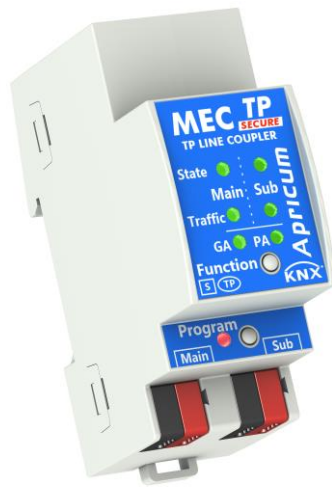


# APRICUM



## MECtp-Sec

KNX Secure Line/Area Coupler/Repeater

### Technical & Application Description

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# 1 Product Description

MECtp-Sec, the secured version of MECtp, is a KNX Secure line coupler that supports the KNX Secure mechanism KNX Data Secure. It provides a bi-directional data connection between two KNX TP lines. The Device Certificate utilization enables the usage of the Security function “Secure Commissioning” that can be set to active.

MECtp-Sec can work as Line/Area Coupler to connect KNX TP Lines and KNX TP Areas. It can also work as KNX Repeater to extend a KNX TP Line. For this purpose, different applications are available. With using the TP Secure Coupler application, MECtp-Sec serves as line coupler to connect a TP Line to a TP Area or Backbone (or as area coupler to connect a TP Area to a TP Backbone). Usage of the TP Secure Repeater application enables MECtp-Sec to extend a KNX TP Line by providing unfiltered data transfer between the connected TP Segments. Up to four Segments (each requires a KNX power supply unit) can form a single TP Line in this way.

MECtp-Sec is suitable for the Extended Frame format and has no KNX communication objects for itself. Long telegrams are supported with up to 240 bytes APDU length. Filtering of telegrams can be configured for both Physical Telegrams and Group Telegrams. Operational modes, line states, telegram traffic, and filter states are shown at the duo-LED display. Telegram repetition (on both TP sides) is also configurable. For bus traffic reduction, special repetition/confirmation settings are provided.

It is possible to set programming of MECtp-Sec and main line devices via the subline to inactive. To be more exact, the sub-to-main transmission of telegrams for configuring purpose can be switched off. This function can avoid unwanted access to devices (and their configurations) from a subline (that may be located outside of a building).

The configurable Manual Function for short-time filter switch-off can ease commissioning and troubleshooting. For example, “transmit all group telegrams” can be activated by a single on-device button press. After the pre-set time period, MECtp-Sec switches automatically back to normal operation.

### 1.1 Front Panel

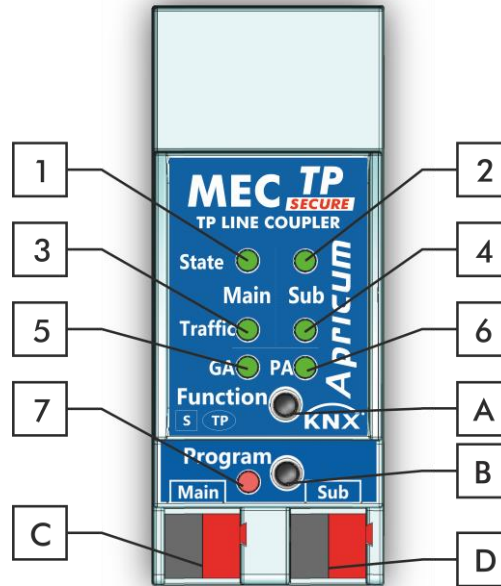


Figure 1: Front View

Table 1: Front Panel Elements

LEDs		Buttons / Connectors	
1	Bus State KNX TP (Main line)	A	Function Button
2	Bus State KNX TP (Subline)	B	Programming Button
3	Telegram Traffic KNX TP (Main line)	C	KNX TP Main Line Connector
4	Telegram Traffic KNX TP (Subline)	D	KNX TP Subline Connector
5	Group Address Routing*		
6	Individual (Physical) Address Routing		
7	Programming LED		

\* only group telegrams with main groups 0...13

### 1.2 LED Indication

Following table gives a general description of the LED display indication intended for normal operation. Constellations of LED lighting during active special functions are further described in next chapter.

Table 2: Normal LED Display

Number	LED	Color	Explanation / Range
1	Bus State KNX TP (Main line)	green	Main Line OK
		orange	Manual Function active
2	Bus State KNX TP (Subline)	green	Subline OK
		< off >	Subline not connected
3	Telegram Traffic KNX TP (Main line)	blinking green	Telegram traffic extent indicated by blinking
		blinking red	Transmission error (BUSY, NACK, missing IACK)
		< off >	No telegram traffic
4	Telegram Traffic KNX TP (Subline)	blinking green	Telegram traffic extent indicated by blinking
		blinking red	Transmission error (BUSY, NACK, missing IACK)
		< off >	No telegram traffic
5	Group Address Routing	green	Filter table active
		orange	Route all
		red	Block all
		< off >	Routing of Group Telegrams is different on main line and subline
6	Individual (Physical) Address Routing	green	Filtering active
		orange	Route all
		red	Block all
		< off >	Routing of Physical telegrams is different on main line and subline
7	Programming LED	red	Programming Mode active
		< off >	Programming Mode not active

### 1.3 LED Indication of Special Functions

During an active special function, only LEDs described here are lighting. Other LEDs are off.

Table 3: LED Status Display for Manual Function

Number	LED	Color	Comment
1	Bus State KNX TP (Main line)	orange	
2	Bus State KNX TP (Subline)	green	is <off> if not connected
5	Group Address Routing	green:	filter
6	Individual Address Routing	orange:	route all
		red:	block all

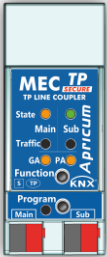
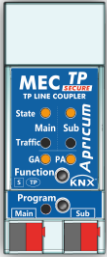


Table 4: LED Status Display for Factory Reset after first Function Button Press

Number	LED	Color	Comment
1	Bus State KNX TP (Main line)	orange	
2	Bus State KNX TP (Subline)	orange	lights red if not connected
5	Group Address Routing	green:	filter
6	Individual Address Routing	orange:	route all
		red:	block all





### 1.4 Commissioning

**Please note for commissioning with default settings:**

- All telegrams are blocked because the filter table is not defined
- The Manual Function switch-off time is 120 min
- Individual Address is 15.15.0
- Activation of Secure Commissioning requires the Device Certificate
- Activation of Secure Commissioning requires a minimum ETS version (see also Security functions)

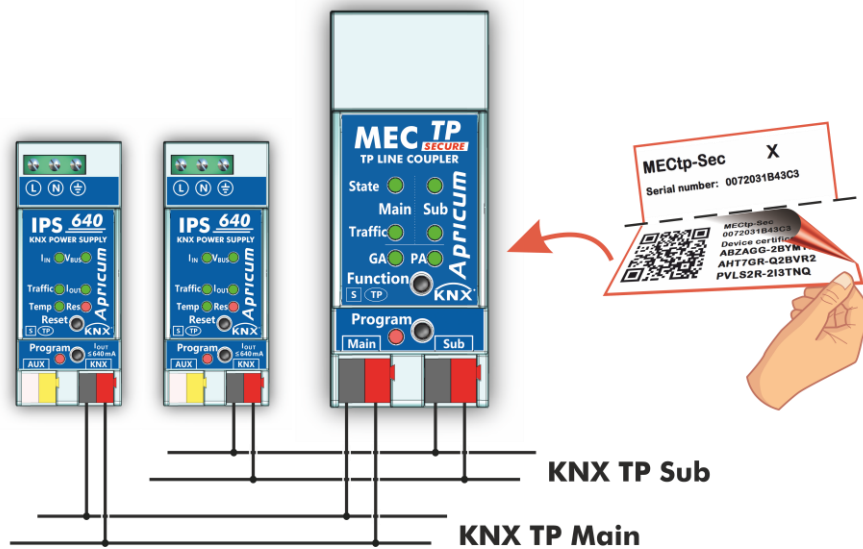


Figure 2: Connection Scheme



To start a secured configuration download, Secure Commissioning must be activated in the ETS project before. Without activation, MECtp-Sec is working as plain device and will behave like MECtp (without supporting KNX Secure).



Please also read chapter 1.6 Important Notes before putting the device into operation.

### 1.5 Secure Commissioning

Before the secured download of a configuration setting and/or the Individual Address can start, the individual Device Certificate of MECtp-Sec must have been added to the ETS project. To be able to add it, the ETS project must be password-protected.



A secured download is only possible after activation of Secure Commissioning.



Activation of Secure Commissioning demands the individual Device Certificate.



Device Certificates can only be added to a password-protected ETS project.

When no project password is set, Secure Commissioning cannot be activated. ETS projects with having Secure Commissioning set to active always require pre-setting a project password. Having no project password set on activation, the ETS then asks to type it in.

**Set Project Password**  
KNX Secure Project

A good password should consist of at least eight characters, at least one number, one uppercase letter, one lowercase letter, and have a special character.

New Password

*Password strength*

Confirm Password

Clear Password OK Cancel

Figure 3: Set Project Password



The individual Device Certificate always is enclosed with a KNX Secure product. To keep the product fully configurable by the user, it is important to make sure the Device Certificate cannot be lost (please note chapter 1.7 Safekeeping of Device Certificate).

## 1.6 Important Notes

It is recommended to participate the standardized courses of a KNX-certified training center before installing, programming, and commissioning a KNX system. Here, the participant gains the necessary knowledge and skills, also required for troubleshooting, by practical exercises.

**Please read this chapter carefully before first use and installation:**

### 1.6.1 Installation and Commissioning

- In the case of damage (at storage, transport) no repairs may be carried out by unauthorized persons
- After connection to the KNX bus system, the device works with its default settings
- **Warning: Do not connect to 230 V. The device is supplied by the KNX bus and does not require any additional external power supply**
- The device may only be installed and put into operation by a qualified electrician or authorized person
- For planning and construction of electric installations the appropriate specifications, guidelines and regulations in force of the respective country have to be complied
- For configuring, use the ETS (or ETS Inside)

### 1.6.2 Mounting and Safety

- For mounting use an appropriate equipment according to IEC60715
- Installation on a 35 mm DIN rail (TH35)
- Connect the KNX bus line as for common KNX bus connections with a KNX bus cable, to be stripped and plugged into a KNX TP connector
- Do not damage electrical insulations during connecting
- Installation only in dry locations

### 1.6.3 Maintenance

- Accessibility of the device for operation and visual inspection must be provided
- The housing must not be opened
- Protect the device from moisture, dirt and damage
- The device needs no maintenance
- If necessary, the device can be cleaned with a dry cloth

### 1.7 Safekeeping of Device Certificate

The Device Certificate can be found on a label that is adhered on side of the housing. To avoid unwanted access, the label consists of two parts. The upper part must remain on the housing, for identifying the device. The lower one is the tear-off part. This part contains the Device Certificate and should be removed from the device for keeping the information at a safe place after commissioning.

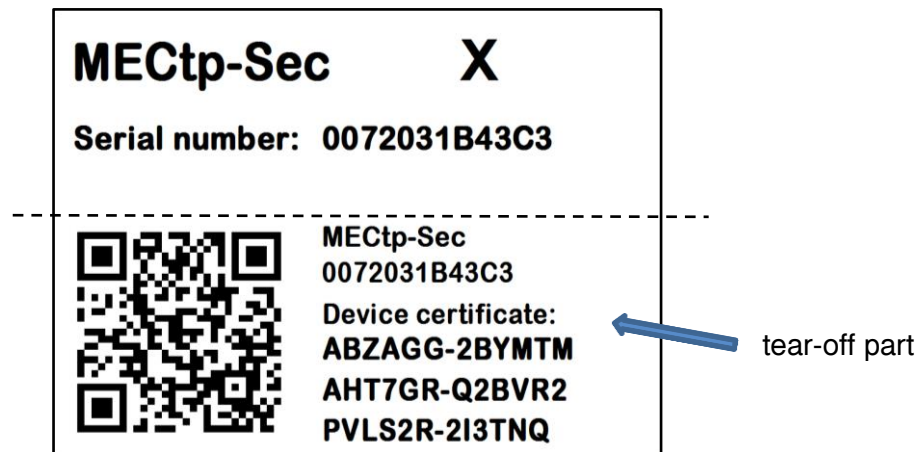


Figure 4: Device Certificate Label

After adding the Device Certificate to the Device Certificate list in ETS, the tear-off part of the Device Certificate label can be archived at a safe place. The Device Certificate list only needs to contain the certificates of the KNX Secure devices that are used within the ETS project. ETS then automatically uses the correct certificates for programming the relevant devices.

For clear identification of the device after removing the tear-off part, the serial number is printed on both label parts, on the one that was removed and on the fixed one that stays on the housing.



When the tear-off part that contains the Device Certificate is lost, only the password-protected ETS project contains the Device Certificate.



Be aware, when the Device Certificate is completely lost, meaning the tear-off part is unavailable and the project password (that contained the certificate) is lost, too, a Secure device cannot be set to active secure mode anymore! Consequently, Security cannot be activated within a new ETS project. In this case, to reprogram a Secure device with active secure mode, a Reset has to be carried out and the Secure device can only be used unsecured, as “plain” device, from then.

### 1.8 Feature Summary

- Device Certificates guarantee only authorized persons can have access to MECtp-Sec.
- When the ETS “Secure Commissioning” function is active, configuration data is downloaded only in encrypted KNX Data Secure format.
- Configuring MECtp-Sec plus devices on the main line from the subline can be switched off. (This is very useful, when there are sublines that bear a high risk of being misused.)
- MECtp-Sec supports long telegrams with up to 240 bytes APDU length. (Both product series, the MEC couplers and UIM interfaces, can process long messages e.g. for energy metering applications and visualization purposes, and support Extended Frames.)
- Settings to increase data throughput and decrease high bus traffic are featured.
- IACK sending on sent out messages is configurable.
- Repetition is configurable for both Physical Telegrams and Group Telegrams.
- To ease commissioning, troubleshooting and fast on-site diagnostics, normal run-time filtering can temporarily be suspended by a single the Function button press. Other lines can be accessed without having to carry out additional ETS downloads. Switching back to normal run-time filter settings after suspension period expiry is automatic (see Manual Function). This avoids forgetting to reactivate the settings for normal filtering.

## 2 KNX Secure

KNX devices that support KNX Secure are able to use a special protection basing on telegram encryption. Also, access to the device for configuring is protected and limited to the user that knows its Device Certificate. The Device Certificate is a device-specific protection code that is enclosed with the device on delivery.

To make use of the KNX Secure protection, every KNX Secure device supports a secure mode. When its secure mode is on, commissioning, configuring and runtime communication run in an encrypted manner so that the device is shielded against intruder attack and unwanted manipulation. For activation, the Device Certificate is necessary (see chapter 1.5 Secure Commissioning). Only when secure mode is active, the KNX Secure device is able to read and send encrypted telegrams. When secure mode is off, the Secure device behaves like a common KNX device without KNX Secure support (also called plain KNX device). KNX Secure devices in secure mode and plain devices can't be combined by the same group object, but it is possible to have a mixed installation consisting of secured devices and plain devices.



Mixing unsecure and secure communication on the same group address is impossible. Also, a mix of KNX IP Secure couplers in secure mode and plain KNX IP Secure couplers cannot be configured when IP Backbone Security is on.

Encrypted KNX telegrams that are processed by secured devices can be distinguished between telegrams for KNX IP Secure and telegrams for KNX Data Secure:

- KNX IP Secure can only be applied upon the KNX IP medium. KNX Secure telegrams are sent as encrypted IP Secure frames (no matter if KNX Data Secure is used or not).
- KNX Data Secure can be applied on any KNX communication medium. End-to-end communication, better say group communication for one or more certain group objects is encrypted. Due to an individual security key, only end devices having identical Group Addresses can encrypt/decrypt the telegrams of their secured group.

For programming a KNX Secure device, ETS must know its FDSK (Factory Default Setup Key) and its serial number. But it is not necessary entering FDSK or serial number. ETS retrieves this information from the Device Certificate, a device-specific 36-character code containing both serial number and FDSK. Serial number and FDSK cannot be modified. After adding a KNX Secure device plus Device Certificate to the ETS project, ETS automatically sets the project-specific Tool Key that is used for programming from then. This Tool Key cannot be modified and only be deleted by a device reset (see chapter 3.6.2 Factory Reset). After the reset, ETS uses the registered FDSK to get access to the device to program a new Tool Key.

### 3 Operational Description

In KNX network installations, MECtp-Sec is used as KNX TP line/area coupler to connect two KNX TP lines. It can be used in plain mode, without activation of Security, and in ETS projects where Security is set to active. After connecting to KNX TP, MECtp-Sec operates with its default settings. For KNX TP line/area coupler functionality, only Individual Addresses x.y.0 can be set. Setting the correct Individual Address is necessary for proper telegram transmission and functioning within the installation.

#### 3.1 TP Secure Coupler Application

During normal operation, MECtp-Sec reacts in accordance with its filter settings. When MECtp-Sec receives telegrams that use Individual Addresses as destination (for example during commissioning), it compares the Individual Address of the receiver with its own Individual Address and decides on that whether it has to route the telegrams or not. When MECtp-Sec receives telegrams that use group addresses as destination, only the telegrams whose group addresses are entered in the filter table are routed.

If a telegram is routed by MECtp-Sec without receiving the corresponding acknowledgement, i.e. due to a missing receiver or to a transmission error, the telegram will be repeated up to three times (depending on the ETS setting). With the parameters „Repetitions if errors...“, this function can be configured separately for each line and both kinds of telegrams. It is recommended to use the default parameter setting.

If not already configured as Line/Area Coupler, the ETS application program “TP Secure Coupler” has to be downloaded to the device. Under the Information tab the configuration setting can be changed by the drop-down menu “Change Application Program”. After changing the configuration setting the filter table entries can be added manually. Updating the application program version can also be done here.

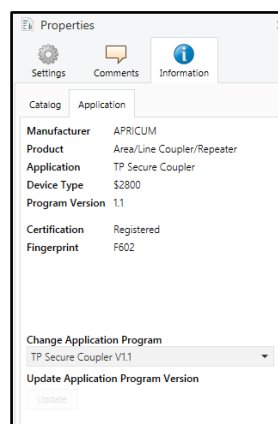


Figure 5: TP Secure Coupler Application

### 3.2 TP Secure Repeater Application

Any received telegram is routed to all lines irrespective of in which line it is processed. Line repeaters make no use of a filter table. It is therefore not important whether the telegram is generated within a line or whether it is sent from an upper line to a lower line via a coupler.

If a telegram is routed by MECtp-Sec without receiving the corresponding acknowledgement, i.e. due to a missing receiver or to a transmission error, the telegram will be repeated up to three times (depending on the ETS setting). With the parameters „Repetitions if errors...“, this function can be configured separately for each line and both kinds of telegrams. It is recommended to use the default parameter setting.

If not already configured as Line/Area Repeater, the ETS application program “TP Secure Repeater” has to be downloaded to the device. Under the Information tab the configuration setting can be changed by the drop-down menu “Change Application Program”. After changing the configuration setting the filter table entries can be added manually. Updating the application program version can also be done here.

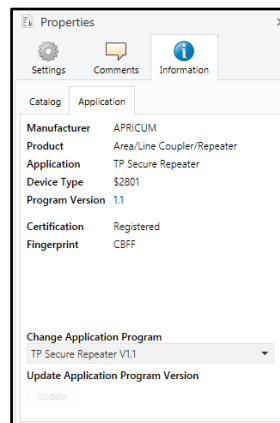


Figure 6: TP Secure Repeater Application



### 3.3 KNX Network Installation

#### 3.3.1 Individual Address

For line coupler functionality in a KNX network, MECtp-Sec has to use the correct Individual Address of a line coupler (x.y.0). For backbone/area coupler functionality in a KNX network, MECtp-Sec has to use the correct Individual Address of an area coupler (x.0.0).



It is recommended to make sure the factory default Individual Address 15.15.0 is not used in the installation network.



Defining a correct topology is absolutely mandatory to guarantee proper functioning.

In a KNX system with MECtp-Sec backbone couplers and MECtp-Sec line couplers, it is necessary to ensure that MECtp-Sec has an address assigned from a free addressing area. Following figure illustrates a possible topology scenario.

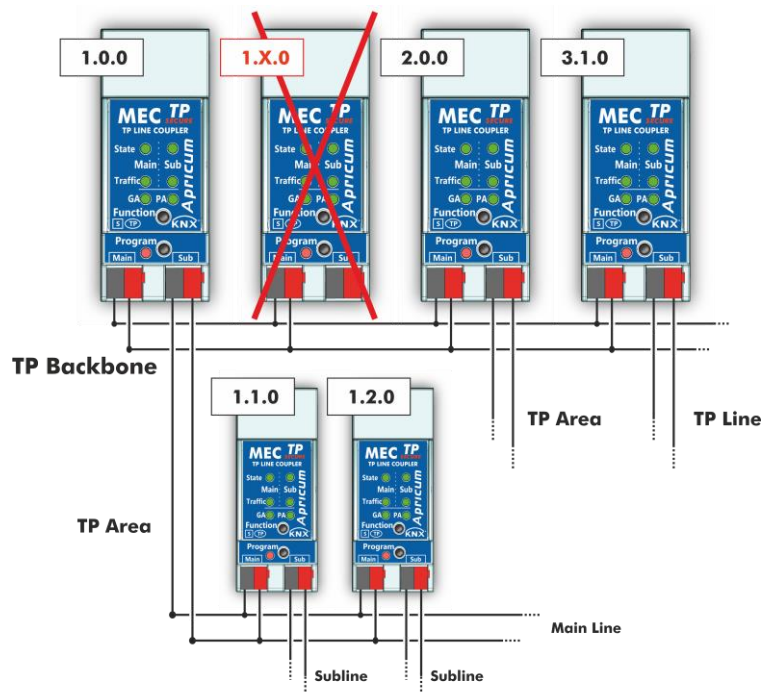


Figure 7: MECtp-Sec Network Topology

Example: If a KNX line coupler with address 1.0.0 exists on the backbone no KNX line coupler with address 1.x.0 can be added here. Even if no line coupler with address 1.1.0 exists on the subline of the 1.0.0 coupler. Vice versa, when line couplers with addresses 3.x.0 already exist in an installation, a line coupler with address 3.0.0 cannot be added.

### 3.3.2 KNX Topology

Via a line/area coupler up to 15 lines can be connected to a main line called an area. It is possible to have up to 64 bus devices on one line. With use of line repeaters a line can theoretically be extended to 255 bus devices. This means up to four line segments form a single KNX TP line. But it is common practice on exceeding 64 bus devices to insert a new line instead of extending the originating one.

The free tree structure of the KNX topology prevents problems caused by circling telegrams and heavy bus load. To maintain this condition, interconnection between lines or line segments is strictly forbidden.

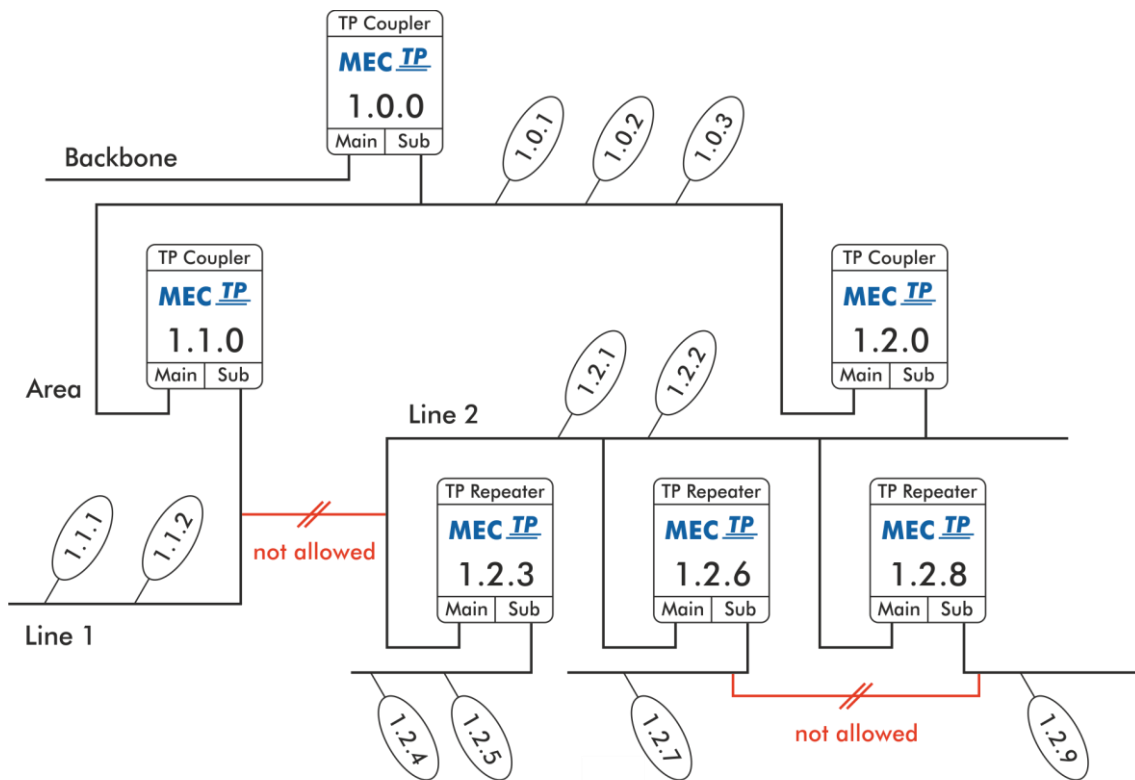


Figure 8: MECtp-Sec Network Topology



Each line segment requires its own KNX power supply unit.



Using repeaters on backbone and main lines is not allowed.



Interconnections are not allowed.

### 3.4 Adding Device Certificate

The Device Certificate can be found printed on a side label on the housing. Every KNX Secure device uses its own Device Certificate. Entering this Device Certificate in ETS is mandatory before activating or using KNX Security functions.



Please also follow the advice on handling the tear-off part of the side label in chapter 1.7 Safekeeping of Device Certificate.

The Device Certificate can be entered manually and by taking a webcam picture of the QR code that is additionally contained on the tear-off part of the Device Certificate side label.



Figure 9: Tear-off Part of the Device Certificate Side Label

After opening the project, the Device Certificate list can be edited. In the Security tab under Project Overview Device Certificates can be added and deleted.

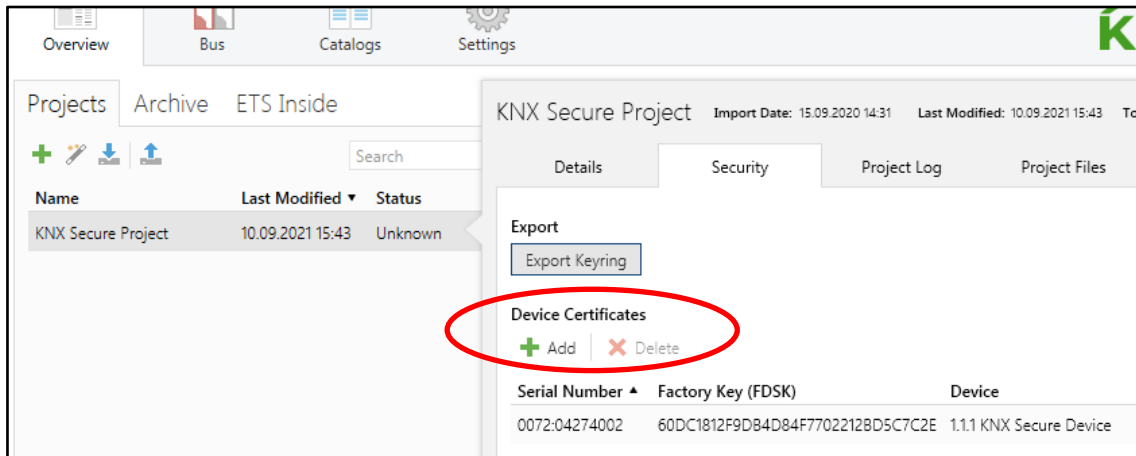


Figure 10: Device Certificate List

When the Device Certificate list doesn't contain the Device Certificate of a certain Secure device, on starting the Secure download into this device following window appears. Then, the QR code must be scanned, or alternatively, the 36-character code of the Device Certificate must be entered manually to continue.

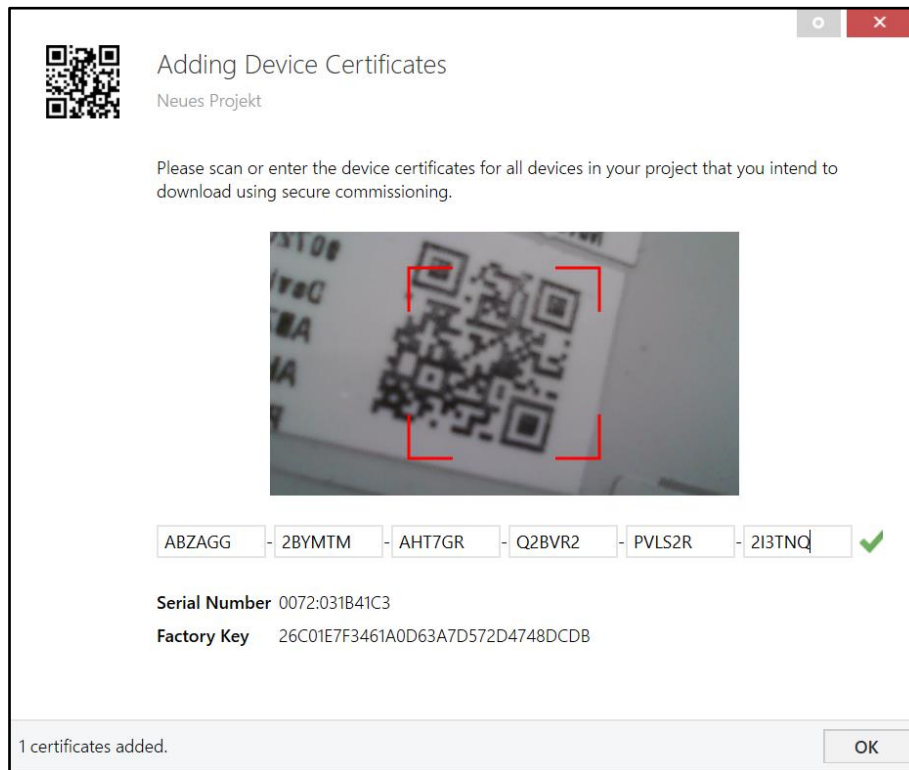


Figure 11: Adding Device Certificate

### 3.5 Programming

#### 3.5.1 Programming of Individual Address (and Application)

The Individual Address (IA) can be assigned to MECtp-Sec by setting the desired address in the properties window of ETS. After downloading it into the device, MECtp-Sec can be addressed and identified by its new Individual Address.

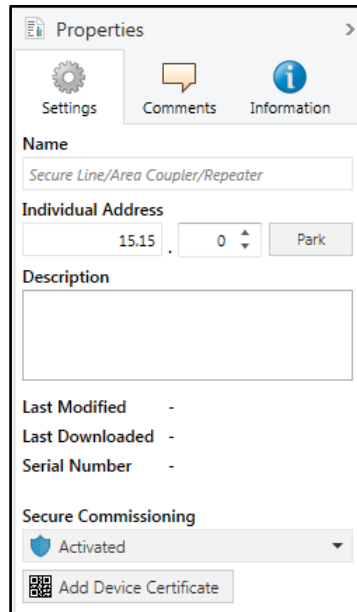


Figure 12: ETS Properties Windows

To download the Individual Address into the device, Programming Mode must be active. Successive pressing the Programming Button switches Programming Mode on and off. LED 7 lighting red indicates Programming Mode is on. Once the download is started in ETS, the Programming Button has to be pressed. After that, the new Individual Address becomes stored in the memory of the device.



To program devices of a line different to which the device used as ETS Current Interface is connected, a correct topology is mandatory.



The device is supplied with the Individual Address 15.15.0 (Factory Default Setting). It is recommended not to use this address for normal operation and to assign a different address when commissioning.

### 3.6 Special Functions

The Function Button activates MECtp-Sec’s special functions Manual Function and Factory Reset. With the Manual Function, the device switches to a special filter setting and with the Factory Reset, MECtp-Sec can be reset to its manufacturer default state. The active special function status is indicated by the LED display (see chapter 1.3 LED Indication of Special Functions).

#### 3.6.1 Manual Function

During normal operation, a rather short press ( $\approx 3$  sec) activates and deactivates the Manual Function. LED 1 indicates the status. LED 5 and LED 6 show the current filtering states.

When the Manual Function is active, either all Physical Telegrams or all Group Telegrams or both can pass the MECtp-Sec without filtering. When the Switch-off time has elapsed, MECtp-Sec automatically switches back to normal operation. To configure the Manual Function and set the Switch-off time, use the parameter tab General like shown in chapter 4.1 General. After switching back from Manual Function to normal operation, the latest downloaded filter parameter settings plus filter table entries become active again.

Table 5: Activation of Manual Functions

Step	Manual Function
1	Hold Function button for 3 seconds
2	LED 1 now is orange indicating Manual Function is on
3	After switch-off, normal operation is indicated by LED 1 lighting green

#### 3.6.2 Factory Reset

A long press ( $\approx 15$  sec) of the Function Button soon followed by a short press ( $\approx 3$  sec) executes the Factory Reset. After the first press, the LED display lights like described in Table 4: LED Status Display for Factory Reset after first Function Button Press. After the second press, all parameters (incl. Individual Address) will be set to factory default. The Tool Key, if set, becomes deleted and the FDSK becomes the relevant key for configuring again. Subsequently, LEDs show the normal operation display again.

Table 6: Activation of Factory Reset

Step	Factory Reset
1	Hold Function button for 15 seconds
2	LEDs 1/2 now are orange
3	Hold Function button for 3 seconds
4	Device restarts

## 4 ETS Database of TP Secure Coupler

### 4.1 General

1.1.0 Secure Line/Area Coupler/Repeater > General

General	Manual Function	pass all telegrams
Main line	Switch-off time for Manual Function	1 hour
Subline		

Figure 13: General Tab Parameters

Table 7: General Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Manual Function	disabled pass all telegrams pass all Physical telegrams pass all Group telegrams <b>[pass all telegrams]</b>	Configuration setting for telegram routing when the Manual Function is active.
Switch-off time for Manual Function	10 min, 1 hour, 4 hours, 8 hours <b>[1 hour]</b>	After expiry of this time period the Manual Function is switched off automatically.

### 4.2 Main Line



Setting “transmit all” is intended only for testing use. Please do not use for normal operation.



If the parameter “Send confirmation on own telegrams” is set to “yes”, MECtp-Sec systematically sends an ACK on any own routed telegram. For example, since repeaters do not use filter tables, it is useful to have an ACK sent along with routed telegrams.

Figure 14: Main Line Tab Parameters

Table 8: Main Line Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Telegram routing (Main line -> Subline)	Group: filter, Physical: block Group and Physical: filter Group: route, Physical: filter Group and Physical: route configure <b>[Group and Physical: filter]</b>	Routing of Physical Telegrams and Group Telegrams can be set to ‘block’ (no routing), ‘filter’ (telegrams are routed according to filtering) and ‘route’ (all telegrams are transmitted). To set telegram routing different as available here, use ‘configure’.
Group telegrams: Main group 0...13	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Group telegrams (with main groups 0...13) can be configured to route all telegrams, no telegrams, or only telegrams entered in the filter table.
Group telegrams: Main group 14...31	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Group telegrams (with main groups 14...31) can be configured to route all telegrams, no telegrams, or only telegrams entered in the filter table.
Physical telegrams	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Physical telegrams can be configured to route all telegrams, no telegrams, or only telegrams depending on their Individual Address.



ETS Parameter	Settings [Default Parameter]	Comment
Physical telegrams: Repetition if errors on main line	no up to 3 repetitions only one repetition <b>[up to 3 repetitions]</b>	After main line transmission error (e.g. due to missing receiver) Physical telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Group telegrams: Repetition if errors on main line	no up to 3 repetitions only one repetition <b>[up to 3 repetitions]</b>	After main line transmission error (e.g. due to missing receiver) Group telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Telegram confirmation on main line	if routed always <b>[if routed]</b>	Either only routed telegrams to the subline are confirmed by an ACK on the main line or each telegram on the main line is confirmed by an ACK.
Send confirmation on own telegrams	yes no <b>[no]</b>	Telegrams sent out to the main line can be confirmed by an added ACK.

### 4.3 Subline



Setting “transmit all” is intended only for testing use. Please do not use for normal operation.



If the parameter “Send confirmation on own telegrams” is set to “yes”, MECtp-Sec systematically sends an ACK on any own routed telegram. For example, since repeaters do not use filter tables, it is useful to have an ACK sent along with routed telegrams.

Figure 15: Subline Tab Parameters

Table 9: Subline Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Telegram routing (Subline -> Main line)	Group: filter, Physical: block Group and Physical: filter Group: route, Physical: filter Group and Physical: route configure <b>[Group and Physical: filter]</b>	Routing of Physical Telegrams and Group Telegrams can be set to ‘block’ (no routing), ‘filter’ (telegrams are routed according to filtering) and ‘route’ (all telegrams are transmitted). To set telegram routing different as available here, use ‘configure’.
Group telegrams: Main group 0...13	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Group telegrams (with main groups 0...13) can be configured to route all telegrams, no telegrams, or only telegrams entered in the filter table.
Group telegrams: Main group 14...31	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Group telegrams (with main groups 14...31) can be configured to route all telegrams, no telegrams, or only telegrams entered in the filter table.
Physical telegrams	transmit all (not recommended) block filter <b>[filter]</b>	Filtering of Physical telegrams can be configured to route all telegrams, no telegrams, or only telegrams depending on their Individual Address.

ETS Parameter	Settings [Default Parameter]	Comment
Physical telegrams: Repetition if errors on subline	no up to 3 repetitions only one repetition <b>[up to 3 repetitions]</b>	After subline transmission error (e.g. due to missing receiver) Physical telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Group telegrams: Repetition if errors on subline	no up to 3 repetitions only one repetition <b>[up to 3 repetitions]</b>	After subline transmission error (e.g. due to missing receiver) Group telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Telegram confirmation on subline	if routed always <b>[if routed]</b>	Either only routed telegrams to IP main line are confirmed by an ACK on the subline or each telegram on the subline is confirmed by an ACK.
Send confirmation on own telegrams	yes no <b>[no]</b>	Telegrams sent out to the subline can be confirmed by an added ACK.
Configuration from subline (KNX TP)	allow block <b>[allow]</b>	'Block' means MECtp-Sec can only be configured from its main line side and configuring devices on main line (and behind) from the subline side is blocked.

## 5 ETS Database of TP Secure Repeater

### 5.1 General

1.1.1 Secure Line/Area Coupler/Repeater > General

General Manual Function pass all telegrams

Main line Switch-off time for Manual Function 1 hour

Subline

Figure 16: General Tab Parameters

Table 10: General Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Manual Function	disabled pass all telegrams pass all Physical telegrams pass all Group telegrams <b>[pass all telegrams]</b>	Configuration setting for telegram routing when the Manual Function is active.
Switch-off time for Manual Function	10 min, 1 hour, 4 hours, 8 hours <b>[1 hour]</b>	After expiry of this time period the Manual Function is switched off automatically.

## 5.2 Main Line



Setting “transmit all” is intended only for testing use. Please do not use for normal operation.



If the parameter “Send confirmation on own telegrams” is set to “yes”, MECtp-Sec systematically sends an ACK on any own routed telegram. For example, since repeaters do not use filter tables, it is useful to have an ACK sent along with routed telegrams.

Figure 17: Main Line Tab Parameters

Table 11: Main Line Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Telegram routing (Main line -> Subline)	Group and Physical: route configure <b>[Group and Physical: route]</b>	Routing of Physical Telegrams and Group Telegrams can be set to ‘route’ (all telegrams are transmitted). To set telegram routing different as available here, use ‘configure’.
Physical telegrams	transmit all (not recommended) block <b>[transmit all]</b>	Filtering of Physical telegrams can be configured to route all telegrams, or no telegrams.
Physical telegrams: Repetition if errors on main line	no up to 3 repetitions only one repetition <b>[only one repetition]</b>	After main line transmission error (e.g. due to missing receiver) Physical telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Group telegrams: Repetition if errors on main line	no up to 3 repetitions only one repetition <b>[only one repetition]</b>	After main line transmission error (e.g. due to missing receiver) Group telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Telegram confirmation on main line	if routed always <b>[if routed]</b>	Either only routed telegrams to the subline are confirmed by an ACK on the main line or each telegram on the main line is confirmed by an ACK.

ETS Parameter	Settings [Default Parameter]	Comment
Send confirmation on own telegrams	yes no [no]	Telegrams sent out to the main line can be confirmed by an added ACK.

### 5.3 Subline



Setting “transmit all” is intended only for testing use. Please do not use for normal operation.



If the parameter “Send confirmation on own telegrams” is set to “yes”, MECtp-Sec systematically sends an ACK on any own routed telegram. For example, since repeaters do not use filter tables, it is useful to have an ACK sent along with routed telegrams.

Figure 18: Subline Tab Parameters

Table 12: Subline Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Telegram routing (Subline -> Main line)	Group and Physical: route configure <b>[Group and Physical: route]</b>	Routing of Physical Telegrams and Group Telegrams can be set to ‘route’ (all telegrams are transmitted). To set telegram routing different as available here, use ‘configure’.
Physical telegrams	transmit all (not recommended) block <b>[transmit all]</b>	Filtering of Physical telegrams can be configured to route all telegrams, or no telegrams.
Physical telegrams: Repetition if errors on subline	no up to 3 repetitions only one repetition <b>[only one repetition]</b>	After subline transmission error (e.g. due to missing receiver) Physical telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Group telegrams: Repetition if errors on subline	no up to 3 repetitions only one repetition <b>[only one repetition]</b>	After subline transmission error (e.g. due to missing receiver) Group telegrams can be not repeated, be repeated only once, or be repeated for max. 3 times.
Telegram confirmation on subline	if routed always <b>[if routed]</b>	Either only routed telegrams to IP main line are confirmed by an ACK on the subline or each telegram on the subline is confirmed by an ACK.

ETS Parameter	Settings [Default Parameter]	Comment
Send confirmation on own telegrams	yes no <b>[no]</b>	Telegrams sent out to the subline can be confirmed by an added ACK.
Configuration from subline (KNX TP)	allow block <b>[allow]</b>	'Block' means MECtp-Sec can only be configured from its main line side and configuring devices on main line (and behind) from the subline side is blocked.



## 6 Glossary

ACK	An ACK is a positive IACK frame. If the sender detects an ACK, then the sender's data has been received correctly, meaning the data has been successfully transmitted to the receiver.
Acknowledgement frames	Acknowledgment on the KNX Link Layer is also called Immediate ACK (IACK) in KNX jargon, presumably to differentiate it from other ack methods on the upper layers. Regarding sender and receiver, IACK frames are used to confirm to the sender the transmitted data was received correctly by the receiver (ACK) or not (BUSY/NACK). Also, a receiver cannot respond by sending back an IACK when a frame is damaged or incorrectly addressed (missing IACK). The IACK confirmation is a mechanism within a KNX TP line or segment. For communication across different lines or segments, the couplers connecting the lines generate the relevant IACKs.
BUSY	A BUSY is a negative IACK frame. If the sender detects a BUSY, then the receiver was not able to process the received frame. Thereafter, the sender waits for a short time period and retries to send the frame.
Communication Object	same as Group Object
Data Point Type (DPT)	Standardized data format for transmitting values via KNX. The complete list of DPTs is available at KNX Association.
Extended Frames format	An extended frame has a maximum APDU length of 254 octets and a maximum length of 263 octets (incl. checksum).
Filtering	Filtering of telegrams by couplers can be accomplished according to the topology via Individual Addresses (Physical Telegrams) and according to filter tables for group communication via Group Addresses (Group Telegrams).
Group Address	Group addresses are used to link group communication objects.

Group Communication Object	Group communication objects contain the datapoints which are transmitted via runtime communication. One or more group addresses are assigned to one group communication object. One of these assigned group addresses is the sending group address (to send the group communication object value to the bus). The remaining assigned group addresses, if available, then receive the value.
Group Object	same as Group Communication Object. A data point in KNX can be called shortly a 'Group Object' or just 'Object'.
Group Telegram	Group-oriented telegrams are named Group Telegrams. Filtering of Group Telegrams by couplers is accomplished according to their built-in filter tables for group communication.
IACK	see Acknowledgement frames
Individual Address	The Individual Address of a device defines the location of the device within the topology.
Long Telegrams	Long telegrams or long frames are telegrams having an APDU length that exceeds 15 octets. Long telegrams use the extended frame format.
NACK	A NACK is a negative IACK frame. When the sender detects a NACK, then the sender's data has not been received correctly by at least one device meaning it has not been successfully transmitted to one or more receivers. Thereafter, the sender waits for a short time period and retries to send the frame.
Physical Address	same as Individual Address
Physical Telegram	Individually addressed telegrams are named Physical Telegrams.
Repetition of telegrams	When there is no positive IACK on the regarded TP line (e.g. NACK, BUSY, missing IACK), couplers usually repeat messages up to three times. For all MEC couplers, the number of repetitions on TP is configurable.

Security functions	For using ETS Security functions, a minimum ETS version is necessary. Security functions have been available since ETS version 5.7.2 (ETS Inside 1.4.0).
Short Telegrams	Short telegrams or short frames are telegrams having an APDU length that is not exceeding 15 octets. Short telegrams use the standard frame format.
Standard Frame format	A standard frame has a maximum APDU length of 15 octets and a maximum length of 23 octets (incl. checksum).

## 7 Technical

### 7.1 State of Delivery

Table 13: Factory Default Setting

<b>General</b>	
Individual Address	15.15.0
<b>KNX TP Main line (Main line to Subline)</b>	
Group telegrams (main group 0...13)	filter (filter table is empty)
Group telegrams (main group 14...31)	route all
Physical telegrams	filter
Physical: Repetition if errors on main line	up to 3 repetitions
Group: Repetition if errors on main line	up to 3 repetitions
Telegram confirmations on main line	if routed
Send confirmation on own telegrams	no
<b>KNX TP Subline (Subline to Main line)</b>	
Group telegrams (main group 0...13)	filter (filter table is empty)
Group telegrams (main group 14...31)	route all
Physical telegrams	filter
Physical: Repetition if errors on subline	up to 3 repetitions
Group: Repetition if errors on subline	up to 3 repetitions
Telegram confirmations on subline	if routed
Send confirmation on own telegrams	no
Configuration from subline	allow

## 7.2 Datasheet

<b>Marking/Design</b>	MECtp-Sec
<b>Current consumption</b>	< 10 mA
<b>Connections</b>	KNX TP main line: KNX TP connector (red/black), screwless, for single-core cable Ø 0.6...0.8 mm
	KNX TP subline: KNX TP connector (red/black), screwless, for single-core cable Ø 0.6...0.8 mm
<b>LED Display elements</b>	State (Main and Sub) Traffic (Main and Sub) Routing (GA and PA) Programming LED
<b>Control elements</b>	Function Button Programming Button
<b>Mounting</b>	35 mm top-hat rail (TH35) according to IEC60715
<b>Protection type</b>	IP20 according to IEC60529
<b>Pollution degree</b>	2 according to IEC60664-1
<b>Protection class</b>	III according to IEC61140
<b>Overvoltage category</b>	III according to IEC60664-1
<b>Approbation</b>	KNX-certified according to ISO/IEC14543-3 and EN ISO 22510
<b>CE Marking</b>	In compliance with directives 2014/35/EU (LVD), 2014/30/EU (EMC), 2011/65/EU (RoHS)
<b>Standards</b>	EN IEC 61000-6-2, EN IEC 61000-6-3, EN IEC 63000, EN IEC 63044-5-1, EN IEC 63044-5-2, EN IEC 63044-5-3
<b>Voltage supply</b>	KNX: 21...30V DC (SELV)
<b>Housing color</b>	Plastic PA66 housing, grey
<b>Housing dimensions</b>	H = 90 mm, W = 36 mm (2 modules), D = 71 mm
<b>Mounting depth</b>	64 mm
<b>Weight</b>	62 g
<b>Operating temperature</b>	-5...45 °C
<b>Storage temperature</b>	-20...60 °C
<b>Ambient humidity</b>	5...93 %, non-condensing

### 7.3 Drawings



Dimensions shown here are specified in mm.



The total device width is 2 modules at 18 mm.

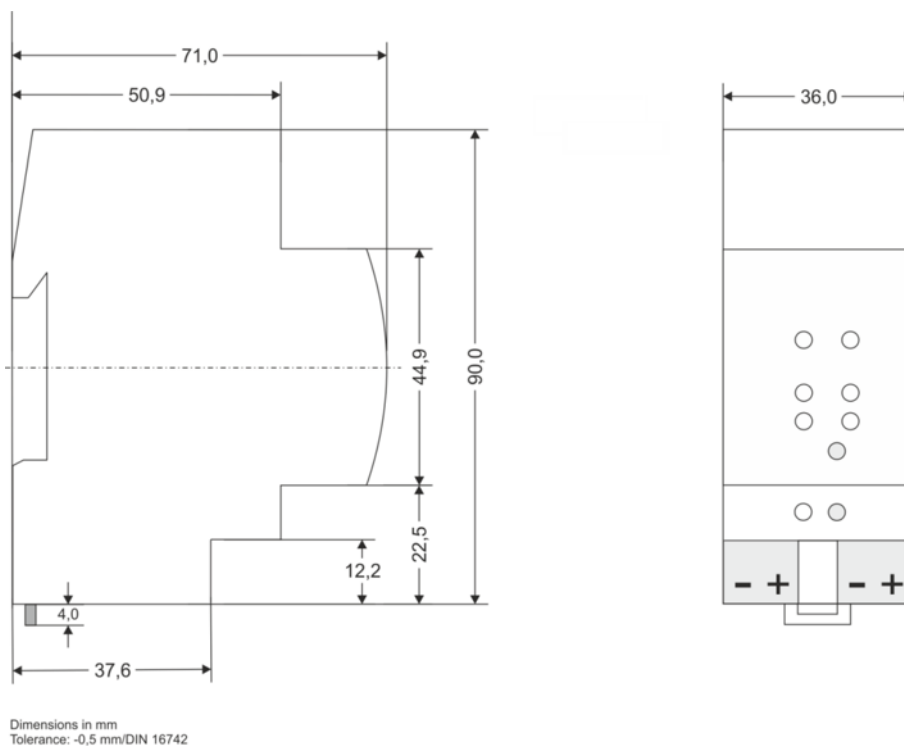


Figure 19: Dimension drawings

## 8 FAQ

- **I lost the Device Certificate. What can I do?**

Take an ETS project where it is contained and open the Project Certificates Report.

- **I opened a new project in ETS and added the Device Certificate. But the download to the secure MECtp-Sec doesn't work.**

Either use Commissioning Password and Authentication Code from your former project or make a factory reset to set MECtp-Sec's tool key back to its FDSK.

- **I lost the Device Certificate and the password for the project where it was contained. What can I do?**

Make a factory reset and use the device on only unsecured from then.

- **What can be a transmission error when a Bus State LED is lighting red?**

For every telegram sent out on KNX TP, MECtp-Sec waits for an acknowledgement on the affected TP line. When the receiver was busy (BUSY) or received an incorrect telegram (NACK) or MECtp-Sec didn't receive an acknowledgement (missing IACK), the concerned LED is lighting red to show a transmission error exists on the line.

- **When can it be necessary to send IACKs on sent out messages?**

For example, when a visualization is part of the installation and this visualization is not ETS-configurable.

## MECtp-Sec

Application:

KNX Secure Line/Area Coupler/Repeater

Doctype:

Technical & Application Description

Release Number / Release Date:

R1-1 / November 2022

TAD is intended for:

(y = a,b,c, ...)

Firmware	5.2
Databases	R1-2y
ETS version	ETS5.7.3 and higher (not ETS6)

Weblink to actual ETS Database:

<https://www.apricum.com/mectp-sec>

Contact:

[apricum@apricum.com](mailto:apricum@apricum.com)

Telephone:

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