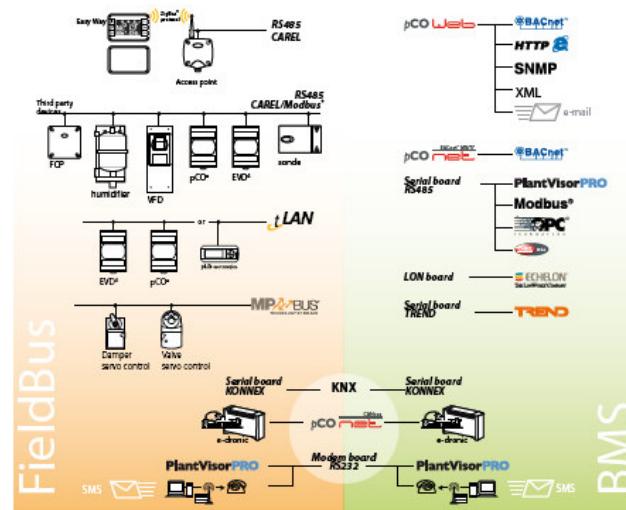# Konnex card

The Konnex technological standard (KNX) is now widely used in building automation and control for commercial and residential applications.

The **Konnex** card (KNX) expands the range of protocols supported by the pCO sistema family.

It has been developed in versions for the Field Bus and BMS ports, and is compatible with:

- FieldBus card: pCO3
- BMS card: pCOs, Supernode, e-drofan.

The Konnex technological standard is now widely used in building automation and control for commercial and residential applications.

The convergence of **EIB** with two other standards used on the European market, **BatiBus** and **EHS**, led to the establishment of the KNX protocol, based essentially on EIB.

The Konnex protocol is approved as:

- European standard: CENELEC EN 50090 and CEN EN 13321-1.
- International standard: ISO/IEC 14543-3
- Chinese standard: GB/Z 20965

The new KNX-EIB products, certified in accordance with the KNX standard, can be used to expand systems already developed with EIB marked products, guaranteeing the complete conformity of the EIB system with the new unified KNX standard.

Substantially, the operating principle of a Konnex network is very similar to LonWorks, however with some advantages:

- KNX is a free protocol and no royalties need to be paid to install the individual devices.
- It is more interoperable than LON as different types of variables can be connected together.

CAREL is member of the KNX Association (www.knx.org).

Market and advantages of Konnex

The market for CAREL products using the KNX protocol is aimed at all HVAC/R applications, usually home automation, residential and/or services, where compatibility is required with third parties devices (not necessarily HVAC/R units) that communicate with this protocol (lighting, electrical appliances, security,..).

The following should be highlighted in relation to Konnex:

Members and partners:

Manufacturers of electronic systems operating in these sectors:

- Home and building automation
- Electrical appliances
- Heating Ventilation Air-conditioning (HVAC)
- Safety and security

Providers

- Energy distributors (Utilities), Telecom providers, Facility management.
- Designers, Installers, and System integrators (EIB partners)
- Other partners: universities and research centres

Software: Just one software package, ETS, for the design, querying and configuration of all KNX products.

The ideal solution for home automation, KNX can be easily installed in:

- New homes and buildings: this is the current market.
- Existing homes and buildings: this represents a potentially interesting market for KNX.
- Historic buildings: new applications and functions can be installed using wireless communication

Home automation applications

Below is a list of the various components in a home automation application that the CAREL Konnex card can communicate with.
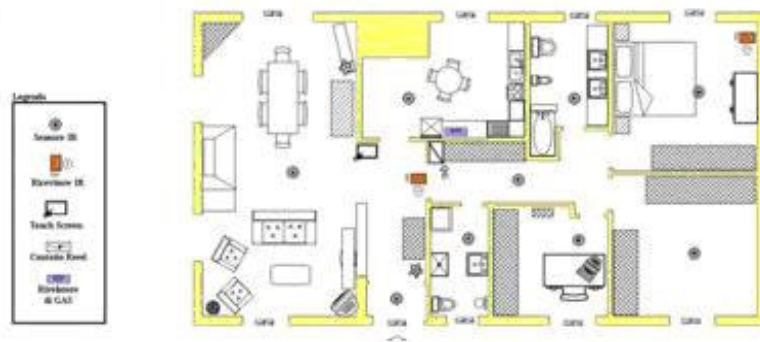
LIGHTING INSIDE THE HOME

- Control of all types of lights (incandescent, fluorescent, LED, halogen)
- Switching from one or more points
- Dimming with different functions
- General ON/OFF or in groups (e.g. general OFF for all lights in the hall)
- Panic button (in the bedroom)
- Timed ON/OFF (toilet light goes off after 5 minutes, occupancy simulation)
- ON/OFF using the occupancy detector (hall, stairs, cellar)
- Continuous brightness control (office)
- Scenarios (TV lighting, dinner lighting, programmable by the user)

LIGHTING OUTSIDE THE HOME

- Switching from inside the home (from various rooms)
- Switching from outside the home
- Lighting controlled by occupancy detector
- Lighting controlled by timer
- Lighting controlled by brightness sensor

ROLLING SHUTTERS, VENETIAN BLINDS, WINDOWS

- Control of Venetian blinds, rolling shutters, electric windows, ventilation louvers or other motor-driven components
- Switching from one or more points
- General control or in groups (general control in the hall for all rolling shutters)
- Brightness control (protection against heat, prevents discoloration of furnishings)
- Control based on temperature (sun and temperature above 25 degrees --> shutters closed)

- Control based on wind (Venetian blinds on terrace or balcony)
- Control based on rain (skylights closed)
- Control by timer (family away --> rolling shutters up and down at set times)
- Control of windows and Venetian blinds on conservatory
- Set Venetian blinds or rolling shutters in a defined position (not completely closed (dark) or open (too much light))
- Window status signals (open/closed, display, LED)
- Scenarios (...close rolling shutters in living room while watching TV)

HEATING, VENTILATION, AIR-CONDITIONING

- Control of radiators, underfloor / wall heating, cooling, fan coil units, electric heaters ...
- Temperature control in all rooms (change temperature, "save" energy)
- Control by timer (different temperatures at different times)
- Control by occupancy sensor (increase or decrease the temperature)
- Remote control (via telephone for holiday homes, Internet)
- Error signals (alarm via telephone)
- Room temperature reading (central LCD, TRITON display with control buttons)

SAFETY & SECURITY

- Control of windows, doors, (... magnetic contacts, glass break sensors, closing contacts on locks)
- Control of rooms with occupancy sensor
- Alarms with sirens and flashing lights
- Silent alarm via telephone (security service)
- Switching sensor in the event of attack (additional function on KNX)
- Smoke detector (children's rooms)
- Water detector (kitchen, bathroom), gas detector (cellar)
- Electronic lock next to door (set the alarm, activate various functions in KNX)

Features of the Konnex network

The following chapter describes the main characteristics of a Konnex network.

Setting the address

In the KNX/EIB system, two types of address can be distinguished:

- "physical" address
- "group" address

Physical address

Where multiple device are connected "in a network", as in the case of KNX/EIB, these need to be identified individually. For this reason, each KNX/EIB device receives, when setting up the installation, a so-called "physical address" that identifies it uniquely; two KNX/EIB devices in the same installation naturally cannot have the same physical address. The physical address is structured so as to reflect the position of a device: for example 1.5.10 refers to device 10, connected to line 5 in sector 1.
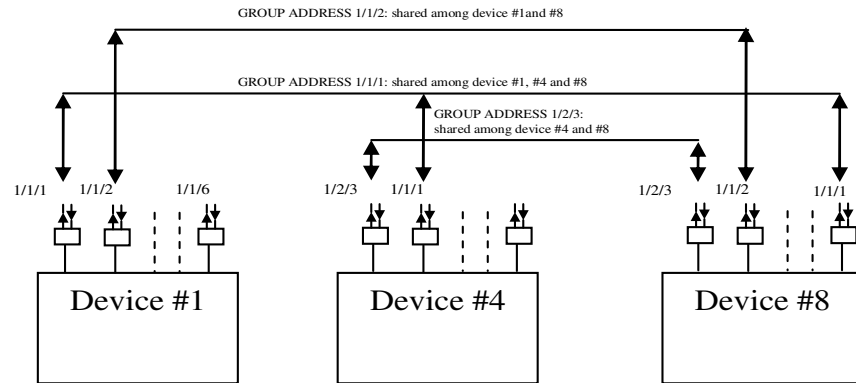
Physical address of the component
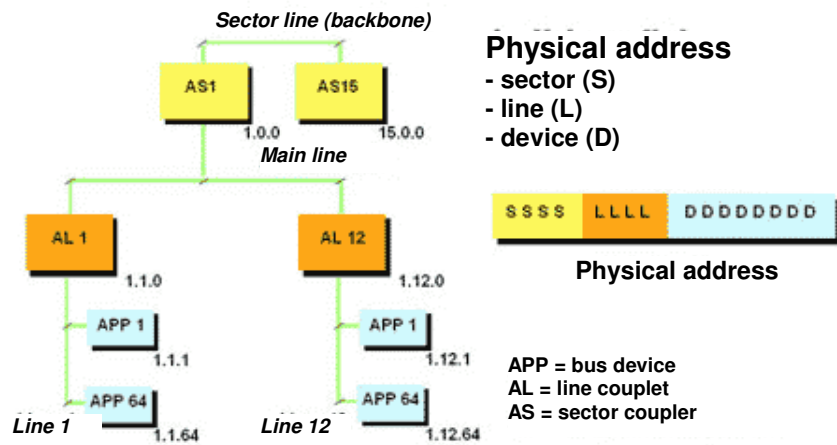
Group address

In the practical operation of the KNX/EIB system, often there is the need to send the same "telegram" to several devices at the same time. In this case, the "physical" address is not used, but rather the so-called "group address". The group address represents a logical address that does not reflect the position of the devices in the bus system, but rather their functions. In this sense, unlike the physical address, multiple bus devices can have the same group address and an individual bus device can be assigned different group addresses.

To "share" a set of variables between multiple devices, these must have the same group address and be the same type (bit, byte, word, etc.…).

GROUP ADDRESS 1/1/2: shared among device #1and #8

GROUP ADDRESS 1/1/1: shared among device #1, #4 and #8

GROUP ADDRESS 1/2/3: shared among device #4 and #8

DataPoint

In the Konnex standard, the information is transferred between devices via data structures called "datapoints"; the term "datapoint" can be considered a synonym of shared variable. The connection is created by assigning the "group address" to each datapoint, independently of the device address.

Configuration procedures

There are three ways to configure Konnex devices:

- "S-mode" (System mode), suitable for systems integrators, complex functions available using a software package (ETS)
- "E-mode" (Easy mode) that allows installers to rapidly configure the installation, while having more limited functions.
- "A-mode" (Automatic mode) designed for end users and for the Plug & Play configuration of consumer devices.

The Carel Konnex card supports TP1 9.6 kbit/s System mode, with cyclical transmission at fixed intervals (2 sec).

System mode in fact creates "free binding" between the variables on the various devices.

Multicast data transmission is used: the node that has a certain output datapoint (transmission) sends the network a package that will be received at the same time by all the devices with an input datapoint (reception) of the same type, with the same group address as the sender.

Transmission media

The KNX standard offers the following transmission media:

- Twisted pair, type 0 and 1
- Powerline at 110 KHz and 132 KHz
- Radio frequency at 868 MHz

Distance

Each line can reach 1,000 m, including all the branches; two KNX/EIB devices connected to the same line can be installed a maximum distance of 700 m apart, while each device must not be more than 350 m from the line power supply.
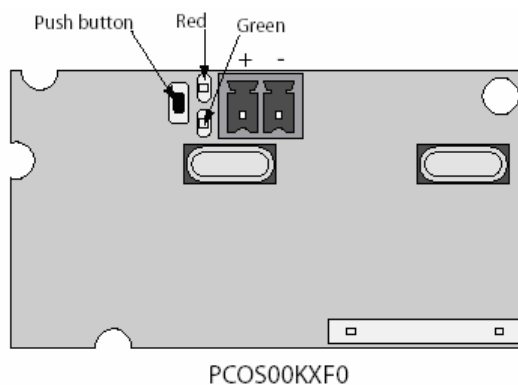
CAREL system components

For connection and compatibility with KNX/EIB standard devices, CAREL has developed a series of essential components:

- Konnex card.
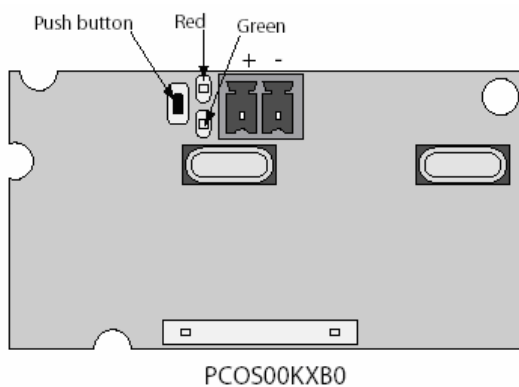- K-Set configuration tool.
- Plug-in for commissioning in ETS3.

Konnex card

The following figure illustrates the 2 versions of the KNX/EIB plug-in card:

- Field Bus (pCO3)

PCOS00KXF0

BMS (pCO3/pCO1/pCOXS/pCOC/Supernode/e-drofan)

PCOS00KXB0

The card features:

- a 2-pin connector for the Konnex network
- 2 LEDs for signals and alarms
- Button for setting the address/reset

K-Set

The K-Set configuration tool (available for download from ksa.carel.com) is required to create the cross-reference table (XML file) between the Modbus variables managed by pCO/e-drofan and the Konnex variables.

This table will be loaded onto the card by the ETS3 tool.

Comparing with the LonWorks systems, it is like creating the NXE & XIF files with LONSet and then downloading the NXE file to the card using LONMaker.

Protocol	Konnex	LonWorks
Cross-reference table	.XML	.NXE
Table creation tool	K-Set	LonSet
Table download tool	ETS3	LONMaker

	Group	Name	Datapoint type	IN/OUT	Index	COIL/REG	Conversion Rule	Conversion Value
	1/1/30	Switch	Boolean	OUT	1	Coil	None	
	1/1/31	Switch	Boolean	IN	2	Coil	None	
	1/1/32	Switch	Boolean	OUT	3	Coil	None	
	1/1/33	Switch	Boolean	IN	4	Coil	None	
	1/1/25	Switch	Boolean	OUT	5	Coil	None	
	1/1/26	Switch	Boolean	IN	6	Register	None	
>	1/1/1	TemperatureCelsius	Float 16 bit	OUT	8	Register	Multiply	10
	1/1/6	Switch	Boolean	IN	6	Coil	None	
	1/1/123	Switch	Boolean	OUT	10	Register	None	
	1/1/130	Switch	Boolean	OUT	123	Coil	None	
*	2/1/11	Switch	Boolean	OUT	11	Coil	None	

ETS3

The ETS® program is the software used to design and setup a KNX system. ETS® is software that is independent of the individual manufacturers and is marketed by the Konnex Association (www.konnex.org). With ETS®, just one software tool can be used to design, setup and troubleshoot KNX systems made up devices produced by the various manufacturers who use KONNEX.
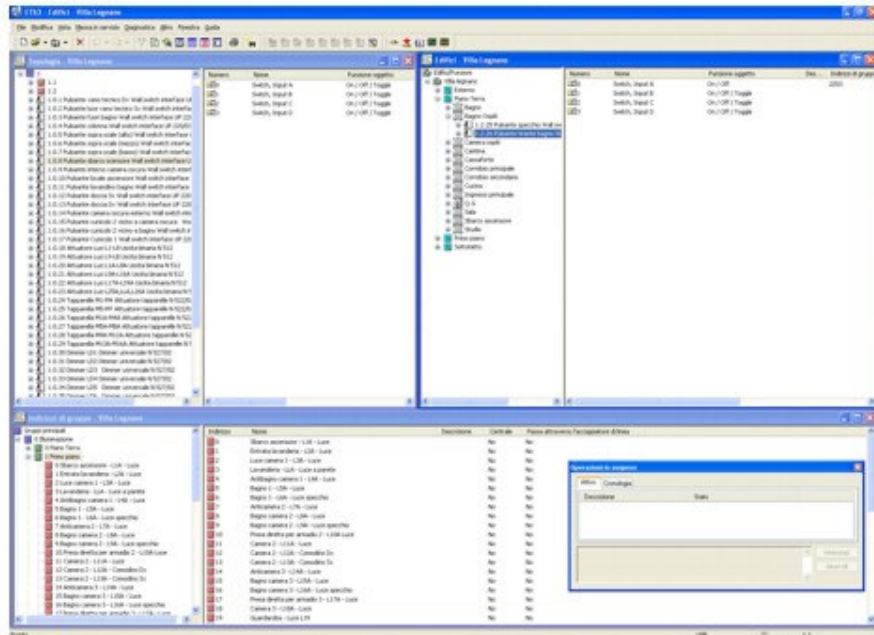
As for the devices made by other manufacturers, the ETS3 data file needs to be loaded with a specific description of the device.

Carel distributes a plug-in in the form of "**project database**", **Carel_plugin_20.pr4** (available for download from ksa.carel.com), which can be used to assign the address and download the table created with K-Set (.XML) to the Konnex card.