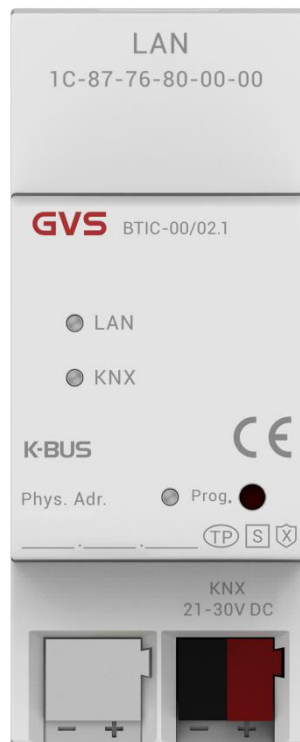


User Manual

K-BUS KNX-BACnet Gateway Client_V1.1

BTIC-00/02.1



KNX/EIB Home and Building Control System

Attentions

1.Please keep devices away from strong magnetic field, high temperature, wet environment;



2.Please do not fall the device to the ground or make them get hard impact;



3.Please do not use wet cloth or volatile reagent to wipe the device;



4.Please do not disassemble the device

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Chapter 1 Summary

The KNX-BACnet Gateway Client is mainly used in intelligent control systems. It communicates with BACnet slave devices (such as: BACnet air conditioners, fan coil and sensors) via the BACnet/IP network and maps their data points onto KNX communication objects, allowing the KNX bus to collect status from and exercise reverse control over BACnet subsystems.

This manual provides detailed technical information about KNX-BACnet Gateway Client for users as well as assembly and programming details, and explains how to use the device by the application examples.

KNX-BACnet Gateway Client is powered from KNX bus. It is available to assign the physical address and configure the parameters by engineering design tools ETS with .knxprod (support edition ETS5.7 or higher).

The functions are summarized as follows:

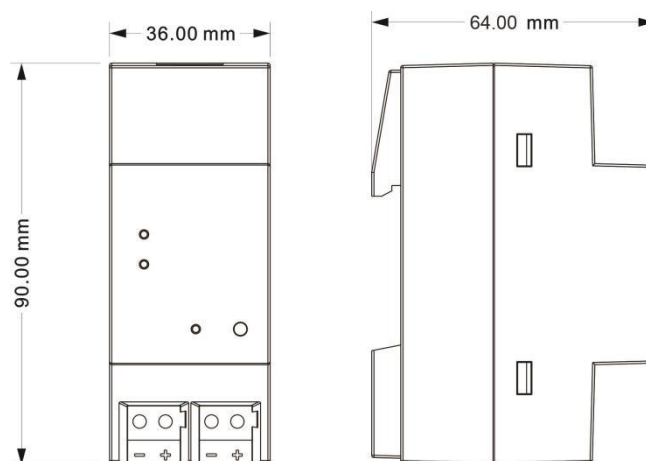
- Supports the BACnet protocol, work in BACnet systems, connect with the BACnet systems via the BACnet gateway
- Supports up to 256 BACnet points. The communication direction, name, and datatype(1bit/2bit/1byte/2byte/4byte) of each BACnet point can be configured independently
- Supports up to 8 different BACnet server IDs
- Support up to 5 KNXnet/IP connections at the same time
- Support the KNX Data Secure and KNXnet/IP Secure

Chapter 2 Technical Data

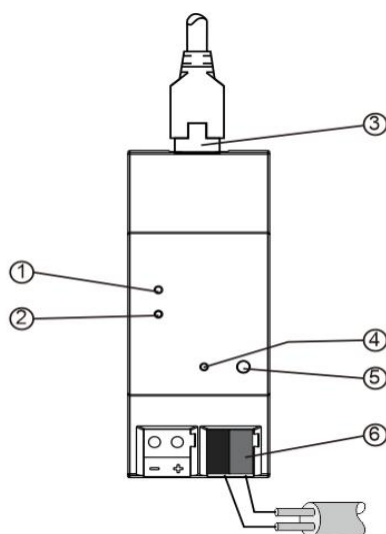
Power supply	Bus voltage	21-30V DC, via KNX bus
	Bus current	19.5mA/24V; 15.5mA/30V
	Bus consumption	470mW
Connections	KNX	Bus connection terminal (red/black)
	LAN	RJ45 socket for 10/100 Base-T
Operation and display	LAN LED	On: That network connect normally Flashing: The telegram traffic between device and network
	KNX LED	On: The KNX bus connect normally Flashing: The telegram traffic between KNX bus and device
	Programming button and red LED	For assigning the physical address
Temperature	Operation	– 5 °C ... 45 °C
	Storage	– 25 °C ... 55 °C
	Transportation	– 25 °C ... 70 °C
Ambient	Humidity	<93%, except dewing
Design	Protocol stack	BACnet Stack at SourceForge
	Installation	Standard 35mm DIN rail installation
Model/Dimension	36 × 90 × 64mm/0.1kg	

Chapter 3 Dimension and Structural Diagram

3.1. Dimension Diagram



3.2. Structural Diagram



① LAN LED

④ Programming LED

② KNX LED

⑤ Programming button

③ LAN connection

⑥ KNX bus connection terminal

Reset the device to the factory configuration: press the programming button and hold for 4 seconds then release, repeat the operation for 4 times, and the interval between each operation is less than 3 seconds.

Chapter 4 Project Design and Programming

Application	Maximum of communication objects	Maximum number of group addresses	Maximum number of associations	Secure group addresses
KNX-BACnet IP Gateway Client/00E1 1.0	527	1024	2048	768

Chapter 5 Parameter setting description in the ETS

5.1. Parameter window“General”

Important Desc	server ID is same with device ID
BACnet Server ID.1 [0=disable]	0
BACnet Server ID.2 [0=disable]	0
BACnet Server ID.3 [0=disable]	0
BACnet Server ID.4 [0=disable]	0
BACnet Server ID.5 [0=disable]	0
BACnet Server ID.6 [0=disable]	0
BACnet Server ID.7 [0=disable]	0
BACnet Server ID.8 [0=disable]	0
Number of Points	0
The minimum interval(s) for sending to KNX [5..255]*1s	5
Read bacnet period [1..255]*1s	2

Fig.5.1 “General” Parameter window

Parameter “Important Desc: server ID is same with device ID”

This parameter indicates that the server and the device use the same ID.

Parameter “BACnet Server ID.x [0=disable]”(x=1~8)

This parameter is for setting the ID of server x and device x. Up to 8 different ID numbers can be set. Options: **0..4194303**

When set to 0, this device is disabled.

Note: Make sure that the ID number of each device/server in the system can be uniquely identified, so as to ensure precise communication and management.

Parameter “Number of Points”

This parameter is for setting the number of BACnet data points. Options: **0..256**

Note: The 256 points are shared by all BACnet slaves in the system.

Parameter "The minimum interval(s) for sending to KNX [5..255]*1s"

This parameter is for setting the minimum time interval at which the device sends KNX telegrams. Options: **5..255**

Parameter "Read bacnet period [1..255]*1s"

This parameter is for setting the period at which the device reads the BACnet data points.

Options: **1..255**

5.2. Parameter window "BACnet point x"

Description of point	
Device/Server ID select	Disable ▼
KNX's DPT	DPT 1.xxx Boolean/Switch/... (1bit) [0..1] ▼
BACnet point type	AnalogInput[0] [4byte IEEE float] ▼
BACnet Instance	0 ▲▼
Enable linear transformation [KNXv=Base+BACv*Factor,value will use float]	☐ Disable ☒ Enable
Base [float xxx.xxx] ->KNX	0
Factor [float xxxx.xxx] ->KNX	1
BACnet point read function	☐ Disable ☒ Enable
Report its value to KNX when it is changed	☐ Disable ☒ Enable
BACnet point write function	☐ Disable ☒ Enable

Fig.5.2 "BACnet point x" Parameter window

Parameter "Description of point"

This parameter is for setting the description of point, up to input 14 characters.

Parameter "Device/Server ID select"

This parameter is for setting the ID of the target server and device for communication.

Options:

BACnet Server ID.1

BACnet Server ID.2

BACnet Server ID.3

BACnet Server ID.4

BACnet Server ID.5

BACnet Server ID.6

BACnet Server ID.7

BACnet Server ID.8

Disable

Parameter "KNX's DPT"

This parameter is for setting the data type. Options:

DPT 1.xxx Boolean/Switch/... (1bit) [0..1]

DPT 3.xxx B1U3 (4bit) [0..16]

DPT 2.xxx (2Bit) [0..3]

DPT 5.001 Scaling (1byte) [0..100]

DPT 9.xxx Float Value (2bytes)

DPT 14.xxx IEEE Float (4bytes)

DPT 7.xxx 16 bit counter (2bytes) [0..65535]

DPT 12.xxx 32 bit counter (4bytes) [0..4294967295]

DPT 5.010 8 bit counter (1byte) [0..255]

DPT 4.001 ASCII character (1byte) [0..255]

DPT 251.600 RGBW (6bytes) [0..255]*6

DPT 232.600 RGB (3bytes) [0..255]*3

DPT 6.010 8 bit counter (1byte) [-128..127]

DPT 8.xxx 16 bit counter (2bytes) [-32768..32767]

DPT 13.xxx 32 bit counter (4bytes) [-2147483648..2147483647]

Parameter "BACnet point type"

This parameter is for setting the BACnet data point and communication type. Options:

AnalogInput[0] [4byte IEEE float]

AnalogOutput[1] [4byte IEEE float]

AnalogValue[2] [4byte IEEE float]

BinaryInput[3] [1byte Enum]

BinaryOutput[4] [1byte Enum]

BinaryValue[5] [1byte Enum]

Multi-state Input[13] [1byte unsigned]

Multi-state Output[14] [1byte unsigned]

Multi-state Value[19] [1byte unsigned]

Parameter "BACnet Instance"

This parameter is for setting the object number assigned to this BACnet data point.

Options: **0..4194303**

Note: Make sure that the object numbers assigned to the same device are unique; otherwise

conflicts will occur.

Parameter "Enable linear transformation [KNXv=Base+BACv*Factor,value will use float]"

This parameter is for setting whether to enable linear transformation.

When enabled, the KNX value is calculated as $\text{KNX value} = \text{Base} + \text{BAC value} \times \text{Factor}$, using the float data type.

Options:

Disable

Enable

When enabled, the following parameters are visible:

---Parameter "Base [float xxx.xxx] ->KNX"

This parameter is for setting the base value for calculating the KNX value.

Options: **-4294967295..4294967295**

---Parameter "Factor [float xxxx.xxx] ->KNX"

This parameter is for setting the factor for calculating the KNX value

Options: **-4294967295..4294967295**

Parameter "BACnet point read function"

This parameter is for setting whether to enable the BACnet point read function.

Options:

Disable

Enable

---Parameter "Report its value to KNX when it is changed"

This parameter is visible when previous parameter enabled. Set whether to report its value to KNX when it is changed.

Options:

Disable

Enable

Parameter "BACnet point write function"

This parameter is for setting whether to enable BACnet point write function. Options:

Disable

Enable

5.3. Using the Integrated Tunneling Server

The KNX-BACnet Gateway Client provides 5 additional physical addresses, as shown in Fig.5.3, for tunnel connections, such as: programming interface (ETS), or for connecting visualization clients, smartphone apps, tablets, bus tools, etc.



Fig.5.3

The physical address of each tunnel connection can be modified in the settings properties window, and their physical addresses must comply with the topology requirements and be located on the same line. In ETS5, when assigning physical addresses to the device, the first 5 free physical addresses on that line are automatically assigned to the individual tunnel connections.

If you do not want to assign a physical address to a tunnel, activate “Park” (as shown in Fig.5.3.2); after the download, this tunnel will receive address 15.15.255. If all tunnels are “Park”, all tunnels will be assigned address 15.15.255. (15.15.255 is the default address of devices without an assigned physical address)

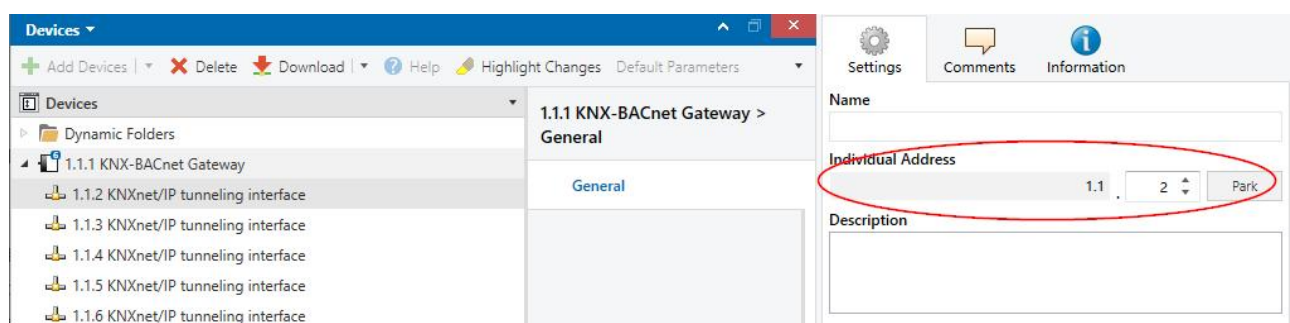


Fig.5.3.2

In addition, tunnel connections can also be encrypted using KNX Security. First activate “Secure Commissioning”, then activate “Secure Tunneling”, as shown in Fig.5.3.3. After activating “Secure Tunneling”, the password of each tunnel connection can be set in ETS, as shown in Fig.5.3.4, users can change this password as required.

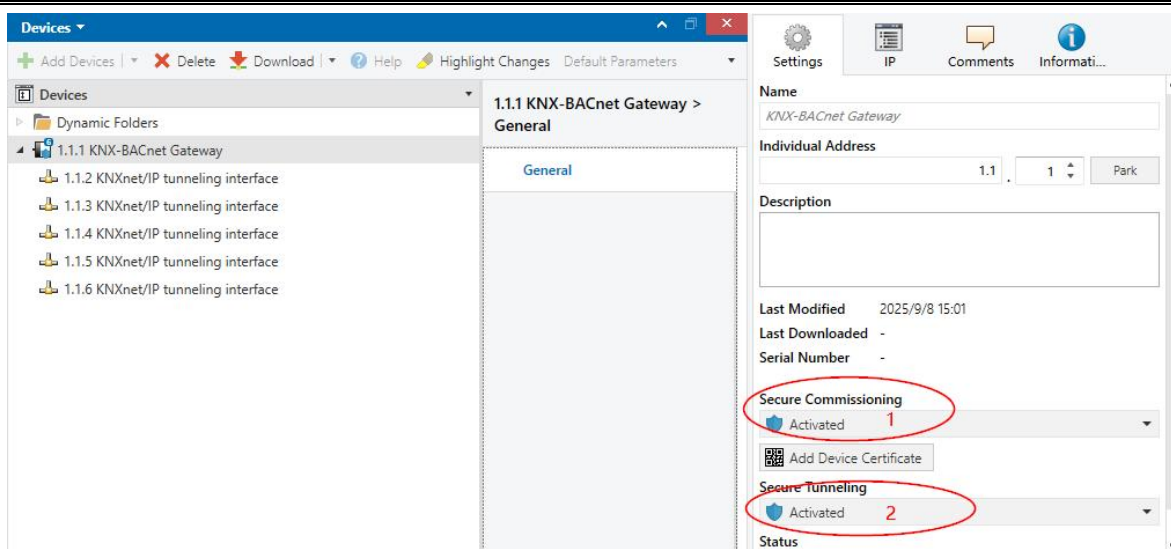


Fig.5.3.3

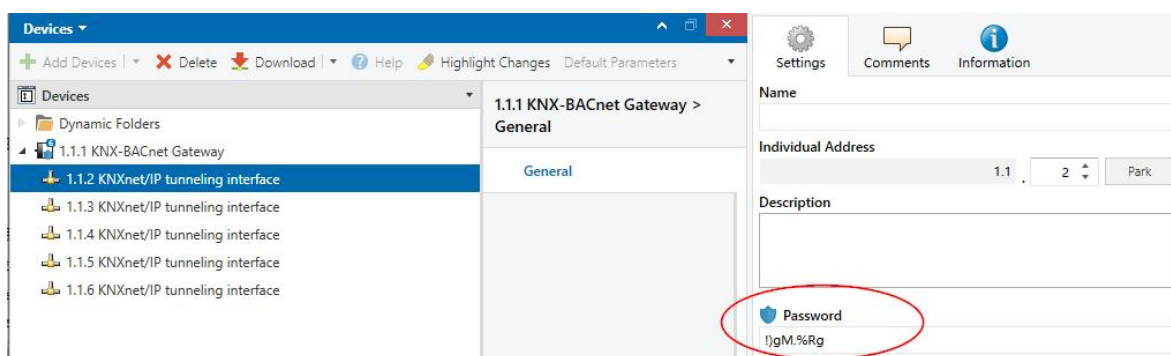


Fig.5.3.4

If the project has no password assigned, manually activating “Secure Commissioning” will prompt you to assign a project password, as shown in Fig.5.3.5. Without a project password, “Secure Commissioning” cannot be activated.

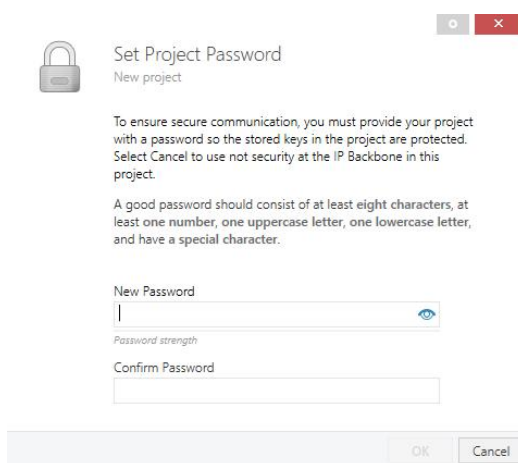
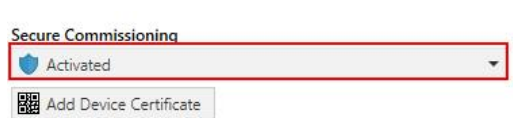


Fig.5.3.5

5.4. KNX Secure

KNX-BACnet Gateway Client is a KNX device that complies with the KNX secure standard. That is, you can run the device in safe way.

If secure commissioning is activated in ETS project, the following information must be considered during device debugging:



❖ It is essential to assign a project password as soon as a KNX Secure device is imported into a project. This will protect the project against unauthorized access.

The password must be kept in a safe place – access to the project is not possible without it (not even the KNX Association or device manufacturer will be able to access it)!

Without the project password, the commissioning key will not be able to be imported.

❖ A commissioning key is required when commissioning a KNX Secure device (first download). This key (FDSK = Factory Default Setup Key) is included on a sticker on the side of the device, and it must be imported into the ETS prior to the first download:

✧ On the first download of the device, a window pops up in the ETS to prompt the user to enter the key, as shown in Fig.5.4.1 below.

The certificate can also be read from the device using a QR scanner (recommended).



Fig.5.4.1 Add Device Certificate window

✧ Alternatively, the certificates of all Secure devices can be entered in the ETS beforehand.

This is done on the "Security" tab on the project overview page, as shown in Fig.5.4.2 below.

The certificates can be also added to the selected device in the project, as shown in Fig.5.4.3.

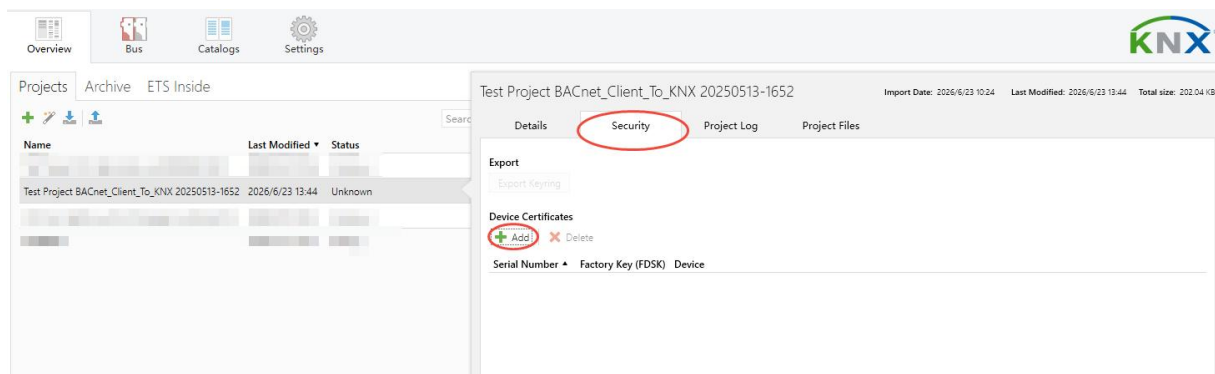


Fig.5.4.2 Add Device Certificate

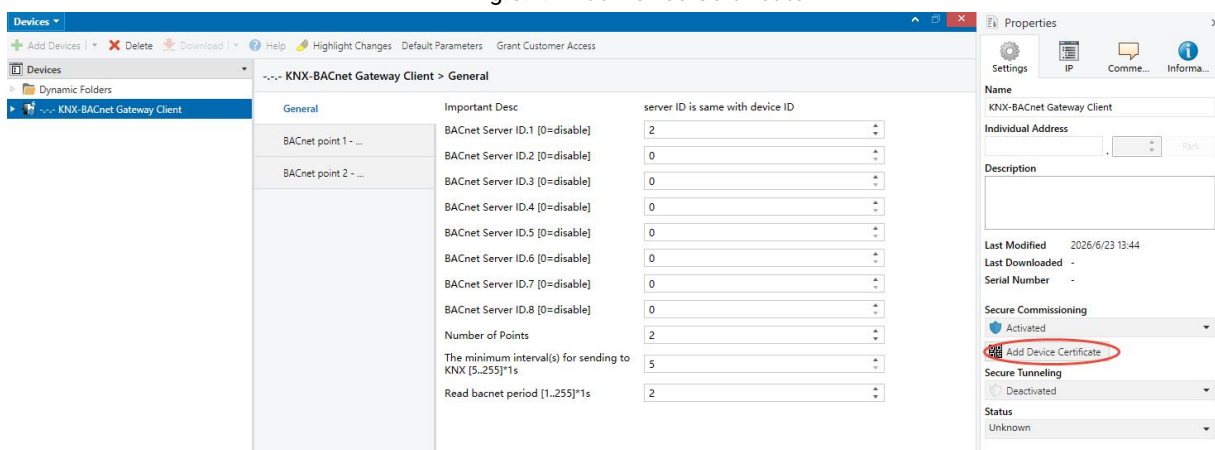


Fig.5.4.3 Add Device Certificate

✧ There is a FDSK sticker on the device, which is used for viewing FDSK number.

Without the FDSK, it will no longer be possible to operate the device in KNX Secure mode after a reset.

The FDSK is required only for initial commissioning. After entering the initial FDSK, the ETS will assign a new key, as shown in Fig.5.4.4 below.

The FDSK will be required again only if the device was reset to its factory settings (e.g. If the device is to be used in a different ETS project).

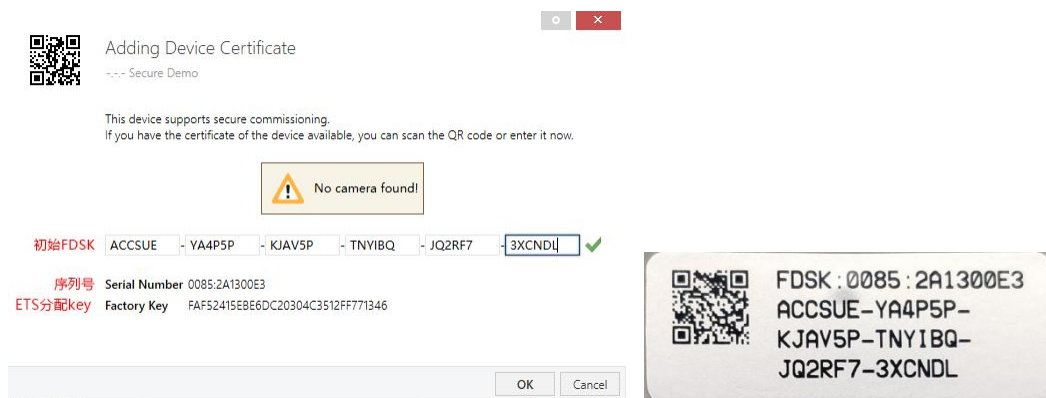


Fig.5.4.4

Example:

If this application in the project needs to be tried with another device, it is no longer the original device. When the application is downloaded to a new device, the following prompt will appear on the left of Fig.5.4.5, click yes, the Add Device Certificate window will appear, then enter the initial FDSK of the new device, and you need to reset the device to the factory settings (it is not required if the device is still factory default; If it has been used, it will be required to reset, otherwise the following error message will appear on the right of Fig.5.4.5 and then the device can be successfully downloaded again.

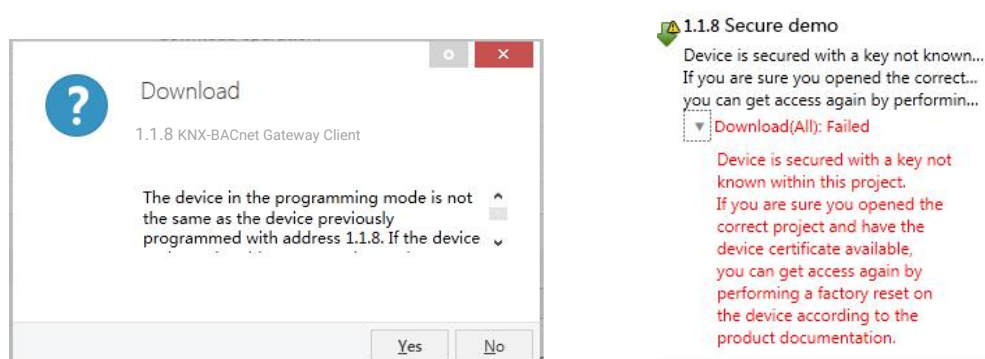


Fig.5.4.5 Example

Whether the device is replaced in the same project, or the device is replaced in a different project, the processing is similar: **Reset the device to the factory settings, then reassign the FDSK.**

After the device is downloaded successfully, the label Add Device Certificate turns gray, indicating that the key for this device has been assigned successfully, as shown in Fig.5.4.6 below.



Fig.5.4.6

ETS generates and manages keys:

Keys and passwords can be exported as needed to the use of security keys outside of the associated ETS projects. As shown in Fig.5.4.7 below, the file extension is .knxkeys.

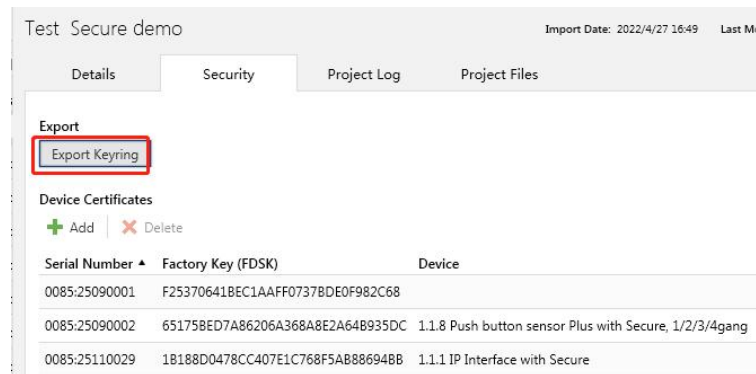


Fig.5.4.7

Example of ETS connecting via an IP tunnel:

Select the IP device, select one of the tunnels (e.g. physical address 1.1.2), and click Test. A dialog for entering the password and authentication code appears (the password and authentication code can be viewed in the properties of the IP device in the project). Enter the password and authentication code and click OK; the word "Ok" appears next to the Test button. Click Select to connect. The whole process is shown in Fig.5.4.8.

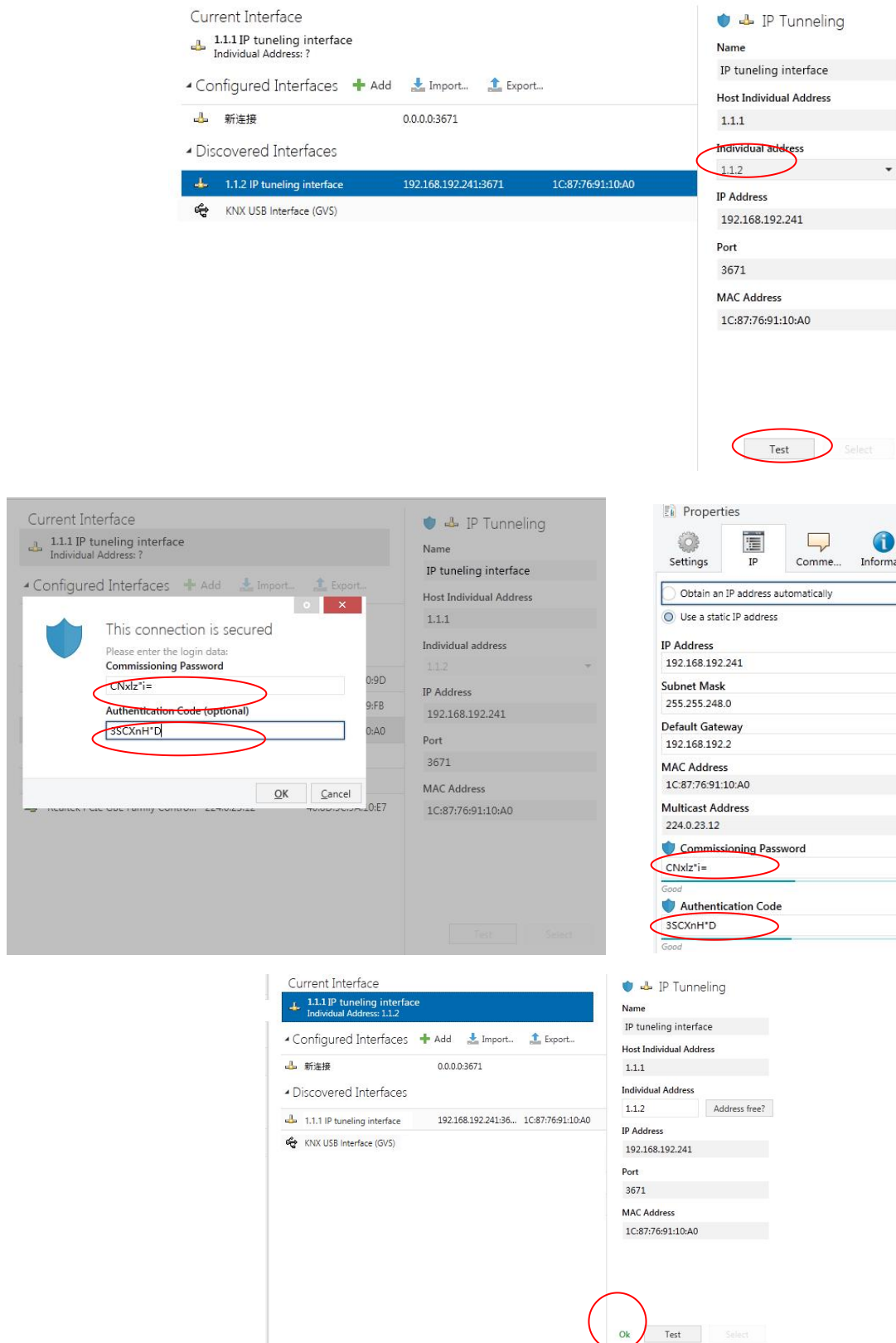


Fig.5.4.8 Example of an IP tunnel connection

In Fig.5.4.8, if "Secure Tunneling" is not activated, no commissioning password or authentication code is required when connecting as an interface. If "Secure Tunneling" is activated, ETS will prompt for

the commissioning password and authentication code when connecting.

If necessary, the KNX-BACnet Gateway Client can be reset to factory settings; please refer to [Chapter 7](#).

Note: Any USB interface used for programming a KNX Secure device must support "long frames".

Otherwise ETS will report a download failure information, as shown in Fig.5.4.9.

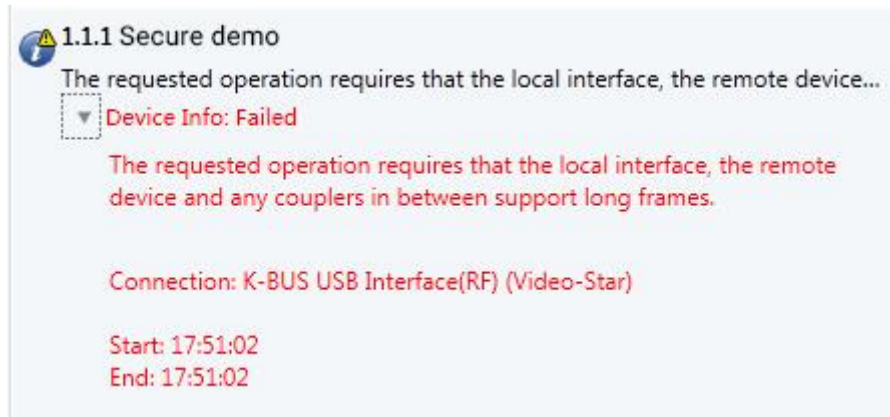


Fig.5.4.9

5.5. Removing the Device

The device can be reset to factory settings. Since it is a secure device, the following information must be observed:

When the device is operated in KNX Secure mode, it can only be reset via ETS when ETS uses the project in which this device is parameterized or when the project provides its commissioning key.

The device can be removed by right-clicking the device in its project in ETS.

Removing the application program:

- The IP address and IP configuration will be retained
- The password for the Tunneling server will be deleted, the commissioning password and authentication code will not be required when connecting (leave the dialog empty if it appears)
- The key assigned by ETS will be retained, no FDSK is required for reprogramming
- The physical address will be retained

Removing the physical address and application program:

- The device will be reset to the factory state
- Recommissioning will require the FDSK, unless the device is in its original commissioning project and its FDSK is still present in the project; then the interface can be reprogrammed directly.

Chapter 6 Description of Communication Object

The communication object is the medium to communicate with other devices on the bus, namely only the communication object can communicate with the bus.

NOTE: “C” in “Flag” column in the below table means enable the communication function of the object; “W” means value of object can be written from the bus; “R” means the value of the object can be read by the other devices; “T” means the object has the transmission function; “U” means the value of the object can be updated.

6.1. “BACnet point x” Communication Object

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,1bit			1 bit	C	R	-	T	-	1-bit	Low
➡	17	BACnet point 1 -	Write to bacnet,1bit			1 bit	C	-	W	-	U	1-bit	Low

DPT 1.xxx Boolean/Switch/... (1bit) [0..1]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,4bit			4 bit	C	R	-	T	-	3-bit controlled	Low
➡	17	BACnet point 1 -	Write to bacnet,4bit			4 bit	C	-	W	-	U	3-bit controlled	Low

DPT 3.xxx B1U3 (4bit) [0..16]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,2bit			2 bit	C	R	-	T	-	1-bit controlled	Low
➡	17	BACnet point 1 -	Write to bacnet,2bit			2 bit	C	-	W	-	U	1-bit controlled	Low

DPT 2.xxx (2Bit) [0..3]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,1byte general			1 byte	C	R	-	T	-	percentage (0..100%)	Low
➡	17	BACnet point 1 -	Write to bacnet,1byte general			1 byte	C	-	W	-	U	percentage (0..100%)	Low

DPT 5.001 Scaling (1byte) [0..100]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,2bytes float			2 bytes	C	R	-	T	-	2-byte float value	Low
➡	17	BACnet point 1 -	Write to bacnet,2bytes float			2 bytes	C	-	W	-	U	2-byte float value	Low

DPT 9.xxx Float Value (2bytes)

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,4bytes IEEE...			4 bytes	C	R	-	T	-	4-byte float value	Low
➡	17	BACnet point 1 -	Write to bacnet,4bytes IEEE float			4 bytes	C	-	W	-	U	4-byte float value	Low

DPT 14.xxx IEEE Float (4bytes)

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,2bytes coun...			2 bytes	C	R	-	T	-	2-byte unsigned value	Low
➡	17	BACnet point 1 -	Write to bacnet,2bytes counter...			2 bytes	C	-	W	-	U	2-byte unsigned value	Low

DPT 7.xxx 16 bit counter (2bytes) [0..65535]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,4bytes coun...			4 bytes	C	R	-	T	-	4-byte unsigned value	Low
➡	17	BACnet point 1 -	Write to bacnet,4bytes counte...			4 bytes	C	-	W	-	U	4-byte unsigned value	Low

DPT 12.xxx 32 bit counter (4bytes) [0.4294967295]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
➡	16	BACnet point 1 -	Read from bacnet,1byte count...			1 byte	C	R	-	T	-	counter pulses (0..255)	Low
➡	17	BACnet point 1 -	Write to bacnet,1byte counter...			1 byte	C	-	W	-	U	counter pulses (0..255)	Low

DPT 5.010 8 bit counter (1byte) [0..255]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,1byte ascii			1 byte	C	R	-	T	-	character	Low
	17	BACnet point 1 -	Write to bacnet,1byte ascii			1 byte	C	-	W	-	U	character	Low

DPT 4.001 ASCII character (1byte) [0..255]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,6bytes RGBW			6 bytes	C	R	-	T	-	Colour RGBW	Low
	17	BACnet point 1 -	Write to bacnet,6bytes RGBW			6 bytes	C	-	W	-	U	Colour RGBW	Low

DPT 251.600 RGBW (6bytes) [0..255]*6

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,3bytes RGB			3 bytes	C	R	-	T	-	3-byte colour RGB	Low
	17	BACnet point 1 -	Write to bacnet,3bytes RGB			3 bytes	C	-	W	-	U	3-byte colour RGB	Low

DPT 232.600 RGB (3bytes) [0..255]*3

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,1byte count...			1 byte	C	R	-	T	-	counter pulses (-128..1...	Low
	17	BACnet point 1 -	Write to bacnet,1byte counter...			1 byte	C	-	W	-	U	counter pulses (-128..1...	Low

DPT 6.010 8 bit counter (1byte) [-128..127]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,2bytes coun...			2 bytes	C	R	-	T	-	2-byte signed value	Low
	17	BACnet point 1 -	Write to bacnet,2bytes counter...			2 bytes	C	-	W	-	U	2-byte signed value	Low

DPT 8.xxx 16 bit counter (2bytes) [-32768..32767]

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	16	BACnet point 1 -	Read from bacnet,4bytes coun...			4 bytes	C	R	-	T	-	4-byte signed value	Low
	17	BACnet point 1 -	Write to bacnet,4bytes counte...			4 bytes	C	-	W	-	U	4-byte signed value	Low

DPT 13.xxx 32 bit counter (4bytes) [-2147483648..2147483647]

Fig.6.1 "BACnet point x"Communication Object

No.	Object function	Name	Type	Flags	DPT
16	read from bacnet, ...	BACnet point 1 - {{}}	1bit	C,T,R	1.*1-bit
			4bit		3.*3-bit controlled
			2bit		2.*1-bit controlled
			1byte		5.001percentage (0...100%)
			2byte		9.*2-byte float value
			4byte		14.*4-byte float value
			2byte		7.*2-byte unsigned value
			4bytes		12.*4-byte unsigned value
			1byte		5.010 counter pulses(0...255)
			1byte		4.* character
			6bytes		251.* Colour RGBW
			3bytes		232.*3-byte colour RGB
			1byte		6.010 counter pulses(-128..127)
			2bytes		8.*2-byte signed value
			4bytes		13.*4-byte signed value

This communication object is used to send the data obtained from the BA system to the KNX bus. The data point type depends on the parameter settings.

The name in parentheses changes with the parameter "Description of point". If description is

empty, display "BACnet point 1 - " by default.

17	write to bacnet, ...	BACnet point 1 - {{}}	1bit	C,W,U	1.*1-bit
			4bit		3.*3-bit controlled
			2bit		2.*1-bit controlled
			1byte		5.001percentage (0...100%)
			2byte		9.*2-byte float value
			4byte		14.*4-byte float value
			2byte		7.*2-byte unsigned value
			4bytes		12.*4-byte unsigned value
			1byte		5.010 counter pulses(0...255)
			1byte		4.* character
			6bytes		251.* Colour RGBW
			3bytes		232.*3-byte colour RGB
			1byte		6.010 counter pulses(-128..127)
			2bytes		8.*2-byte signed value
			4bytes		13.*4-byte signed value

This communication object is used to receive the control commands issued by the BA system from the KNX bus. The data point type depends on the parameter settings.

Table 6.1 "BACnet point x"Communication Object

Chapter 7 Factory settings

The default parameter settings of the KNX-BACnet Gateway Client at delivery are as follows:

Physical address	15.15.254
Physical address of the IP tunneling connection	15.15.241
	15.15.242
	15.15.243
	15.15.244
	15.15.245
IP configuration	
IP address	192.168.2.200
Subnet mask	255.255.255.0
Default gateway	192.168.2.1

When the IP address needs to be reset, the device can be reset to the factory configuration.

The procedure to reset the device to the factory configuration is as follows:

Press the programming button and hold for 4 seconds then release, repeat the operation for 4 times, and the interval between each operation is less than 3 seconds. The LAN, KNX, and programming LED will turn off, and then the LAN and KNX LED will return to normal status and the device restarts. After the restart is completed, the device is restored to the factory settings.

For more information about the FDSK (Factory Default Setting Key), please refer to [Chapter 5.4](#).