SIEMENS

IP Router Secure

N 146/03

The IP router connects KNX lines via data networks using the internet protocol (IP) and the KNXnet/IP standard. At the same time, this device enables bus access from a PC or other data processing devices.

- Easy to connect to higher-level systems by using the internet protocol (IP)
- Secure access and data transfer via KNXnet/IP Secure
- Encrypted communication with authenticated devices
- Can be used topologically flexible as an area coupler, line coupler or area and line coupler
- LED displays for operational readiness, KNX communication and IP communication
- Easy and secure configuration using ETS
- Easy to connect to visualization systems and facility management systems

Functions of the IP router

The IP router is a rail-mounted device for installation in distributions. The device uses the KNXnet/IP standard and connects KNX lines to each other via data networks using the internet protocol (IP). At the same time, this device enables bus access from a PC or other data processing devices.

Connections and power supply

The connection to KNX is established using a bus connector terminal (black and red terminals). The connection to the data network (IP via 10 or 100BaseT (depending on the switch)) is established using an RJ45 socket.

The IP router also needs operating voltage in order to operate. The IP router can obtain this operating voltage via the network line using "Power over Ethernet" as per IEEE 802.3af. Alternatively, the operating voltage can be obtained via the second terminal block (white-yellow terminals) from an AC/DC 24 V safety extra low voltage supply or from a bus voltage supply (unchoked voltage, DC 29 V). As soon as the safety extra low voltage supply is connected to the second terminal block, operating voltage is drawn from it.

Remote access

Even if there is no direct network connection between a PC and an IP router, you can use a suitable network infrastructure for remote access to a KNX installation.
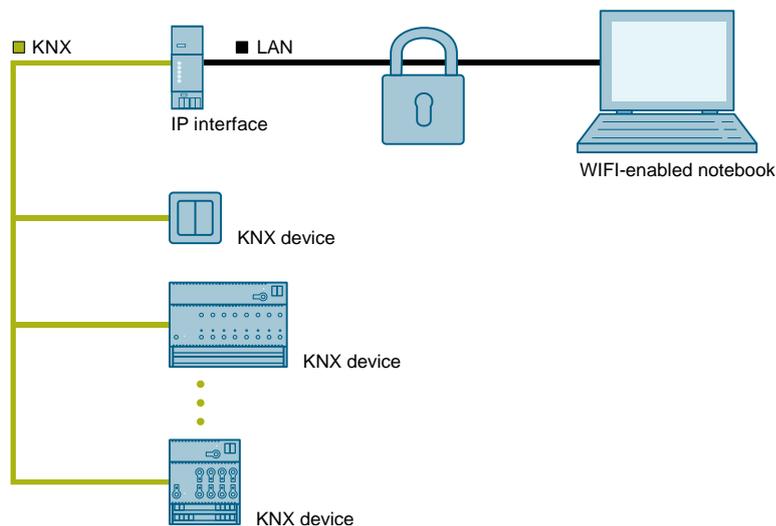
Secure remote access

Additional functions

The IP router has the following attributes:

- Easy to connect to higher-level systems by using the internet protocol (IP)
- Secure access and data transfer via KNXnet/IP Secure
- Direct access to the KNX installation from every point in the IP network (KNXnet/IP tunneling)
- Fast communication between KNX lines, areas and systems (KNXnet/IP routing)
- Communication across buildings and properties (networking properties)
- Filtering and forwarding of telegrams according to
  – Physical address
  – Group address
- LED displays for
  – Operational readiness
  – KNX communication
  – IP communication

- Easy and secure configuration using ETS
- Easy to connect to visualization systems and facility management systems
- Slot for SD card (not in use)

Security functions of the IP router

The IP router supports the "**KNX IP Secure**" security standard and offers the following security functions, among others:

- Encrypted transfer of KNX telegrams between IP routers in the IP network
- Encrypted transfer of KNX telegrams between IP routers and PC software
- Secure access only from authenticated devices
- Secure commissioning via ETS

During secure commissioning via ETS, the device certificate printed onto the device (FDSK = Factory Default Setup Key) is imported and stored for this exact device in the ETS project.

| i	For more information on KNX IP Secure, refer to the ETS software help or go to the following website: https://support.knx.org

i	Alternatively, insecure commissioning without KNX IP Secure is also possible. In this case, the device is insecure and responds like other KNX devices without IP Secure.

Topology and routing functions

IP Router Secure can be used as an area or line coupler (KNXnet/IP routing).

In this context, two separate KNX bus lines within a data network are connected to each other data-wise. Galvanically, however, the KNX bus lines remain separated. This makes it possible to operate each bus line electrically independent from the other lines.
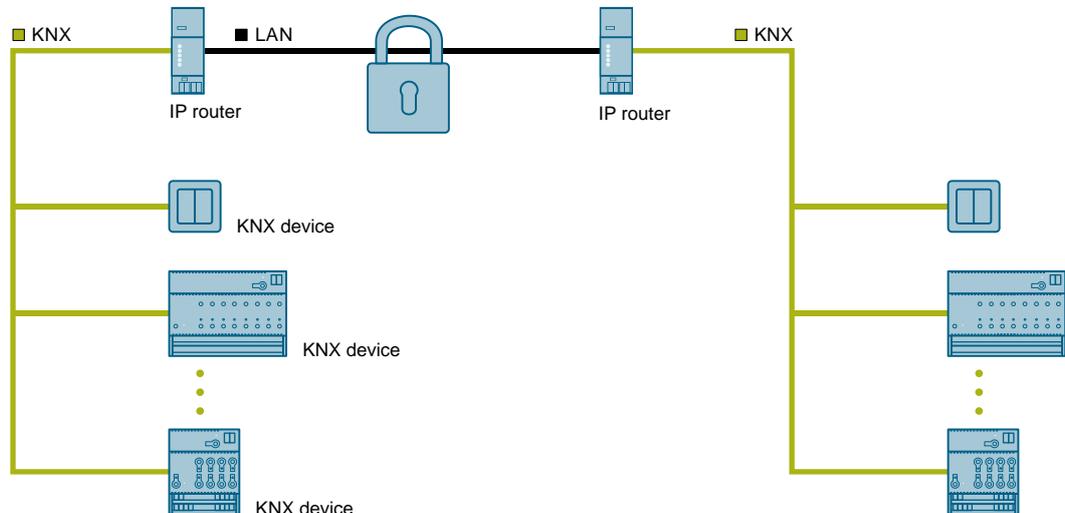
More secure communication during operation

Functions when using the IP router as a line or area coupler

- Fast communication between KNX lines
- Option to extend an existing KNX system beyond the building by using LAN and WAN connections
- Direct forwarding of KNX data to every network user
- KNX remote configuration from every network access point
- Can be used in a new or an existing KNX network
- Reduces the bus load by means of filter tables, which determine which bus telegrams are forwarded to and from the bus line or blocked. The ETS software automatically generates the filter table when the device is configured and commissioned.
- When the physical address is assigned, ETS is used to automatically specify the coupler function (area coupler: main line 1 – 15; line coupler: line 1 – 15).

Requirements for use as a line coupler

- Network components must support IP multicasting.
- Network/LAN routers must be set up in such a way that they forward IP multicast datagrams.
- The IP multicast address 224.0.23.12 has been reserved for KNXnet/IP routing.

i	When using the router as a world (system) coupler (0.0.0) and full extension of KNX lines incl. line amplifiers, it is no longer possible to reach all line segments due to the routing counter.

i	When you assign the physical address, make sure that the IP router and line coupler in an installation receive topologically correct physical addresses. To do this, see the following rules.

Rule for using the IP router as an area coupler

If an IP router is used as an area coupler with physical address x.0.0, no additional IP router may be topologically "underneath" this IP router, i.e. with a physical address x.y.0 (y=1...15).
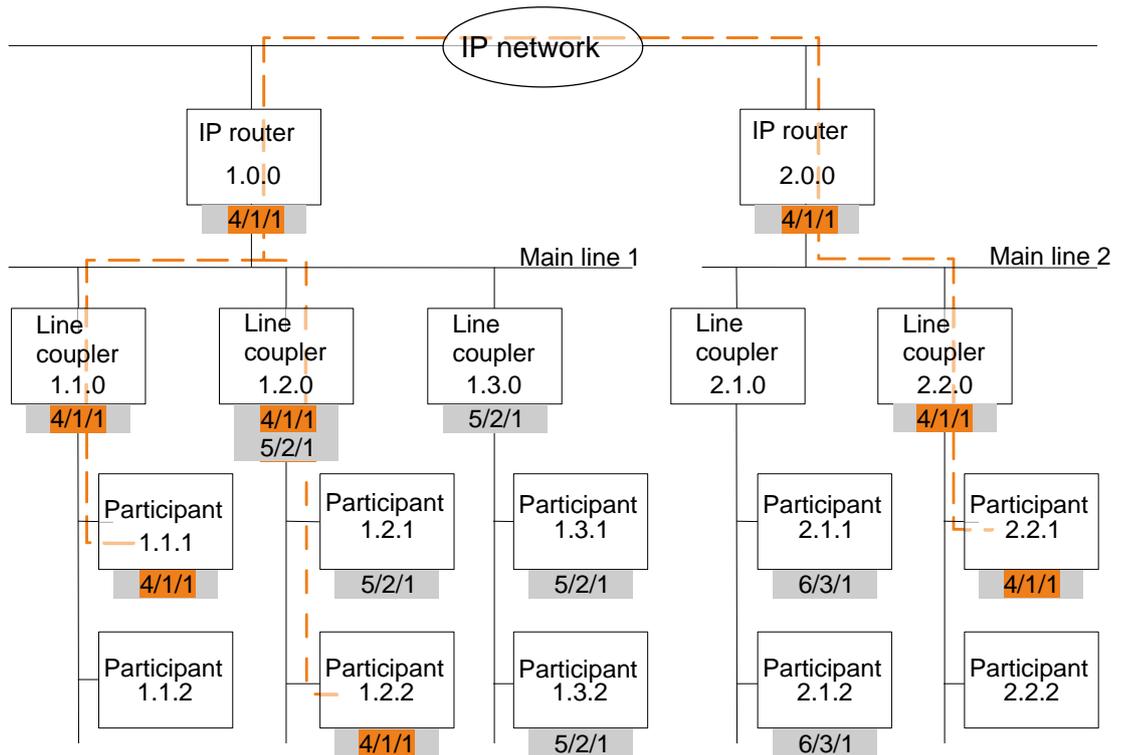
IP-Router Secure as area coupler

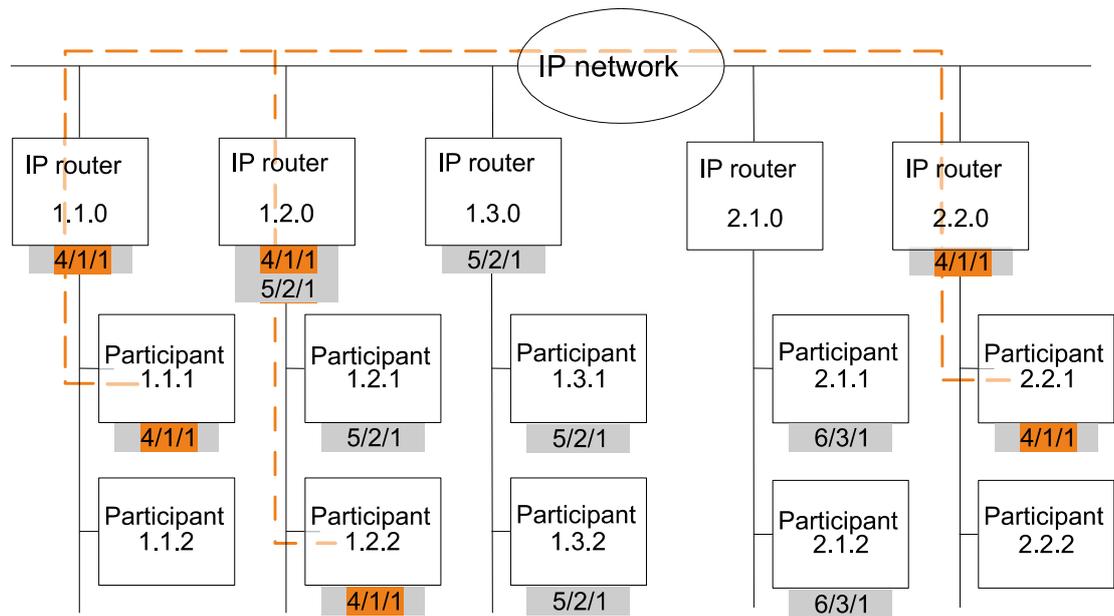x/x/x Group address

x.x.x Physical address (IP address)

— — Path of a telegram from the sender to the recipients (example)

Telegrams are only forwarded or received by devices with the same group address.

Example: Telegram is only forwarded or received by devices with group address 4/1/1.

Rule for using the IP router as a line coupler

If an IP router is used as a line coupler (e.g. 1.2.0), no IP router with corresponding area coupler address (e.g. 1.0.0) must be used "above" it in the system.

IP-Router Secure as line coupler

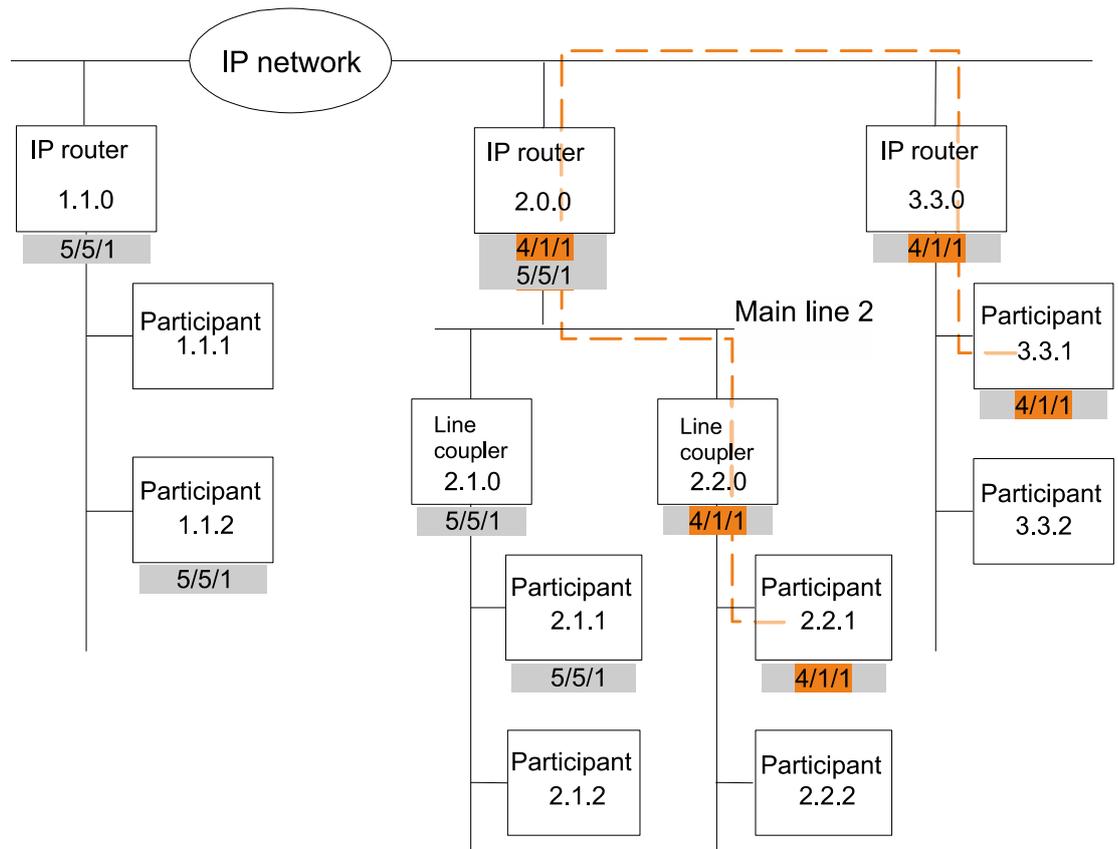x/x/x Group address

x.x.x Physical address (IP address)

– – Path of a telegram from the sender to the recipients (example)

Telegrams are only forwarded or received by devices with the same group address.

■ Example: Telegram is only forwarded or received by devices with group address 4/1/1.

Rule for using the IP router as an area and line coupler

The IP router can be used as an area or line coupler. The physical address has the structure x.y.0, with x=1…15 and y=1…15.

IP-Router Secure as area and line coupler

x/x/x Group address

x.x.x Physical address (IP address)

— — Path of a telegram from the sender to the recipients (example)

Telegrams are only forwarded or received by devices with the same group address.

Example: Telegram is only forwarded or received by devices with group address 4/1/1.

Response on bus voltage failure and recovery

If the IP router detects a bus voltage failure on the bus line, this is stored as an error. In the same way, bus voltage recovery of the bus line is detected and the error is deleted internally. Depending on the configuration, both events are reported to KNXnet/IP.

Position and function of the connections, operating and display elements
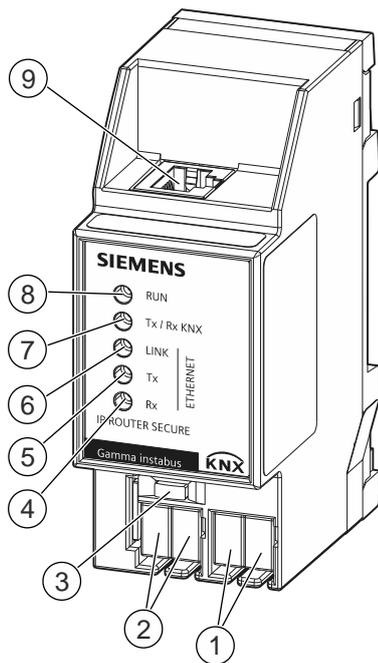
IP router LEDs and connections

Pos. no.	Element	Function
1	Connection terminals for additional power supply, screwless	They supply the device with power if there is no power supply via the RJ-45 connection (Power over Ethernet).
2	KNX bus terminal blocks, screwless	KNX bus connection
3	LED status display Button: Learning mode	Short push of button (< 1 s): → Display status (LED on = active) Very long push of button (> 20 s): → Reset to factory settings (LED starts blinking after 20 s)
4	LED "Rx"	LED lights up if data is received via the RJ-45 connection (Ethernet)
5	LED "Tx"	LED lights up if data is sent via the RJ-45 connection (Ethernet)
6	LED "LINK"	LED lights up as soon as there is a connection via the RJ-45 (Ethernet) connection
7	LED "Tx / Rx KNX"	LED lights up when telegrams are sent or received via the KNX bus
8	LED "RUN"	LED lights up as soon as power supply is established and the device is ready for operation
9	RJ-45 connection	Connecting the device to the network

Location of the device certificate QR code
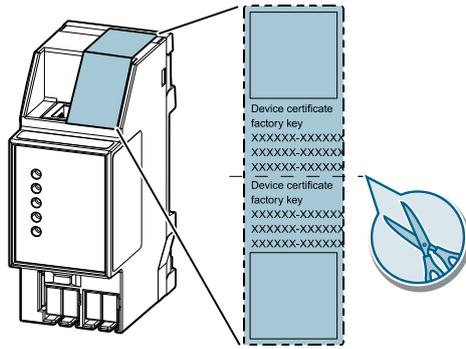
Device certificate

The QR code of the device certificate is affixed to the device as a sticker. There is a duplicate QR code, which can be removed for easy commissioning.

Type overview

Type	Description	Order number
N 146/03	IP-Router Secure	5WG1146-1AB03

Version of the Engineering Tool Software and application program

Application	Version
Engineering Tool Software (ETS)	ETS 5.7.3 and up
Application program	091A CO IP-Router Secure 0040 02

Product documentation

Documents belonging to the product, such as operating and assembly instructions, application description, product database, additional software and CE declarations can be downloaded from the following website:

http://www.siemens.com/gamma-td

Frequently asked questions

For frequently asked questions regarding the product and their solutions, see:

https://support.industry.siemens.com/cs/ww/en/ps/faq

Support

Contact details for additional questions relating to the product:

Tel: +49 911 895-7222

Fax: +49 911 895-7223

Email: support.automation@siemens.com

http://www.siemens.com/supportrequest

Safety

⚠	**⚠ CAUTION**
	National safety regulations
	Failure to comply with national safety regulations may result in personal injury and property damage.
	• Observe national provisions and comply with the appropriate safety regulations.

ℹ	If you pass on the device, ensure you also pass on the documentation for the device, such as, the operating instructions.

Notes on secure data transfer

- Operate device only in secure mode.
- Only connect the device to the internet in secure mode.

  The device is in secure mode if the device has been commissioned using secure commissioning, secure tunneling has been activated, and strong and different passwords are used.

Possible additional security measures include:

- Only operate the device in secure mode in a safe network environment.
- Set up a separate IP network with its own hardware for KNX communication.
- Use user IDs and strong passwords to restrict access to the (KNX) IP network.
- If the device is operated in insecure mode, additionally protect remote access to the device by using a VPN connection.

  (A virtual private network (VPN) establishes an encrypted and authorized connection (VPN tunnel) from a remote connection to a network via the internet. This VPN connection enables secure communication protected from eavesdropping between a remote device and the KNX installation.)
- If Wi-Fi is used, change the preset SSID of the wireless access point. Encrypt the Wi-Fi using a secure procedure (such as WPA2 at present).
- Document network settings and give them to the building owner/operator or LAN administrator.
- Coordinate the administration of access rights to this KNXnet/IP device in an IP network with the respective IP network administrator.

Measures after replacing a device in the network

If an IP Router Secure or an IP Interface Secure in secure mode is stolen from a network or replaced due to a defect, secure commissioning has to be repeated for all other devices in the network. To do this, deactivate the "Secure commissioning" option for each device in the settings of the project, active the option again and load the data to the devices again. (There is no need to load the data into the device between deactivation and reactivation.)

Secure commissioning has to be repeated because it is not possible to exclude the possibility that the keys that are in the secure section of the device can be read. Recommissioning has the effect that new keys are generated and the old keys become worthless. The removed device no longer works in the network.

More information on KNX security

For more information on KNX security, including, for example, a security check, refer to the "KNX Secure" section on the KNX website (http://www.knx.org).

ℹ️ **Areas of use**

The device can be used for fixed installations in interior spaces, for installations in dry locations, within distribution boards or small casings with DIN rails EN 60715-TH35.
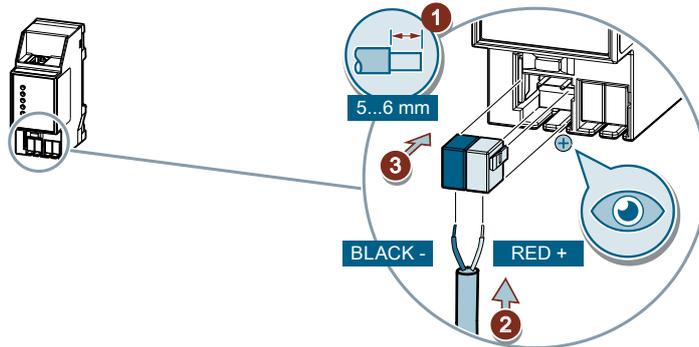
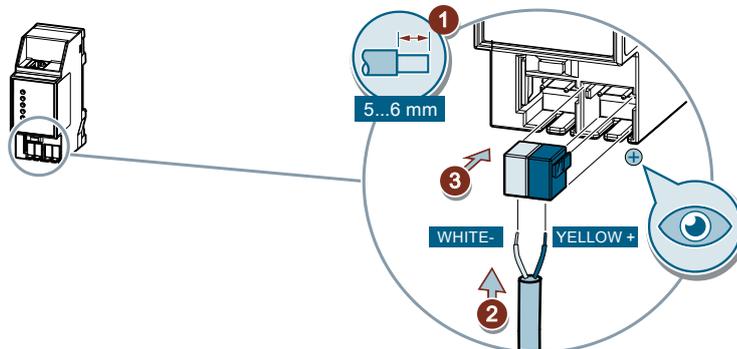|	• Electrical expertise is required for the installation.
	• The installation must be performed by a specialist.
	• Do not open the casing of the device.
	Incorrect installation can deactivate electrical safety features without this being apparent to a lay person.

Ethernet RJ-45 connection
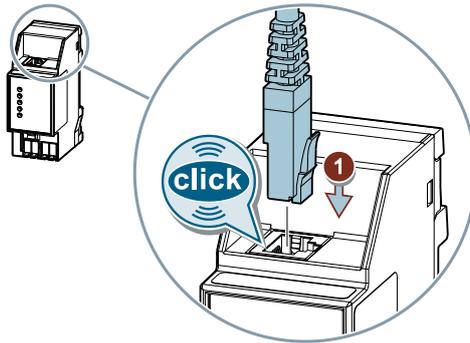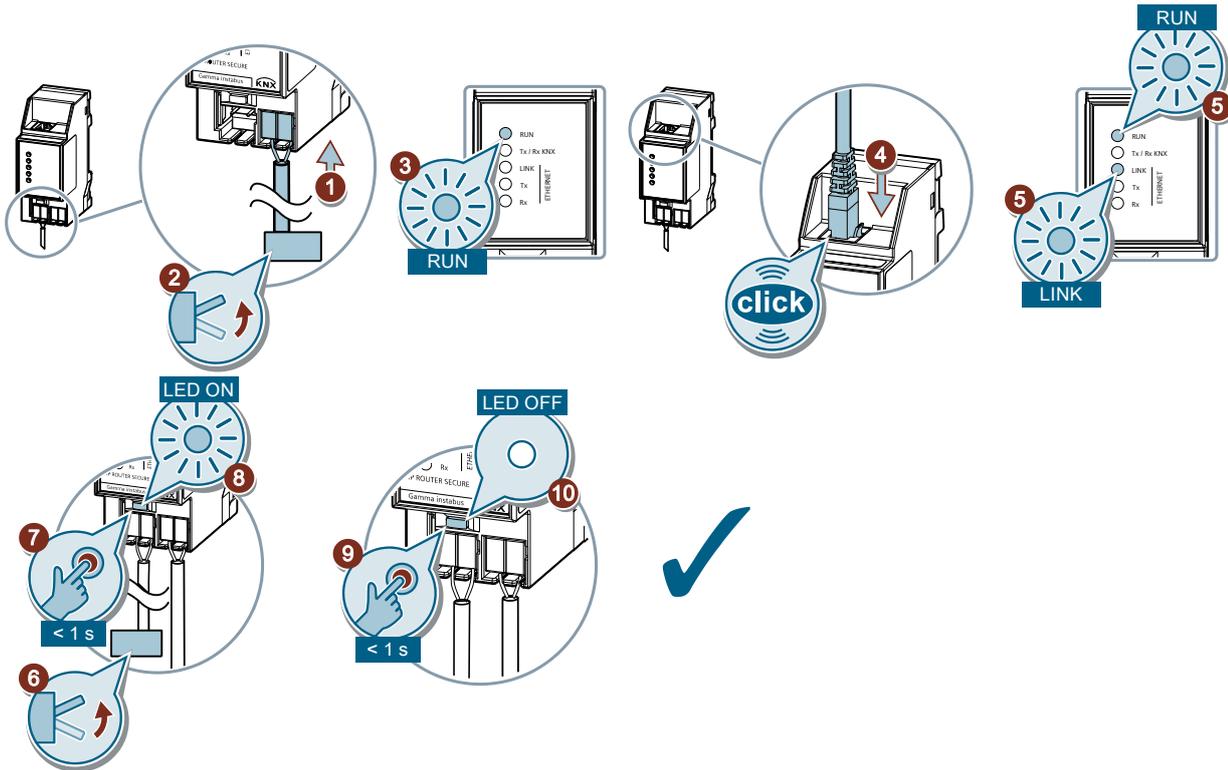

KNX 24 VDC type SELV connection

Power supply connection AC 16…24 V, DC 16…30 V

Checking the power supply via Ethernet (PoE) / Ethernet RJ-45 and KNX
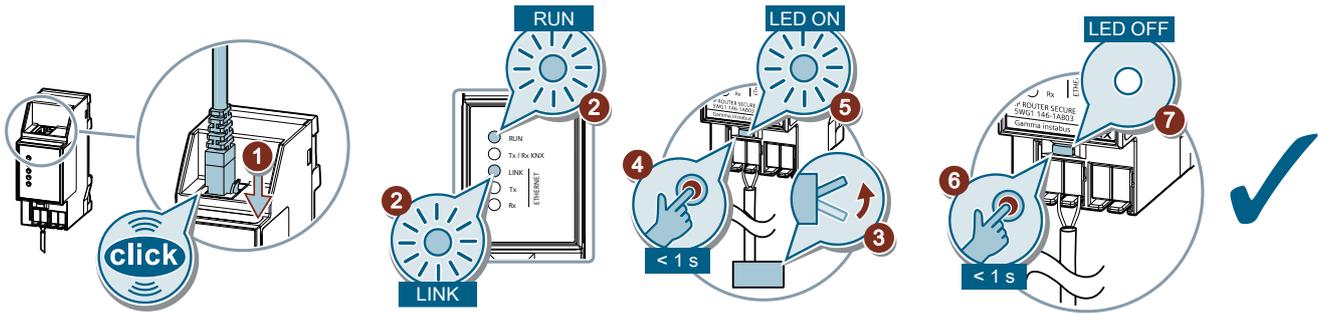
Checking the power supply via the terminal block (yellow and white)

Resetting the device to factory settings

!	NOTICE
	Loss of data due to resetting device!
	When you reset the device, all parameters and settings entered are deleted.
	• Ensure that the device is really supposed to be reset.

Resetting the device to factory settings

- Press the Learn button (at least 20 seconds) until the programming LED starts flashing quickly.
- ⇨ The programming LED flashes for 8 seconds.
- ⇨ The device has been reset to factory settings. All parameter settings have been deleted.

Disposal

	Defective devices can be returned to the appropriate sales office with a return delivery note. To do this, contact support: Product documentation and support [➜ 10]

	The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage. • Dispose of the device through channels provided for this purpose. • Comply with all local and currently applicable laws and regulations.

Update

Do not interrupt power supply to the device while the data on the device is being updated!

Interfaces

Network communication	
Standard for interfaces	Ethernet
Internet protocols supported	ARP, ICMP, IGMP, TCP/IP, UDP/IP, DHCP, AutoIP
KNXnet/IP as per KNX system specification	Core v2, Routing, Tunneling v2, Device Management, IP Secure, Data Security

Power supply

Power supply	
KNX bus voltage	DC 24 V (DC 21…30 V)
KNX power consumption	4 mA
Auxiliary power supply	From "Power over Ethernet" DC 48 V (as per IEEE 802.3af) max. 1.7 W Alternatively, from external operating voltage AC/DC 24 V (AC 16. 24 V, DC 16…30 V) max. 1.7 W (57 mA at DC 24 V)
Recommended power supplies	Unchoked voltage from KNX power supplies N 125
Power loss (internal consumption)	1.7 W

Physical specifications

Physical specifications	
Housing material	Plastic
Dimensions	Dimensions [➜ 18]
Weight (device)	approx. 100 g
Fire load	3 MJ

Ambient conditions

| Ambient conditions	
Ambient temperature during operation minimum	-5 °C
Ambient temperature during operation maximum	+45 °C
Storage temperature minimum	-25 °C
Storage temperature maximum	+70 °C
Transport temperature minimum	-25 °C
Transport temperature maximum	+70 °C
Relative humidity (non-condensing) minimum	5 % r.h.
Relative humidity (non-condensing) maximum	90 % r.h.
Climatic resistance	EN 60721-3-3 class 3k5

Protection settings

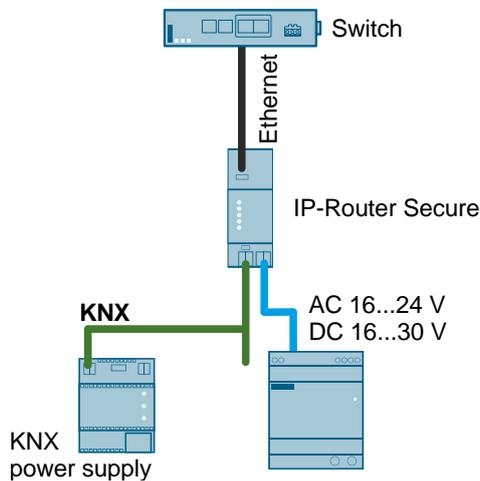| Protection settings	
Degree of pollution (according to IEC 60664-1)	2
Overvoltage category (according to IEC 60664-1)	III
Protection type IP	IP20
Electrical safety, bus	Safety extra low voltage
Standard for which the device meets the requirements (electrical safety)	EN 50491-3:2010
Standard for which the device meets the requirements (EMV)	EN 50491-5-1 EN 50491-5-2 EN 50491-5-3 EN 61000-6-1 EN 61000-6-2 EN 61000-6-3

Reliability

Reliability	
Failure rate (at 40°C)	489 fit

Power Supply Power over Ethernet

PoE switch

IEEE 802.3af

Ethernet

IP-Router Secure

KNX
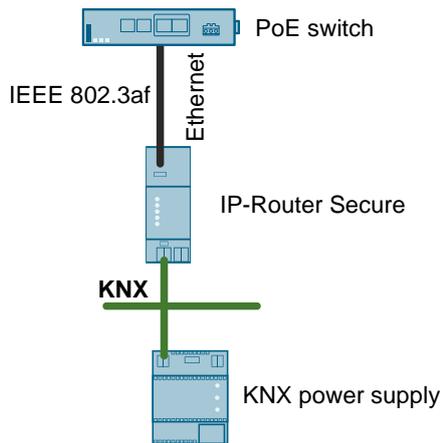
KNX power supply

Example: Power supply via Power over Ethernet (PoE)

Connection with separate power supply

Switch

Ethernet

IP-Router Secure

AC 16...24 V
DC 16...30 V

KNX

KNX
power supply

Example with separate power supply

Power supply via KNX

Switch

Ethernet

IP-Router Secure

KNX

DC 29 V
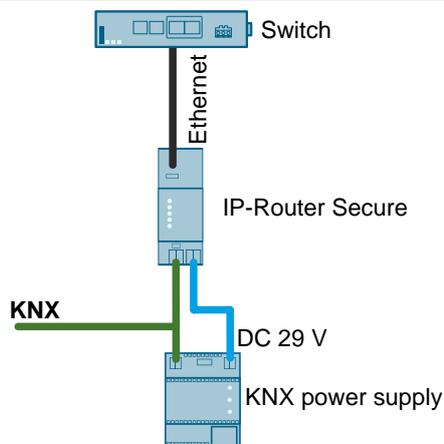
KNX power supply

Example with unchoked bus power supply

55 mm
[2.17 in]

44 mm
[1.73 in]

90 mm
[3.54 in]

36 mm
[1.42 in]

2 HP

61 mm
[2.40 in]
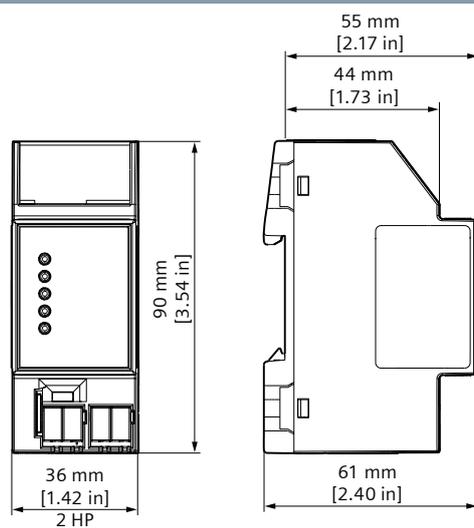
Dimensions

HP Horizontal pitch

1 HP = 18 mm