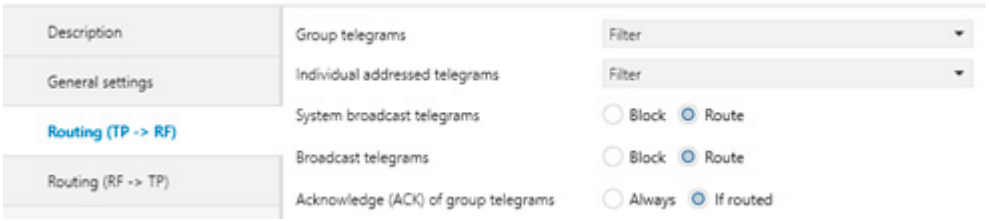
**Manual control on the device**
This parameter is used to configure manual operation on the device. The manual operation mode can be blocked or activated (with or without time limit). The time limit defines the duration until the automatic return from manual operation back to the normal operating mode.

The following configuration options are available:

- Disabled
- Enabled with time limit 1 min
- Enabled with time limit 10 min
- Enabled with time limit 30 min
- Enabled without time limit

| NOTE | |
|---|---|
|  | The activated manual operation can reduce the security of the installation. |

## 10.6 Routing (TP -> RF)




**Group telegrams**
The following settings are possible:

- **Block**
  No group telegram is forwarded to the RF line.
- **Route**
  All group telegrams are forwarded to the RF line regardless of the filter table.
- **Filter**
  The filter table is used to decide whether the received group telegram is to be forwarded to the RF line.

| NOTE |
| --- |
| The setting “Route” should only be used for test purposes. |

**Individual addressed telegrams**
The following settings are possible:

- **Block**
  No individual addressed telegram is forwarded to the RF line.
- **Route**
  All individual addressed telegrams are forwarded to the RF line.
- **Filter**
  The destination address is used to check whether the received individual addressed telegram is forwarded to the RF line.

| NOTE |
| --- |
| The setting “Route” should only be used for test purposes. |

**System broadcast telegrams**
The following settings are possible:

- **Block**
  No received system broadcast telegram is forwarded to the RF line.
- **Route**
  All received system broadcast telegrams are forwarded to the RF line.

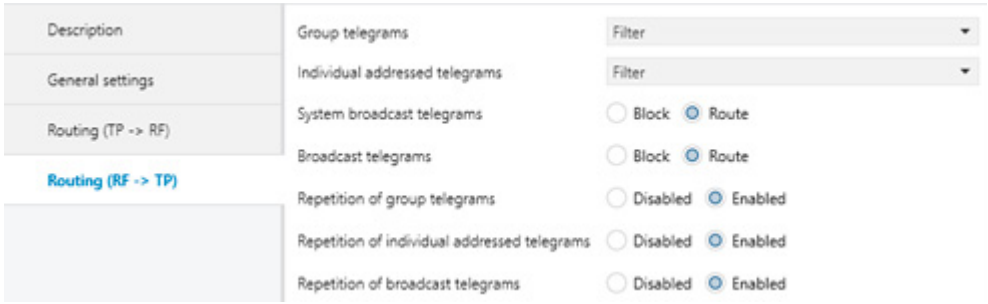
**Broadcast telegrams**
The following settings are possible:

- **Block**
  No received broadcast telegram is forwarded to the RF line.
- **Route**
  All received broadcast telegrams are forwarded to the RF line.

**Acknowledge (ACK) of group telegrams**
The following settings are possible:

- **Always**
  For received group telegrams (from the TP line) always send an acknowledge.
- **If routed**
  For received group telegrams (from the TP line) an acknowledge is sent only when telegram is forwarded to the RF line.

## 10.7 Routing (RF -> TP)




**Group telegrams**
The following settings are possible:

- **Block**
  No group telegram is forwarded to the TP line.
- **Route**
  All group telegrams are forwarded to the TP line regardless of the filter table.
- **Filter**
  The filter table is used to decide whether the received group telegram is forwarded to the TP line.

| NOTE | |
|---|---|
| ! | The setting “Route” should only be used for test purposes. |

**Individual addressed telegrams**
The following settings are possible:

- **Block**
  No individual addressed telegram is forwarded to the TP line.
- **Route**
  All individual addressed telegrams are forwarded to the TP line.
- **Filter**
  The destination address is used to check whether the received individual addressed telegram is forwarded to the TP line.

| NOTE | |
|---|---|
| ! | The setting “Route” should only be used for test purposes. |

**System broadcast telegrams**
The following settings are possible:

- **Block**
  No received system broadcast telegram is forwarded to the TP line.
- **Route**
  ll received system broadcast telegrams are forwarded to the TP line.

**Broadcast telegrams**
The following settings are possible:

- **Block**
  No received broadcast telegram is forwarded to the TP line.
- **Route**
  All received broadcast telegrams are forwarded to the TP line.

**Repetition of group telegrams**
The following settings are possible:

- **Disabled**
  The forwarded group telegram will be not repeated in case of an error in the TP line.
- **Enabled**
  The forwarded group telegram will be repeated up to three times in case of an error.

**Repetition of individual addressed telegrams**
The following settings are possible:

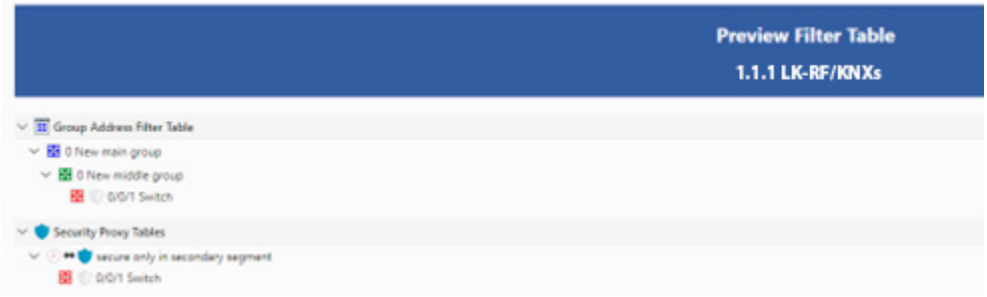
- **Disabled**
  The forwarded individual addressed telegram will be not repeated in the TP line in case of an error.
- **Enabled**
  The forwarded individual addressed telegram will be repeated up to three times in case of an error.

**Repetition of broadcast telegrams**
The following settings are possible:

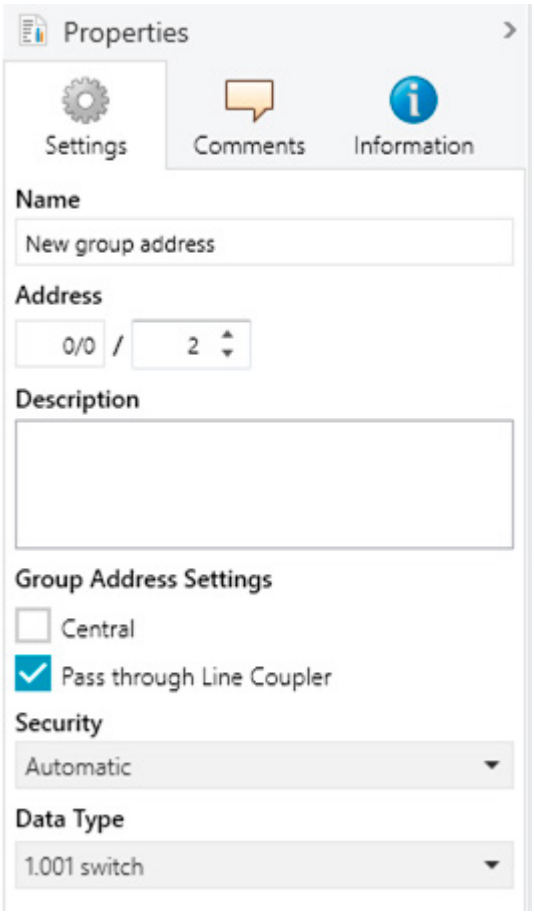
- **Disabled**
  The forwarded broadcast telegram will be not repeated in the TP line in case of an error.
- **Enabled**
  The forwarded broadcast telegram will be repeated up to three times in case of an error.

## 10.8 Filter Table / Security Proxy Tables

The filter table is created automatically by the ETS. The group addresses of the telegrams that are to be forwarded via the coupler are included in the filter table for this purpose. The content of the filter table can be displayed via the preview. Also the security proxy tables are displayed here.




The filter table can be extended by manually adding group addresses. For this purpose, “Pass through Line Coupler” must be activated in the properties window of the corresponding group address.



# 11 Care, maintenance and disposal

## 11.1 Cleaning

As the device is installed protected in the sub-distribution (control cabinet), it does not normally require cleaning. However, if cleaning is necessary, please observe the following instructions.

| DANGER |
| --- |
| **Electric shock when touching live parts.**<br>**Electric shock can cause death.**<br>**Before working on the device, isolate the device from the mains supply and cover live parts in the vicinity!** |

If necessary, clean the surface of the device with a soft, lint-free cloth.

| NOTE |
| --- |
| **Do not use aggressive cleaners!**<br>➜ Do not use aggressive cleaning agents such as thinner or acetone to clean the device.<br>➜ Only use a fibre-free cloth for cleaning.<br>➜ Pointed and hard objects can destroy the device. |

## 11.2 Maintenance

The device does not normally require maintenance by the operator. Repairs to the devices may only be carried out by the manufacturer.
For repairs, contact your responsible B.E.G. Brück Electronic branch or directly B.E.G. Brück Electronic GmbH, Germany.

## 11.3 Disposal

Observe the nationally applicable regulations for electrotechnical components when disposing of them.

# 12 Diagnosis / Troubleshooting

| | NOTE |
|---|---|
|  | **Diagnosis / troubleshooting via the ETS!**<br>➜ For diagnosis / troubleshooting, use the corresponding functions of the ETS, e.g.<br>■ Group monitor<br>■ Bus monitor<br>■ Line scan |

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# 13 Service / Support

## 13.1 Manufacturer's warranty

The company B.E.G. Brück Electronic GmbH grants a warranty in accordance with the warranty conditions, which you can download from the website at https://www.B.E.G.-luxomat.com/service/downloads/.

## 13.2 Contact details

**Service hotline:**
+49 (0)2266 90121-0
Monday to Thursday 8.00 to 16.00 (UTC+1)
Friday 8.00 to 15.00 (UTC+1)

**E-mail:**
support@beg.de

**Return address for repairs:**
Contact your B.E.G. branch or agency.
You can find the contact details at https://www.beg-luxomat.com/en-in/service/service-points/.

Or contact directly
**B.E.G. Brück Electronic GmbH**
**Gerberstrasse 33**
**51789 Lindlar**
**GERMANY**

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B.E.G. Brück Electronic GmbH
Gerberstraße 33
51789 Lindlar

T +49 (0) 2266 90121-0
F +49 (0) 2266 90121-50

support@beg.de
beg-luxomat.com