enertex bayern gmbh
simulation entwicklung consulting

Manual and Configuration

Enertex® KNX IP Secure Interface

Note

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Inhalt

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 of the subscriber 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.

Assembly and connection

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

- A 10/100 Mbit compatible Ethernet connection
- KNX / EIB bus connection

Comissioning

Boot

When powered the display shows the product name. The default for the network is DHCP. The boot time is about 2 seconds. During this time, the green / red / yellow LEDs operate as running light for a short time. At the end of the boot process, the IP address of the device is shown in the display.

If the IP address assignment is done via DHCP server, the boot time is extended accordingly. As soon as "KNX Ready" appears in the display, the device can be addressed via the bus and, for example, alternatively be programmed via a USB interface. The green LED flashes every second with a duty cycle of 1:30.

Displays

After one minute, the display turns off automatically.

To turn this on again, the DISPLAY button on the front panel must be pressed briefly. When the display is activated, pressing the DISPLAY button will scroll through various pages of information.

Page 1 shows the firmware version, IP address, physical address, serial number, bus voltage and used tunnel connections.

Page 2 shows all IP settings, as well as the boot time.

Page 3 gives information about the telegram load.

Page 4 shows the FDSK as long as the device has not been set to the secure state.

There are three LEDs on the front. The green LED flashes every second with a duty cycle of 1:30 and indicates ready for operation. The red LED indicates the programming mode, the yellow LED indicates bus activity.

In the LAN socket two further LEDs are installed. The green indicates a connection to another IP device or switch ("Link"), the yellow LED shows the IP data transfer.

Reset

If the device is to be reset to the factory settings, the PROG button on the front panel must be pressed for 10 seconds. After this time, the red LED starts to flash - then the PROG key can be released and the device carries out the reset to the delivery condition.

Functional Overview

The device has the following functions:

- KNX IP Secure
  - Eight independent KNXnet / IP tunnel connections
  - Communication via TCP or UDP for communication
  - KNX IP tunneling in encrypted (secure) mode.
- Displays
  - LED displays for KNX communication, Ethernet communication and programming mode
  - Power indicator
  - OLED display for status messages, parameter displays etc.
- Special functions
  - Configuration via ETS and Telnet
  - SNTP server
  - Measurement of the TP bus voltage, TP bus current and temperature (Telnet, OLED display)
  - Maximum TP APDU packet length of the KNX bus (248 bytes)
  - Maximum TP packet length adjustable (Telnet) between 55 and 248 bytes (APDU)
  - Simulation of UDP tunnels for ETS communication (Telnet)
- Performance
  - Specification of a max. TP data rate for writing KNX telegrams
  - Buffering up to 256 telegrams per tunnel (2048 in total) in the device on the IP side
  - Buffering up to 1024 telegrams for telegrams from IP to TP

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 to factory settings.

Backbone For IP devices, this is always the IP network.

Multicast An IP address in the network over which all the routers of a backbone communicate. Tunnel connections do not need this address. Multicast connections are always established with the UDP protocol. Unlike TCP communication, an UDP telegram can always be lost. This is e.g. for WLAN connections very likely. Therefore, the routing backbone should always be realized with an Ethernet cable connection, as this is almost 100% transmission safe.

Backbonekey The routing protocol communicates in secure mode with encrypted telegrams. The key for encryption must be the same for all participants and is loaded into the device. The ETS generates the necessary backbone key on its own.

Tunnelling A KNX point-to-point connection on the TCP / IP network, which is established with UDP or TCP protocol. Tunneling communication is reliable and has incorporated a link layer for that purpose. Therefore independent of the ethernet connection, e.g. Cable or WLAN, and regardless of the TCP / IP protocol (UDP or TCP), no data is lost. With UDP, however, the restriction is that the data link layer works with a one-second timeout. For Enertex devices, this timeout can be adjusted in the advanced setup.

Telnet A simple TCP server on port 23 that enables direct text-based communication with the IP device. Telnet is a de facto standard used at the window level, e.g. with "Putty" is addressed.

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.

ETS 5.6.6 and ETS 5.7.1

Version requirements

For error-free operation of the devices in secure mode, ETS 5.7.x or higher is required.

In plain mode, the device can basically be programmed as of ETS 5.6.6. Although the secure mode can be parameterized, it is not fully implemented in this version. If the device is therefore to be operated secure, we recommend working with version 5.7 or higher.

Special behavior

If you program the individual address in the ETS 5.6.6 with its own nd a tunnel connection, the ETS will throw an error message at the end. This is to be ignored, the assignment of the address has nevertheless been made.

If no tunnel addresses are assigned in the application, all tunnels are set by the ETS to 15.15.255. Communication via the tunnel connection can then be considerably disturbed or not possible.

If the device is integrated in a secure project, the ETS saves the parameterization of this particular device including secure parameters. If the device is reset to factory settings, the ETS (5.6 or 5.7) only addresses the device in encrypted form. Therefore, communication with the ETS can no longer be established. In this case, only deleting the application and restarting the ETS will help.

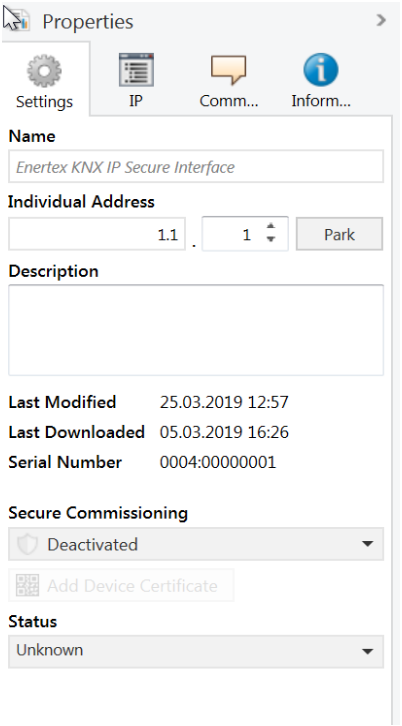
If an update of Windows runs in the background, strange phenomenon can occasionally occur with the communication between the device and the ETS. In this case, wait for the end of the update and restart Windows.

Topology

To insert the interface into an ETS project, a TP line must exist.

Device Properties

General



Name
Enertex KNX IP Secure Interface

Individual Address
1.1 . 1

Description

Last Modified 25.03.2019 12:57
Last Downloaded 05.03.2019 16:26
Serial Number 0004:00000001

Secure Commissioning
Deactivated

Status
Unknown

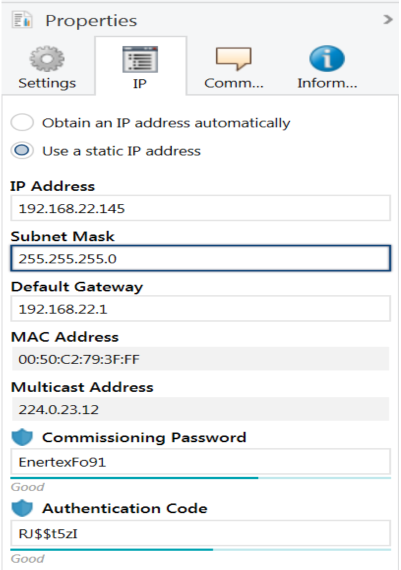
Figure 1: Properties of the device

Name Any name can be assigned, max. 30 characters

Secure Comissioning If activated, the encryption is active for commissioning: all parameters are then transmitted in encrypted form, although e.g. Tunnel connections are still unencrypted.

Secure Tunnelling If activated, the tunnel connections can only be established via KNX Secure Tunneling.

IP Properties



○ Obtain an IP address automatically
● Use a static IP address

IP Address
192.168.22.145

Subnet Mask
255.255.255.0

Default Gateway
192.168.22.1

MAC Address
00:50:C2:79:3F:FF

Multicast Address
224.0.23.12

Commissioning Password
EnertexFo91
Good

Authentication Code
RJ$$t5zI
Good

Abbildung 2: IP Einstellungen des Geräts

Obtain an IP address automatically The device requires a DHCP server for IP address assignment

Use a static address The user specifies the IP settings.

Comissioning Password A password from which the ETS generates a key. This is the key to secure commissioning (see above).

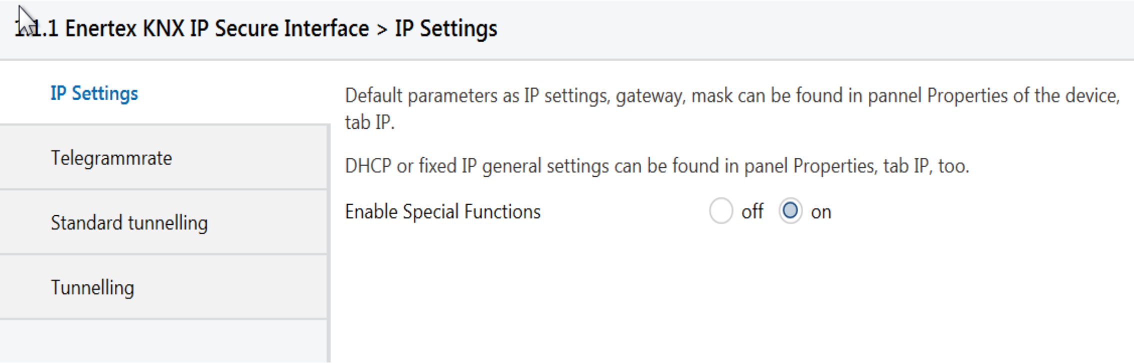
Authentication Code With the authentication password, the user proves that he has access to the project.

MAC Address Is a device property

Multicast Address Is given by the backbone configuration (see Fehler: Referenz nicht gefunden).

Device-specific parameters

General



1.1.1 Enertex KNX IP Secure Interface > IP Settings

Default parameters as IP settings, gateway, mask can be found in pannel Properties of the device, tab IP.

DHCP or fixed IP general settings can be found in panel Properties, tab IP, too.

Enable Special Functions ○ off ● on

Figure 3: General settings of the device

Name	Options	Description
(Text)		The ETS has manufacturer-independent uniform parameter dialogs for various settings. To simplify the application, a note text is displayed here.
Enable Special Functions	off/on	Enertex® devices offer special functions to ensure a maximum of flexibility.

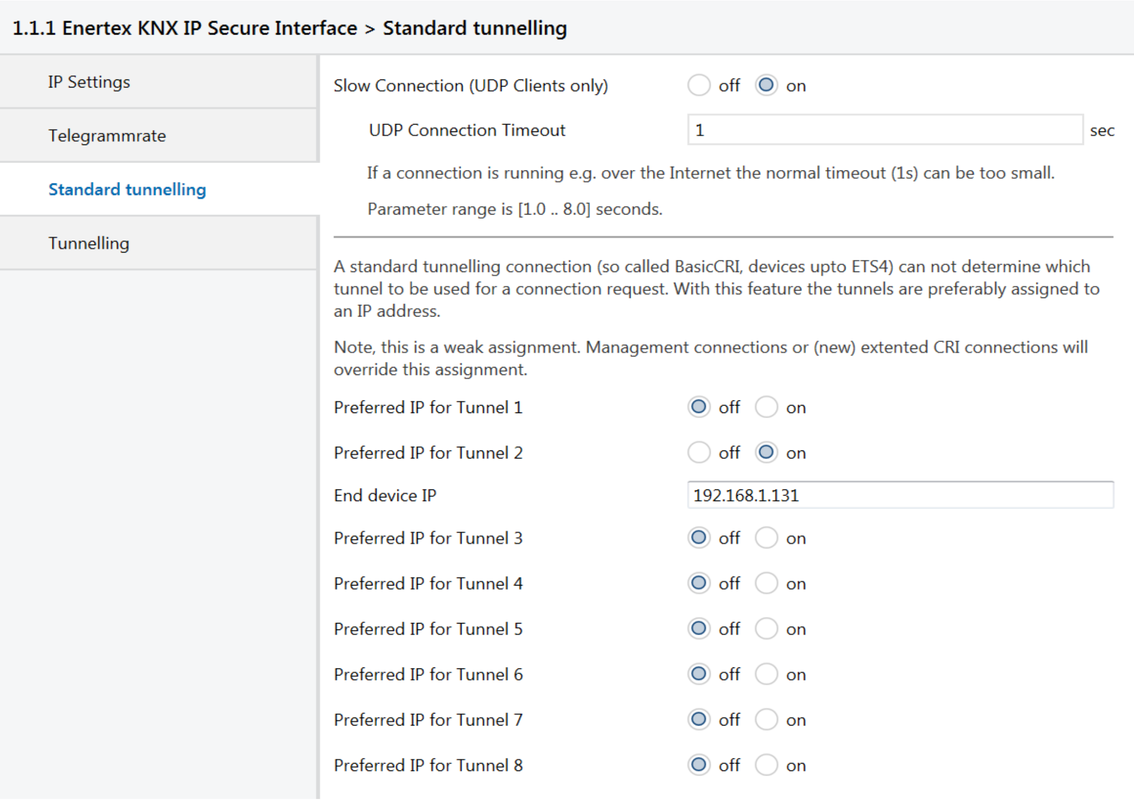
Special Functions

Standard tunnel preferred IP

Enertex® devices offer the possibility for standard tunnel connections (before 2019) to assign each of these tunnel connections to an IP address. In the analysis of group telegrams, this makes it easier to assign the telegrams to the sender which "sits" behind the tunnel, as e.g. Visualizations or smartphone apps.

Note:

This assignment can be resolved at any time by the ETS or a new so-called extended tunnel connection (as of 2019).



1.1.1 Enertex KNX IP Secure Interface > Standard tunnelling

Slow Connection (UDP Clients only) ○ off ● on

UDP Connection Timeout 1 sec

If a connection is running e.g. over the Internet the normal timeout (1s) can be too small.

Parameter range is [1.0 .. 8.0] seconds.

A standard tunnelling connection (so called BasicCRI, devices upto ETS4) can not determine which tunnel to be used for a connection request. With this feature the tunnels are preferably assigned to an IP address.

Note, this is a weak assignment. Management connections or (new) extented CRI connections will override this assignment.

Preferred IP for Tunnel 1 ● off ○ on

Preferred IP for Tunnel 2 ○ off ● on

End device IP 192.168.1.131

Preferred IP for Tunnel 3 ● off ○ on

Preferred IP for Tunnel 4 ● off ○ on

Preferred IP for Tunnel 5 ● off ○ on

Preferred IP for Tunnel 6 ● off ○ on

Preferred IP for Tunnel 7 ● off ○ on

Preferred IP for Tunnel 8 ● off ○ on

Figure 4: Preferred IP for Tunnelling

Name	Options	Description
Slow Connection	off/on	The tunnel connections over UDP are controlled by default with a connection timeout of 1 second. This may be too short for connections over the Internet.
UDP Connection Timeout	1,0 ... 8,0 sec	Tunnel X should preferably be used for communication with the parametrized IP address.
Preferred IP for Tunnel X	off/on	
End device IP	(IP-V4 Address)	

Telnet

Telnet can be used to request additional information from the IP Interface. Telnet access is factory-protected with the password "knxsecure".

Once the Interface is in secure mode, the telnet interface is disabled.

Although it can be enabled for developer purposes prior to programming the secure mode, this is a security risk.

`help`	Displays all available commands

`ifconfig`	Displays network parameters
	
	`IP mode.......: DHCP`
	`IP............: 192.168.33.142`
	`Subnet mask...: 255.255.0.0`
	`Gateway.......: 192.168.33.1`
	`NTP server....: 192.53.103.108`
	`Sys multicast.: 224.0.23.12`
	`RT multicast..: 224.0.23.12`
	`Hardware addr.: 00:50:c2:79:3f:ff`
	
	Sys multicast: Multicast address for System telegrams
	RT multicast: Multicast address für routingt telegrams

`ifconfig [help|dhcp|ip|mask]`	Set network parameters via the telnet interface.
	Expamples
	
	Setting IP Addresse with DHCP:
	`ifconfig dhcp`
	
	Statically set the IP address to 192.168.1.2 (in this case, the gateway and mask should also be adapted, see below)
	
	`ifconfig ip 192.168.1.2`
	
	Set the gateway to 192.168.1.1:
	`ifconfig gw 192.168.1.1`
	
	Set the mask to 255.255.255.0:
	`ifconfig mask 255.255.255.0`

`tpconfig`	Show KNX parameters
	
	`KNX bus state.: up`
	`KNX address...: 15.15.000`
	`Serial number.: 00-a6-00-00-00-01`

`tpconfig [help|set]`	Set KNX parameters via the telnet interface. Set the TP address to 1.1.0: `tpconfig set 1.1.0`
`progmode [0|1]`	Query or change programming mode (0 = off, 1 = on)

`apdu [55..248]`	Read or configure the maximum length of the KNX TP telegrams. This may be necessary if there is an incorrect implementation of a TP stack. In that case the ETS may try to use telegrams with 248 bytes payload, but the TP device can not process (e.g. Zennio Z35i). Default is 248 and should only be changed if necessary.
	
	`# apdu`
	`maximal len of a KNX telegram 248.`
	`Usage: apdu [55 .. 248]`

`tpratemax [5..50]`	Read or configure maximum telegram rate (IP => TP); 50 T / s corresponds to 100% bus load.
	
	`# tpratemax`
	`no limit, sending with maximum performance to TP.`
	`Usage: tpratemax [5 .. 50]`

`stats`	Shows various statistics on device and bus status
	
	`uptime: 114 days, 2:19`
	`KNX communication statistics:`
	`TX to IP (all)..: 333729 (ca. 233 t/m)`
	`TX to KNX.......: 23244 (ca. 16 t/m)`
	`RX from KNX.....: 94559 (ca. 66 t/m)`
	`Overflow to IP..: 0`
	`Overflow to KNX.: 0`
	`TX tunnel re-req: 260`
	`TP bus voltage..: 28.95 V`
	`TX TP rate......: 50 T/s (= 100 %)`
	
	Uptime: Runtime of the interface since last restart
	TX to IP (all): Number of all telegrams sent on IP
	TX to KNX: Number of all telegrams sent on KNX
	RX from KNX: number of telegrams received from the KNX bus
	Overflow to IP: Number of telegrams that could not be sent to IP
	Overflow to KNX: Number of telegrams that could not be sent to the KNX bus
	TX tunnel re-req: Number of telegrams that had to be repeated in the tunnel connections
	TP bus voltage: Current bus voltage (at the time of calling stats)
	TX TP rate: maximum telegram rate (TP)

`free [clear]`	Shows statistics about the memory usage
	
	`Used stack memory...: 14 %`
	`Allocated memory....: 64 %`
	`Unused memory.......: 35 %`
	`TP-Tx buffer........: 0 %`
	`TP-Tx buffer max....: 0 %`
	`TP-Rx buffer max....: 0 %`
	`Tunnel-T8 buffer max: 92 %`
	
	Used stack memory: Function stack utilization
	Allocated memory: Allocated device memory
	Unused memory: Unused device memory
	TP-Tx buffer: Currently used TP send buffer
	TP-Tx buffer max:Max. Utilization of TP send buffer (IP => TP) since system startup
	TP-Rx buffer max:Max. Utilization TP receive buffer (IP <= TP) since system startup
	Tunnel-XX (XX=1..8) buffer max:Max. Utilization of the tunneling buffer. Only tunnels whose buffer was used at all will be displayed
	
	Clear the buffer statistics:
	`free clear`

`tunnel [1..8]`	Shows active tunnel connections (without argument) or detailed information about the specified tunnel connection (with argument 1..8)
	
	`# tunnel`
	`Tunnels open: 1/8`
	`1: 00.02.246, closed`
	`2: 00.02.247, open (CCID: 82)`
	`3: 00.02.248, closed`
	`4: 00.02.249, closed`
	`5: 00.02.250, closed`
	`6: 00.02.251, closed`
	`7: 00.02.252, closed`
	`8: 00.02.253, closed`
	
	`# tunnel 2`
	`Tunnel 2..................: open (CCID 82)`
	`KNX address...............: 00.02.247`
	`HPAI control..............: 192.168.22.252:4808`
	`HPAI data.................: 192.168.22.252:4808`
	`Connect. type.............: TUNNEL_CONNECTION`
	`Communication.............: UDP CONNECTION`
	`TX tun req................: 23169`
	`TX tun re-req.............: 0`
	`RX tun req................: 821`
	`RX tun re-req (identified): 0`
	`RX tun req (wrong seq.)...: 0`
	`Current tunnel buffer.....: 0 %`
	`Connected since (UTC).....: 16:26:16 29-01-2019`
	
	CCID: Connection ID of the tunnel connection
	KNX address: Tunnelling address
	HPAI control: Control endpoint of the connection partner
	HPAI data: Data endpoint of the connection partner
	Connect. Type:Connection type tunnel or management connection
	Communication: UDP or TCP Connection
	TX tun req: Number of telegrams sent to the tunnel connection
	TX tun re-req: Number of telegrams that had to be repeated in the tunnel connections
	RX tun req: Number of telegrams received from the tunnel connections
	RX tun re-req: Number of telegrams received twice by the tunnel connections
	RX tun req (wrong seq.):number of frames received from the tunnel connections with wrong sequence number
	Current tunnel buffer: Utilization currently of the IP buffer of the tunnel
	Connected since (UTC): Time since the tunnel connection has been established.

`version`	Firmware-Version
`mask`	Mask-Version
`display [0|1]`	Query or change the display mode (0 = standard, 1 = inverted)

`tunaddr 1..8 address`
`tunaddr reset`
`tunaddr setall`
`tunaddr help`
	KNX address of a tunnel read (`tunaddr`) or change, e.g. `tunaddr 1 15.15.240`, set all tunnel addresses consecutively from a certain start address (`tunaddr setall 15.15.15`), or reset the KNX addresses of all tunnels to factory settings (`tunaddr reset`)
	
	`# tunaddr`
	`1: KNX address: 15.15.010`
	`2: KNX address: 15.15.011`
	`3: KNX address: 15.15.012`
	`4: KNX address: 15.15.013`
	`5: KNX address: 15.15.014`
	`6: KNX address: 15.15.015`
	`7: KNX address: 15.15.016`
	`8: KNX address: 15.15.017`

`tunmode [std/tpblk]`	Read tunnel mode (without parameters) or set (`tp` or `tpblk`); `tunmode tpblock:`IP => KNX If same backbone forward to line frame KNX=> IP if same sub line send to backbone
`Tunneltime [1.0..8.0]`	Query or change timeout for tunnel connection (1.0 to 8.0). Setting is identical to "slow connection", Figure 4
`tunudp`	Query or change the type of tunnel connection for the ETS (0 = default, 1 = UDP only).
`date`	Show date and time
`sntp [query|server IP]`	Send request to the NTP server (`sntp query`) or set the IP of the NTP server (`sntp server 1.2.3.4`)
`logmem`	Event memory in the device. Suitable for the development of clients. Read out for support requests.

`passwd oldpw newpw`
`passwd oldpw`
`passwd newpw`
	Changes the current Telnet password (passwd), deletes the current password (old passwd) or sets a new password if none is currently set (new passwd)

`secure [0|1]`	Display or change the behavior of the Telnet interface in secure mode (0 = disable, default, 1 = enable) **Note: Although it can be enabled for developer purposes prior to programming the secure mode, this is a security risk.**
`factory_reset`	Reset to factory settings and reboot
`die`	Test hardware watchdog. Executes reset.
`reboot`	reboot
`logout`	end Telnet-Session

Latest documentation and Software

Under http://www.enertex.de/d-produkt.html you will find the current ETS database file as well as the current product description.

Specification

Symbols	Must not be disposed of with household waste.
KNX (Powersupply)	DC 21 ... 32 V SELV current consuimption < 20 mA
Ethernet-Interface	Rj45-connector 10M/100MBit Ethernet
Display	Graphical OLED, 128x64 Programming LED (red), Bus Activity LED (yellow), Voltage LED (green flashing) Network link (green), network activity (yellow)

KNX Functions	• KNXIP Secure Tunneling • Up to 48 telegrams per second • AES 128 encryption • Asymmetric key exchange for tunnel connections • UDP and TCP communication • Up to 8 tunnel connections • APDU 248, parameterizable between 55 and 248 • TP telegram rate limit • TP bus voltage measurement (display telnet or display)
Environment	-5 ... +45° C
Installation	• Only for use in dry interiors. • Only for installation in distributor according to DIN 43880 on DIN rail 35mm according to EN 50022. • Degree of protection IP20
Outer dimensions	35,0 mm x 89,6 mm x 62,9 mm (L x B x H)

Open Source Software

This product uses third-party software from the following authors:
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LWIP

Quelle: https://savannah.nongnu.org/projects/lwip/