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Gateway configuration manual DMX - KNX TP EK-BK1-TP

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Scope of the document

This document describes the gateway (protocol converter) DMX – KNX TP. The gateway finds its ideal application in the integration of DMX devices over a RS485 serial network in a KNX-based automation system for homes and buildings. This product belongs to a broad line of ekinex® gateways designed to meet the needs for integration of the building automation most widely used protocols, based on serial, Ethernet or proprietary infrastructures. For further informations about the available technical solutions, please visit www.ekinex.com.

1 Product description

The DMX ekinex® EK-BK1-TP gateway è un apparecchio KNX modulare per montaggio a quadro. is a KNX modular unit for panel mounting. It allows you to exchange informations with one or more slave devices over a RS485 differential serial network through DMX protocol. The ekinex gateway acts as DMX master. The informations exchanged over the DMX network are updated over the KNX network by means of a twisted pair (TP) communication cable.

The device manages a one-way data stream: up to 12 bytes of KNX data are defined, each one associated with a device over the DMX network. The gateway converts the data coming from KNX master and writes its value on the corresponding DMX device.

Configuration is performed through a PC application software which communicates through the integrated Ethernet port. The application software CGEKBK1TP is available for download at www.ekinex.com.

1.1 Main functions

The gateway acts as a unidirectional protocol converter: the KNX master writes up to 512 bytes on as many DMX devices.

KNX side: up to 512 1-byte communication objects are defined. Each object is converted by the gateway to a value between 0 and 256, which is sent to the corresponding DMX device.

1.2 Technical data

Characteristic	Value
Power supply	8...24 Vac 12...35 Vdc
Power Absorption	At 24 Vdc: 3,5 VA
Application area	dry indoor environment
Environmental conditions	<ul style="list-style-type: none"> • Operating temperature: - 40 ... + 85°C • Stock temperature: - 25 ... + 55°C • Transportation temperature: - 25 ... + 70°C • Relative humidity: 93% non-condensing
Programming elements	1 pushbutton and 1 LED (red) on the front
Display elements	4 status LEDs + 1 Ethernet connector LED
Configuration elements	2 1-way microswitches <ul style="list-style-type: none"> • Microswitch A: OFF normal mode; ON Boot mode • Microswitch B: OFF terminaton resistance not inserted; ON termination resistance (120 Ω) inserted between RT+ ad RT- on the RS485 port.
Safety class	II
Installation	35 mm DIN rail (according to EN 60529)
Protection degree	IP20
Dimensions (WxHxD)	82 x 75 x 35 mm
Ethernet interface (IEEE 802.3)	
Connector	RJ45, minimum cable category: 5E
DMX interface	
Communication port	RS485, electrically isolated from power supply and KNX communication port
Baud rate	250 kbaud
KNX TP interface	
Communication port	KNX TP (twisted pair), 9600 baud, electrically isolated from power supply and RS485 communication port
Power supply	SELV 30 Vdc through bus KNX
Current absorption from bus	< 13 mA

1.3 Supply

The supply includes the device and terminal blocks to connect to the KNX bus. An instruction sheet is also supplied within the package.

1.4 System requirements for configuration software

Configuration and commissioning of the ekinex® gateway must be performed using the application program CGEKBK1TP, available for download at www.ekinex.com.

The PC where the application program is installed must meet the following requirements:

- Desktop o laptop PC with Ethernet IEEE 802.3 port.
- 32/64 bit operating system, Microsoft Windows® XP, 7, 8.0, 8.1 e 10.



.NET Framework 4.0 system library installation is required.

1.5 Certifications

Compliance with the European directives is certified by the CE symbol on the product label and on the documentation.

2 Switching, display and connection elements

The device is equipped with a pushbutton and a KNX programming LED, with a status LED and terminal blocks for KNX and RS485 network connection. A port for RJ45 connector for device configuration via Ethernet as well as two 1-way microswitches are also present.

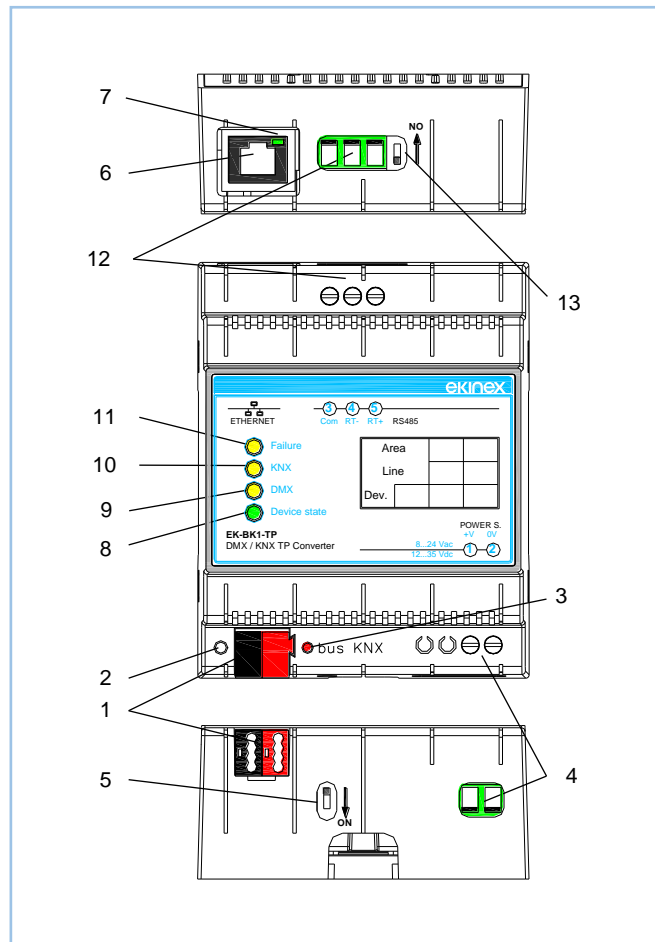


Figure 1 - Switching, display and connection elements

- | | |
|-----|-----------------------------------|
| 1) | KNX bus line terminal blocks |
| 2) | KNX programming pushbutton |
| 3) | KNX programming LED |
| 4) | Power supply terminal blocks |
| 5) | 1-way microswitch A |
| 6) | Ethernet port |
| 7) | Ethernet port LED |
| 8) | Device status LED |
| 9) | DMX communication LED |
| 10) | KNX communication LED |
| 11) | Device error LED |
| 12) | RS485 serial line terminal blocks |
| 13) | 1-way microswitch B |

Command elements

- Pushbutton that switches between normal mode and KNX physical address programming.

1-way microswitches

- A - OFF: normal mode active. ON: Boot mode active
- B - OFF: open. ON: RS485 line termination inserted (120 Ω termination resistance in parallel between RT+ and RT-)

Display elements

The device can run according to two operating modes: Normal mode (configuration loaded, DMX and KNX communication running) and Boot mode (no configuration or still loading configuration).

LED	Normal mode	Boot mode
Green LED (8) – Device status	Slow blinking (~1 Hz)	ON: device on OFF: device off
Yellow LED (9) – Modbus communication	Blinks when a frame is received on the RS485 port.	Fast blinking: no configuration Very slow blinking (~0,5 Hz): loading configuration.
Yellow LED (10) – KNX communication	Blinks when a frame is received.	Fast blinking: no configuration Very slow blinking (~0,5 Hz): loading configuration.
Yellow LED (11) – Device error	ON: at least one DMX request did not get a correct answer OFF: no error	Fast blinking: no configuration Very slow blinking (~0,5 Hz): loading configuration.
Green LED (7) – Ethernet port	ON: Ethernet connector plugged OFF: Ethernet connector unplugged	ON: Ethernet connector plugged OFF: Ethernet connector unplugged
Red LED (3) – KNX programming	ON: physical address programming mode on OFF: physical address programming mode off	Fast blinking: no configuration Very slow blinking (~0,5 Hz): loading configuration.



In the current version of the device, both KNX physical address programming and configuration download must be performed through the configuration program: for KNX physical address please refer to “Communication parameters” paragraph, “ID Device” parameter.

3 Configuration and commissioning

The device configuration requires the following tools:

- The documentation of the DMX products
- CGEKBK1TP application software to properly configure the gateway
- Knowledge of the ETS automation project, with particular attention to communication objects and group addresses passing on the bus during the multicast communication between sensors and actuators.



Configuration and commissioning of the ekinex® gateway require specialized skills about KNX networks and knowledge of the specific ETS automation project. In order to acquire such skills, it is essential to attend trainings and workshops organized at KNX-certified training centers. For further information: www.knx.it.

4 DMX protocol general informations

DMX512, also known as DMX (Digital Multiplex), is a digital communication standard used primarily to control lighting in the entertainment business. It is typically implemented in a unidirectional way and it is based on RS-485 physical protocol.

The protocol is essentially composed of a unidirectional serial string generated by a master device (in this case the ekinex gateway, which interprets and converts the incoming information from a KNX master), whose information can control up to 512 remote units (slaves) connected in cascade. Each remote unit is controlled by a data composed of eight bits (one byte), which contains the information that allows to obtain 256 possible levels.

The transmission is asynchronous. Each bit sent over the network has a duration of 4 microseconds: the transmission speed is then 250 Kbps.

The transmission starts with a BREAK, a string composed of a minimum of 22 bits at a low level, for a total duration of 88 microseconds. The duration of the BREAK can also be slightly higher: the protocol provides for a maximum duration of one second (though, especially if you send all 512 control bytes, it is recommended that the BREAK does not exceed 120 microseconds). Then the protocol sends a MAB (Mark After Break), composed of two high bits, for a total time of 8 microseconds.

At this point of the protocol is ready to send the first frame (data 0) that is used as a Start Code (SC) and whose value is also zero. Each frame consists of a start bit (low level), data (CD, Channel Data by 8 bits, or one byte) and two stop bit (high level).

The frame 0 contains no information, while the following 512 frames contain, in order, the levels which will be assigned to the controlled devices, from 1 to 512. Between consecutive frames a MTBF (Mark Time Between Frames) can be inserted, whose value must be between 0 and 1 second. Once the transmission of the data packet is done, a MTBP (Mark Time Between Packets) may be provided, whose value must be between 0 and 1 second.

All receivers (slaves) are identified by a specific code between 1 and 512 set by a microswitch; each device has also a counter synchronized with the DMX512 Start Code string. When the counter identifies the frame corresponding to the code set, the data is stored inside the receiver and used to drive the slave. In a dimmable lamp, for example, if the byte contains the data 127 the lamp will light up to 50%, if 255 the lamp will be fully illuminated whilst if 0 the lamp will be switched off completely.

5 Configuration software

The ekinex® configuration software CG-EK-BK1-TP allows you to perform the following operations:

- Selection of physical address of the device over the KNX TP network;
- Selection of Ethernet parameters (for configuration download only);
- KNX network: communication objects definition and relative group addresses to be acquired;
- KNX network: communication objects definition and relative group addresses to be sent over the KNX network;
- DMX network: default values definition;
- Firmware and/or configuration update.

The application program consists in multiple modal windows called “forms”: each form must be closed before accessing the following form. The buttons on the main form (see Figure 2 – Main form of the application program) are ordered according to the proper sequence to follow in order to perform a correct configuration.

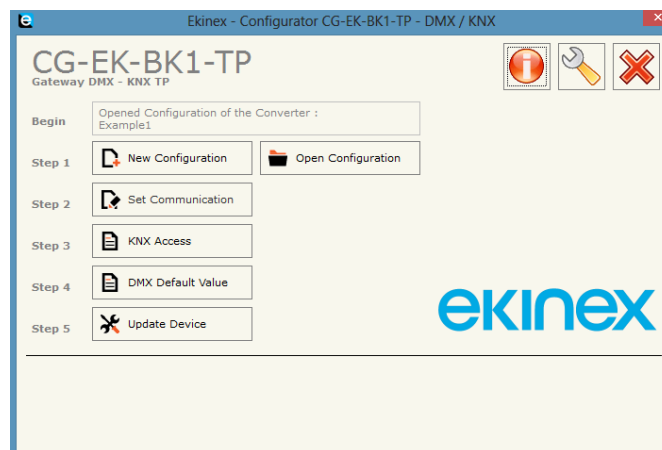


Figure 2 – Main form of the application program

Starting from the main form, by accessing the *About...* window, you can check the current version of the installed program.

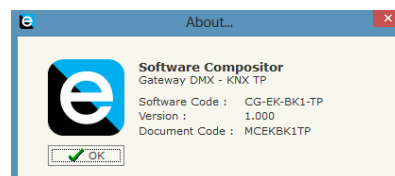


Figure 3 – About form



Please visit the section about communication gateways on www.ekinex.com in order to check the current version of the application program and download the latest version.

5.1 Creating a new project or modifying a saved project

The application program allows you to create a new configuration or open an existing one using the buttons called *New Configuration* and *Open Configuration* (see Figure 2 – Main form of the application program): the configuration files are stored on the hard drive in XML format.

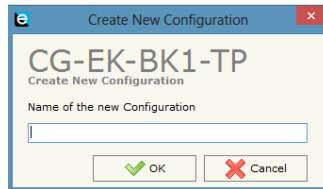


Figure 4 – Create new configuration form

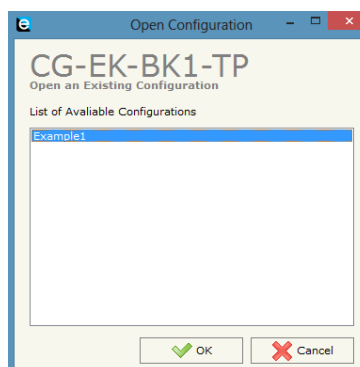


Figure 5 – Open configuration form

In order to duplicate an existing project, you must find the project folder containing the XML files and copy them in a new folder. Project files can be found by the following path:

i

“C:\Program Files(x86)\Ekinex\Compositor_CG-EK-BK1-TP\Projects”.

Once the project has been duplicated, simply restart the application program and open the form *Open configuration* (see Figure 6 - Open configuration form): you will see the name of the duplicated project in the list of available configurations.

5.2 Software Options

The *Software Options* form allows you to select a different language for the application program.

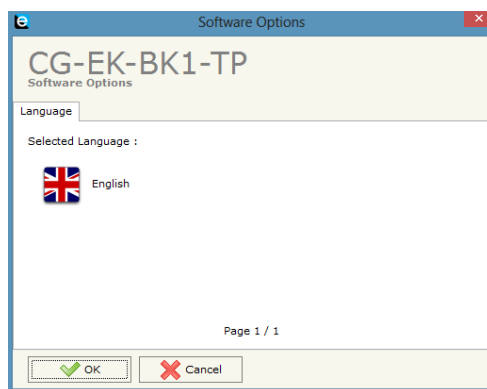


Figure 6 – Options form, Language tab

5.3 Communication parameters

In this section we define the basic communication parameters for the KNX TP network, for the DMX network and for Ethernet connection. Ethernet connection is required in order to perform the configuration update on the device.

Figure 8 – Set communication form

You can access the form by pressing the *Set Communication* button in the main form (see Figure 2 – Main form of the application program).

Description of fields in *Set communication* form.

Parameter name	Values	Description
KNX		
Type	KNX TP	Type of connection used for KNX communication. The parameter has a constant value "KNX TP". The device supports KNX communication over a twisted pair communication cable.
ID Device		This parameter identifies the physical address assigned to the KNX device. The format requires the use of a dot "." as a separator between the 3 fields: area, line and device address. Here are the conventions used for physical addressing and the values used for each field: Area field: = 0 reserved for backbone, values [1...15] Line field: = 0 reserved for main line, values [1...15] Device address field: = 0 reserved for coupler, values [1...255], range [1..64] for devices belonging to the line, above 64 for device belonging to extensions or other segments of the line. Example: 1.3.5: Area = 1; Line = 3; Device address = 5.
DMX		
Channel number		Number of devices configured over the DMX network (up to 512)
Ethernet		
IP ADDRESS		IP Address (4-octet format) assigned to the device. Each octet is set in an Edit box. Default IP Address is: 192.168.2.205 . This is the address assigned to the device before the first configuration or after a complete restore.
SUBNET Mask		Subnet mask assigned to the device.
GATEWAY		Gateway address used for Ethernet communication. The gateway can be enabled or disabled through the control check-box placed at the right side of the field.



Please refer to the technical documentation of the slave device in order to set the correct parameters of the serial communication. Incompatible values of these parameters may prevent the correct exchange of frames.

5.4 KNX communication object configuration

In this section we define communication objects sent or acquired over the KNX network. You can access the form by pressing the *KNX Access* button in the main form (see Figure 2 – Application program main form).

#	Enable	Source Add	Dest/Group	Priority	Format	Extended	ReTest	OnTimer	Poll Time	Position	Bit Mode	Length	Mnemonic
1	<input checked="" type="checkbox"/>	2.4.8	31/7/255	Normal	None	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1000	0	No	2	
2	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
3	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
4	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
7	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
8	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
9	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Figure 9 – KNX Set Access form

The form contains a configurable grid. Each record allows you to assign the properties for each communication object exchanged over the KNX network. In order to make the management of a significant number of data easier, after selecting a record it is possible to delete it from the project, insert a new record in a specific position and perform copy/paste of a previously configured record.

Description of fields in *KNX Set Access* form

Field name	Values	Description
N		Progressive number of the configuration record
Enable	checked / unchecked	Configuration record enabling. If a record is disabled, the corresponding data points will not be acquired or changed over the KNX bus
Source Address		Through this field you can acquire datapoints of all lines over the KNX bus (0.0.0 value) or you can select one specific line (e.g. 4.3.0) or a single device identified by a specific physical address (e.g. 4.3.1).
Dest/Group		A Group Address (2-level, 3-level or free structure) or a Physical Address can be set. In case of a group address the fields must be separated through a “/”, while in case of physical address the separator will be a “.”.
Priority	System/ Urgent / Normal / Low	KNX frames priority. In multicast communication (exchange of frames from/to group addresses), the default priority is Low.
Format	None / Swap16 / Swap32 / Swap All / Int to Float / Float to Int / Float 16 to Float 32	Since only 1-byte values can be exchanged, the only admissible value is <i>none</i> .
Extended	checked / unchecked	Enables extended frame format for KNX communication (cEMI = Common Extended Message Interface)
ReTest	checked / unchecked	Enables the re-send of a frame in case of wrong response message
OnTimer	checked / unchecked	Event which enables the cyclical sending of command frames over the KNX bus.
Poll Time		Cyclic poll time (in ms) when OnTimer event is enabled.
Position	Value in range [0...1439]	Posizione del primo byte nel buffer di memoria interna di appoggio in cui viene memorizzato un dato.
Bit Mode	No / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7	Position, inside the first byte of the internal support memory buffer, where a 1-bit data is stored.
Length		Size (in number of bytes) of the data stored inside the internal memory.
Mnemonic		Text to comment the record and/or the datapoint over the KNX bus.

5.5 DMX default value configuration

In this section we define the default values associated with the DMX devices. The default value is the value acquired by the channels associated to the DMX devices when the ekinex gateway is powered up.

Channel	Default Value	Mnemonic
1	0	
2	0	
3	0	
4	0	
5	0	
6	0	
7	0	
8	0	
9	0	

Figura 10 - Form DMX Default Value

Description of fields in *DMX Default Value* form

Field name	Values	Description
Channel		Device identification number
Default value		Default (power up) value
Mnemonic		Text to comment the register read over the DMX network.

5.6 Configuration update

The implemented configuration and possibly the updated firmware can be downloaded by pressing the *Update Device* button in the main form of the application program (see Figure 2 – Main form of the application program).

There can be 2 possible update sequences, the first in case the IP address assigned to the device is unknown, the second in case the IP address is known.

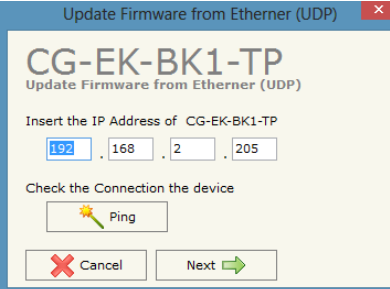


Figure 12 - Update configuration form

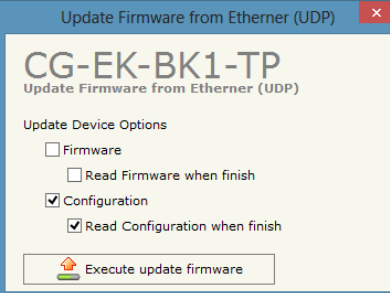


Figure 13 - Download options form

Sequence to follow in case of unassigned or unknown IP address:

- Power off the device
- Set the 1-way microswitch A (see Figure 1 – Switching, display and connection elements) to ON position
- Power on the device
- Connect PC and device by means of an Ethernet cable. Make sure that the PC's network parameters are consistent with the IP address assigned to the device in Boot Mode **192.168.2.205**. Otherwise, change the PC's network settings
- Write the IP address **192.168.2.205** inside the Update Configuration form (see Figure 12 – Update configuration form)
- Press *Ping* button; if you correctly applied the procedure, the text "*Device found!*" will appear
- Press *Next* button
- Select the desired options (see Figure 13 – Download options form): firmware update, configuration update or both
- Press *Execute update firmware* button
- When all operations are completed (see Figure 14 – Update in progress) shut down the device
- Set the 1-way microswitch A (see Figure 1 – Switching, display and connection elements) to OFF position
- Power on the device

If the sequence is successful, this means that firmware and/or configuration has been correctly downloaded on the device.

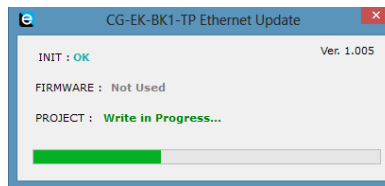


Figure 14 - Update in progress

Sequence to follow in case of known IP address:

- Power on the device with PC and device connected by means of an Ethernet cable
- Provide the device IP address (see Figure 12 – Update configuration form). Make sure that the PC's network parameters are consistent with the IP address assigned to the device. Otherwise, change the PC's network settings
- Press *Ping* button; if you correctly applied the procedure, the text "*Device found!*" will appear (see Figure 12 – Update configuration form)
- Press *Next* button (see Figure 12 – Update configuration form)
- Select the desired options (see Figure 13 – Download options form): firmware update, configuration update or both
- Press *Execute update firmware* button
- When all operations are completed (see Figure 14 – Update in progress) the device automatically switches back to Normal mode.

If the sequence is successful, this means that firmware and/or configuration has been correctly downloaded on the device.



It is recommended to update the firmware when a new version of the application program is installed or when configuring the device for the first time.

In case the update procedure goes into PROTECTION mode (see Figure 15 – Update error, "Protection" mode), you may want to check the following:

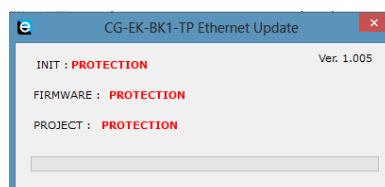


Figure 15 – Update error, "Protection" mode

- Repeat the update sequence
- Reboot your PC
- When running the program on a Virtual Machine, close it and rerun the program using the primary OS
- When using Windows 7 or later, make sure the user has administrator privileges
- Pay attention to firewall settings
- Check LAN configuration



In case of manual firmware update, replace “Sim67821.sim” file in the system folder “C:\Program Files (x86)\Ekinex\Compositor_CG-EK-BK1-TP\Master”. After replacing, open *Update configurazione* form (see Figure 12 – Update configuration form) in the application program and start the proper sequence.

6 Warning

- Installation, electrical connection, configuration and commissioning of the device can only be carried out by qualified personnel.
- Opening the housing of the device causes the immediate end of the warranty period.
- ekinex® KNX defective devices must be returned to the manufacturer at the following address:

SBS S.p.A. Via Circonvallazione s / n, I-28010 Miasino (NO) Italy.

7 Other information

- This application manual is aimed at installers, system integrators and planners
- For further information on the product, please contact the ekinex® technical support at the e-mail address: support@ekinex.com or visit the website www.ekinex.com
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