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simulation entwicklung consulting

## Manual and Configuration

# Enertex® KNX TP Secure Coupler



## Note

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## Security Notes

- Installation and assembly of electrical equipment may only be carried out by qualified electricians.
- When connecting KNX / EIB interfaces, KNX™ training is required.
- Failure to observe this instruction may result in damage to the unit, fire or other hazards.
- This guide is part of the product and must remain with the end user.
- The manufacturer is not liable for costs or damages caused to the user or third parties by the use of this device, misuse or interference of the connection, malfunctions of the device or other connected devices.
- The opening of the housing, other unauthorized modifications and / or conversions to the device will void the guarantee!
- The manufacturer shall not be liable for any inappropriate use.

## Commissioning

To operate the Enertex® KNX IP Secure Coupler, you need:

- Two KNX/EIB lines

## Boot

When the unit is powered up, the display shows the product name.

The boot time is approximately 3 seconds. During this time, the green/red/yellow LED will start running for a short time. At the end of the booting process the display shows "KNX Ready",

The device is supplied with power via the bus line connected to the MAIN terminal.

The green LED flashes every second with a pulse duty cycle of 1:30.

## Display

After one minute the display turns off automatically. To turn it on again, press the DISPLAY button on the front panel briefly.

When the display is turned on, pressing the DISPLAY key initiates a scrolling through various information pages.

### Page 1

Routing information such as group addresses, filter information and device addresses of the senders.

Main => Sub                    \* : \*

Activity of routing from main to subline. The \* - character is animated and rotates with incoming telegrams on the respective page

Sub => Main                    \* : \*

Activity of routing from sub to main line. The \* - character is animated and rotates with incoming telegrams on the respective page

PHY: xx.yy.zzz

Device address of the indicated telegram

GA: aa/b/ccc

group address of the indicated telegram

*Note: At higher telegram load only a part of the group addresses is visible (approx. 3 displays per second).*

**Page 2** shows the firmware version, physical address, serial number, bus voltage and status of sub and main line

**Seite 3** shows information on telegram load

**Seite 4** shows the FDSK as long as the device is not set to the secure mode.

Pressing the DISPLAY button for more than 5 seconds will block (=bypass) all filters of the routing. During this phase, the display will show a countdown until it automatically returns to normal mode with activated filters. This function of the DISPLAY key can be blocked via the ETS application (see section Filter blocking (bypass)).

At the front side there are three LEDs. The green LED is blinking every second with a 1:30 duty cycle and indicates operational readiness. The red LED indicates programming mode, the yellow LED shows bus activity.

## Reset

If the device is to be reset to the factory settings, the PROG key on the front panel must be pressed for 10 seconds. After this time the red LED starts blinking - then the PROG button can be released and the unit will perform the reset to factory settings.

## Functional overview

The device has the following functionalities:

- KNX Secure Coupler
  - Connection for KNX TP subline (SUB)
  - Connector for KNX TP Main Inie (MAIN)
  - KNX TP Routing for coupling of KNX lines or areas (SUB and MAIN)
  - Use as line repeater
  - Galvanic separation of the lines
  - Telegram forwarding and filtering by physical address
  - Telegram forwarding and filtering by group address with up to 62 filter blocks
  - Programming the application via secure communication ("data secure")
- Displays
  - LEDs for operational readiness, TP communication and programming mode
  - OLED display for status messages, parameter messages, etc.
- Special functions
  - Measurement of TP bus voltage for sub and main line (OLED display)
  - Measurement of current consumption for sub and main line (OLED display)
  - 248 bytes TP APDU packet length of the KNX bus
  - Configuration of a programming lock for the SUB or MAIN line or both in plain or secure mode
  - Configuration of the DISPLAY button to switch on blocking (bypassing) the activated routing filters.

- Performance
  - Specification of a maximum TP data rate for writing KNX telegrams for each line
  - Buffering up to 1024 telegrams each for SUB and MAIN

## ETS Parameter

### Terms

**Encryption, encrypted** If devices send data information via the TP bus or IP network, they are generally readable by third parties. These only require access to the TP bus or IP network for reading. Encryption of the data in this context means that the contents of the telegrams are no longer to be interpreted if the encryption parameters (for example passwords) are unknown.

**Key, Key Parameter** A series of numbers known only to the ETS project. These numbers are used to transform the data in both directions: encryption and decryption.

**FDSK (Factory Default Setup Key)** The initial factory key. This key is used when commissioning the initial programming. A new key is loaded into the device, whereby this process is encrypted with the FDSK. The FDSK key is then no longer valid. It is reactivated only when resetting the device to factory settings.

**Secure Mode** If the device is parameterized via the ETS so that the communication is only encrypted, this is referred to as secure mode.

**Plain Mode** If the device is parameterized via the ETS so that the communication is only unencrypted, this is called unsecured mode.

### Version requirements

For accurate operation of the devices in secure mode, ETS 5.7.4 or higher is required.

### Topology

To insert the coupler into an ETS project as **area coupler**, this project must have a TP backbone. The coupler must be assigned to the address XX.0.0 (see [www.knx.org](http://www.knx.org)), where XX represents the desired area.

To insert the coupler into an ETS project as **line coupler**, the main line must be of type TP. The coupler must be assigned to the address XX.YY.0 (see [www.knx.org](http://www.knx.org)), where XX represents the desired area, YY the desired main line

Example with the following topology stored in the ETS:

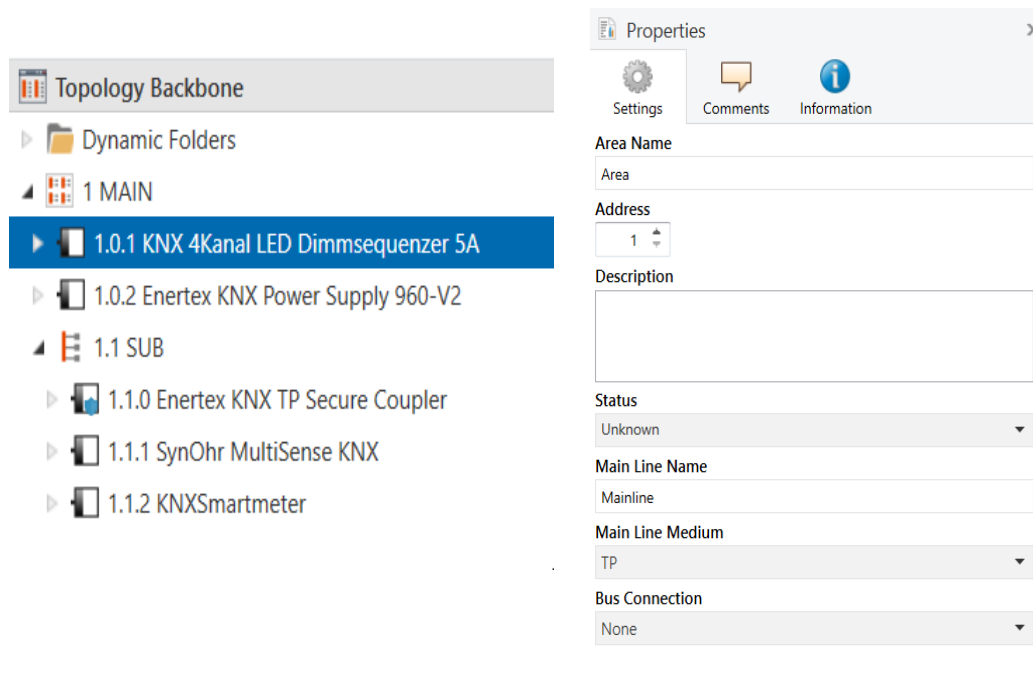


Figure 1: Topology (left) and properties of the main line

#### Linien:

- 1: MAIN: main line medium TP
- 1.1: SUB: sub line medium TP

If the device is used as a line **repeater**, all filters for group addresses (see below) and physical addresses must be set to forwarding.

## Device properties

Figure 2: Device properties

**Name** Any name can be assigned, max. 30 characters

**Secure commissioning** If enabled, the encryption for commissioning is active: All parameters are encrypted during transmission.

## Device specific parameters

### General

Figure 3: General settings of the device

The application parameters and filter tables of the Enertex® KNX TP Secure Couplers can be downloaded from both the main line and the sub line. It is also possible to limit the parameter download to the main line or the sub line or both lines. In the latter case, the device can no longer be accessed until it is reset to the factory default settings by a factory reset.

#### Example

*A TP outside line is connected to SUB, the main line to MAIN. The coupler is programmed so that only group addresses according to the filter are routed. For example, it prevents the address of the door opener on the MAIN line from being accessed by the SUB line. A potential attacker would be easily possible to reprogram the filter tables of the coupler. This can be prevented by activating the programming lock*

Name	Selection options	Description
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(Explanation)		The device can be programmed from both the sub and the main line in the factory default state. This can be restricted by means of the options shown here.
From sub line	<u>off/on</u>	See parameter dialog
From main line	<u>off/on</u>	See parameter dialog
Enable special functions	<u>off/on</u>	Enertex® devices offer special functions to ensure maximum flexibility for the user

## Special functions

### Behaviour of main line

1.1.0 - Enertex KNX TP Secure Coupler > Special functions > Behaviour main line

Programming	ACK for every telegram	<input checked="" type="radio"/> off <input type="radio"/> on
Special functions	Direction: device as receiver from main line	
Behaviour main line	ACK for routed telegrams only	<input type="radio"/> off <input checked="" type="radio"/> on
Behaviour sub line	Direction: device as sender to sub line	
Routing	Repeat routed telegrams if not ACKed	<input type="radio"/> off <input checked="" type="radio"/> on
Filter	Telegram rate limitation for sending (main line only). 50 telegrams per second equals 100% bus load.	
	Max. number of telegrams to main line	50 T/s

Figure 4: Behaviour of main line

Name	Selection options	Description
ACK for every telegram	<u>off/on</u>	The coupler acknowledges each telegram, even if it does not forward this telegram
ACK for routed telegram only	<u>off/on</u>	The coupler only confirms the telegrams that it forwards
Repeat routed telegrams if not ACKed	<u>off/on</u>	The coupler repeats unconfirmed individually addressed telegrams
Max. number of telegrams to main line	5 .. <u>50</u>	See parameter dialog

### Behaviour of sub line

1.1.0 Enertex KNX TP Secure Coupler > Special functions > Behaviour Sub line

Programming	ACK for every telegram	<input type="radio"/> off <input checked="" type="radio"/> on
Special functions	Direction: device as receiver from sub line	
Behaviour Main line	ACK for routed telegrams only	<input type="radio"/> off <input checked="" type="radio"/> on
Behaviour Sub line	Direction: device as sender to main line	
Routing	Repeat routed telegrams if not ACKed	<input type="radio"/> off <input checked="" type="radio"/> on
Filter	Telegram rate limit for sending (sub line only). 50 Telegrams per second equals 100% bus load.	
	Max. number of telegrams to sub line	50 T/s



Figure 5: Behaviour of sub line

Name	Selection options	Description
ACK for every telegram	<u>off</u> /on	The coupler acknowledges each telegram, even if it does not forward this telegram
ACK for routed telegram only	<u>off</u> /on	The coupler only confirms the telegrams that it forwards
Repeat routed telegrams if not ACKed	<u>off</u> /on	The coupler repeats unconfirmed individually addressed telegrams
Max. number of telegrams to sub line	5 .. <u>50</u>	See parameter dialog

## Routing

### 1.1.0 - Enertex KNX TP Secure Coupler > Special functions > Routing

Programming

Check of topology

Special functions

Behaviour main line

Behaviour sub line

Routing

If enabled, the coupler will detect an error in topology and send A\_Network\_Parameter\_Response on main or sub line, respectively. This telegram is sent on the line, which violates the KNX rules for routing topology.

If enabled, the detected errors will be shown on display. The erroneous telegrams will not be routed.

Check topology  off  on

Abbildung 6: Routing

Name	Selection options	Description
Check topology	<u>off</u> /on	See parameter dialog

## Filter

### Physical address filter

The Enertex KNX TP Secure coupler can be configured in such a way that physically addressed telegrams are forwarded, blocked or filtered. Physically addressed means that devices are loaded or programmed across the coupler with the ETS application parameters. If this communication is blocked, for example, an actuator on the main line cannot be programmed from the sub line.

If, additionally, broadcast telegrams are also blocked, it is not possible to assign the physical address via the coupler using the programming button of the other device, even if the physically addressed telegrams are forwarded by the coupler.

This applies to all communication that is related to the device address in the specified direction. The required parameters are located in the physical address filter (see 7).

**1.1.0 - Enertex KNX TP Secure Coupler > Filter > Physical address filter**

Programming	Filter for phy. addressed telegrams
Filter	The Enertex KNX TP Secure coupler can be parameterised in such a way that physically addressed telegrams are forwarded, blocked or filtered. Physically addressed means that devices are loaded or programmed across the coupler.
<b>Physical address filter</b>	If this communication is blocked, for example, an actuator on the main line cannot be programmed from the sub line. As a consequence it is not possible to change the phy. address of a device.
Group address filter	Main => Sub <input type="text" value="filter (default)"/>
Filter blocking	Sub => Main <input type="text" value="filter (default)"/>
	Filter for broadcast telegrams If broadcast telegrams are blocked, the physical address cannot be assigned across the coupler, for example. Main => Sub <input checked="" type="radio"/> off <input type="radio"/> on Sub => Main <input checked="" type="radio"/> off <input type="radio"/> on

Figure 7: Filter for physically addressed telegrams

Name	Selection options	Description
Physical address filter		The physically addressed telegrams (e.g. programming of actuators) can be forwarded, blocked or filtered via routing. This applies to all communication that refers to the device address in the specified direction.
Main => Sub	<u>filter</u> , block, route	Direction: MAIN to SUB
Sub => Main	<u>filter</u> , block, route	Direction: SUB to MAIN
Blocking of broadcast telegrams		Broadcast telegrams (e.g. search for actuators in programming state) can be forwarded or blocked via the router.
Main => Sub	<u>off/on</u>	Direction: MAIN to SUB
Sub => Main	<u>off/on</u>	Direction: SUB to MAIN

## Group address filter

## Standard

1.1.0 Enertex KNX TP Secure Coupler > Filter > Group address filter

Programming	Main => Sub	
+ Special functions	Main Group 0..13	filter
- Filter	Main Group 14..15	route
	Main Group 16..31	route
Physical address filter	Extended Group Address Filter	<input type="radio"/> off <input checked="" type="radio"/> on
- Group address filter		
Ext. filter Main => Sub	Sub => Main	
Ext. filter Sub => Main	Main Group 0..13	filter
	Main Group 14..15	route
Filter blocking	Main Group 16..31	route
	Extended Group Address Filter	<input type="radio"/> off <input checked="" type="radio"/> on

Figure 8: Standard filter for group telegrams

Name	Options	Description
Main => Sub		Direction: Main to Sub
Main group 0 to 13	filter, block, <u>route</u> Group telegrams can be routed, blocked or filtered via the routing.	Group telegrams can be routed, blocked or filtered via routing. The groups 0 to 13 are combined to one block.
Main group 14 to 15	<u>filter</u> , block, route	Group telegrams can be routed, blocked or filtered via routing. The groups 14 to 15 are combined to one block.
Main group 16 to 31	<u>filter</u> , block, route	Group telegrams can be routed, blocked or filtered via routing. The groups 16 to 31 are combined to one block.
Extended group address filter	<u>off/on</u>	In addition to the block-oriented filtering of group address telegrams, each group can also be separately routed, blocked or filtered via routing. With this function, the parameter dialog can be opened for this purpose.
Sub => Main		Direction: Sub to Main
Main group 0 to 13	filter, block, <u>route</u>	Group telegrams can be routed, blocked or filtered via routing. The groups 0 to 13 are combined to one block.

Main group 14 to 15	<u>filter</u> , block, route	Group telegrams can be routed, blocked or filtered via routing. The groups 14 to 15 are combined to one block.
Main group 16 to 31	<u>filter</u> , block, route	Group telegrams can be routed, blocked or filtered via routing. The groups 16 to 31 are combined to one block.
Extended group address filter	<u>off/on</u>	In addition to the block-oriented filtering of group address telegrams, each group can also be separately routed, blocked or filtered via routing. With this function, the parameter dialog can be opened for this purpose.

### *Extended group address filter*

For both directions, in addition to the block-oriented filtering of group address telegrams, each group can also be individually routed, blocked or filtered via routing. Therefore, there are the additional entries in the navigation bar when activated (vgl. 7 bzw. 8, respectively) „Ext. filter Main => Sub“ and „Ext. filter Sub => Main“.

For each of these entries, there are 32 more group address filters that work independently of the block-oriented filters. The settings of the 32 group address filters override those of the block-oriented filters.

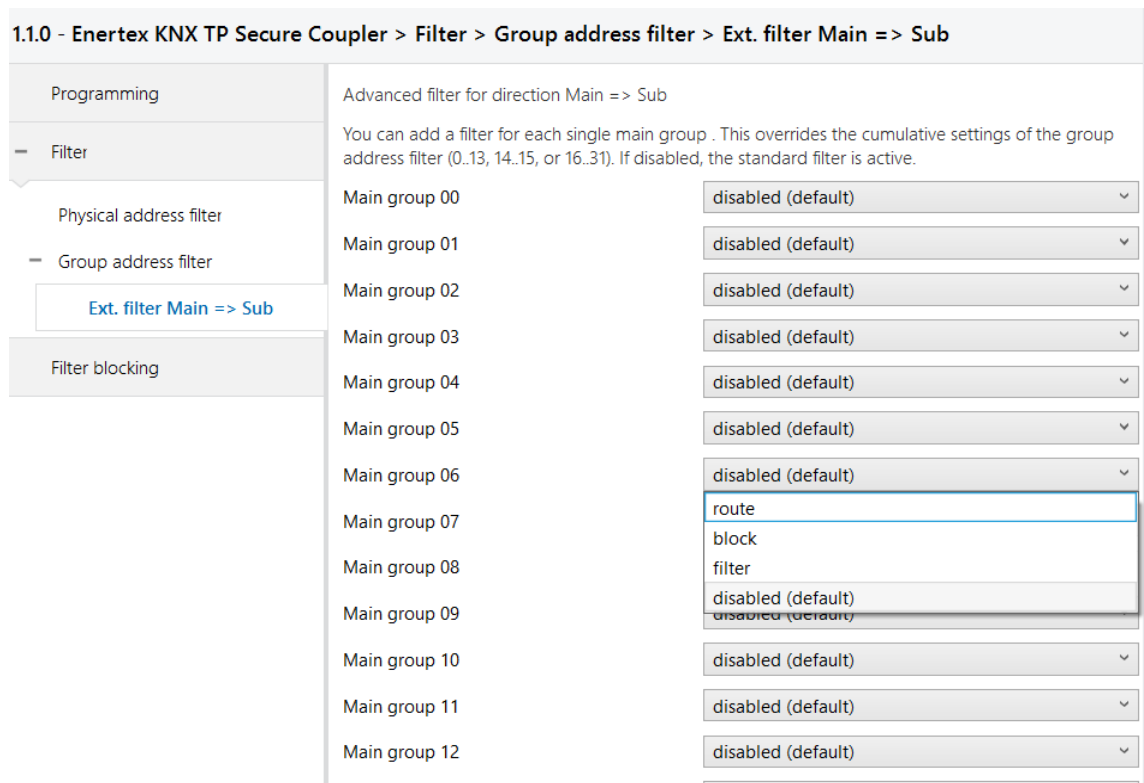


Figure 9: Extended filter for group address telegrams (main to sub)

Name	Selection options	Description
Main Group 00	<u>inactive</u> , filter, block, forward	Group telegrams of this main group can be routed, blocked or filtered via routing. If the filter is not active, the behavior of the parameters of 8 and 9, respectively.
Main group NN NN = 01 .. 31	See above	See above

### Filter blocking (bypass)

During commissioning, it is sometimes useful to temporarily override all filters and routing rules, so that when troubleshooting, a localization can be made. This deactivation of all routing rules is called "filter blocking" in this application.

By pressing and holding (>5 seconds) the DISPLAY button, the filter blocking can be activated. After a programmable timeout, the filters are reactivated. During this time the display shows a countdown until the filters are reactivated. The time-dependent deactivation of the display is disabled while „filter blocking“ is active, i.e. the display is continuously on.

In addition, you can set a parameter in the application to determine whether a filter bypass becomes active after the application download [once].

After another restart or pressing the DISPLAY key, the filter function is reactivated.

Abbildung 10: Parameters filter blocking

Name	Selection options	Description
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1.1.0 - Enertex KNX TP Secure Coupler > Filter blocking		
Programming	For commissioning you can temporarily disable all filter functions (filter blocking) after a download or after pressing DISPLAY for 5 seconds.	
+ Filter	Block filter once after programming	<input checked="" type="radio"/> off <input type="radio"/> on
Filter blocking	DISPLAY activates the filter blocking	<input type="radio"/> off <input checked="" type="radio"/> on
	Deactivate filter for	3600 sec
	Block Filter configuration for	Groupaddress & Broadcast & Individual
Block filter once after programming	off/on	See parameter dialog Note: This parameter is only active once after the download for the specified time period "Deactivate filter for".
DISPLAY activates the filter blocking	off/on	See parameter dialog
Deactivate filter for (sec)	10 .. 3600 .. 65365	See parameter dialog
Block filter configuration for	Group addresses Broadcast Individual	The filter bypass can be selected for the three different types of communication (group communication, broadcast and physically addressed) in any combination.

## Latest data

<http://www.enertex.de/e-produkt.html> contains the current ETS database file and the current product description.

## Technical data

<b>Symbols</b>	Must not be disposed of with household waste..
<b>KNX TP SUB</b>	DC 21 ... 32 V SELV current consumption < 9 mA
<b>KNX TP MAIN (Power)</b>	DC 21 ... 32 V SELV current consumption < 1.5 mA
<b>Display</b>	Graphical OLED, 128x64 dots, additional display information Programming LED (red), bus activity LED (yellow), voltage LED (blinking green)
<b>KNX functions</b>	<ul style="list-style-type: none"> <li>• AES 128 encryption</li> <li>• Up to 62 group address filters</li> <li>• APDU 248</li> <li>• TP Telegram rate limitation for Sub</li> <li>• TP Telegram rate limitation for Main</li> <li>• TP Bus voltage measurement for Sub (display)</li> <li>• TP Bus voltage measurement for Main (display)</li> </ul>
<b>Environmental temperature</b>	-5 ... +45° C
<b>Installation</b>	<ul style="list-style-type: none"> <li>• For use in dry indoor areas only.</li> <li>• Only for installation in distribution boxes to DIN 43880 on 35 mm top-hat rail to EN 50022.</li> <li>• Protection class IP20</li> </ul>
<b>Dimensions</b>	35.0 mm x 89.6 mm x 62.9 mm (L x W x H)