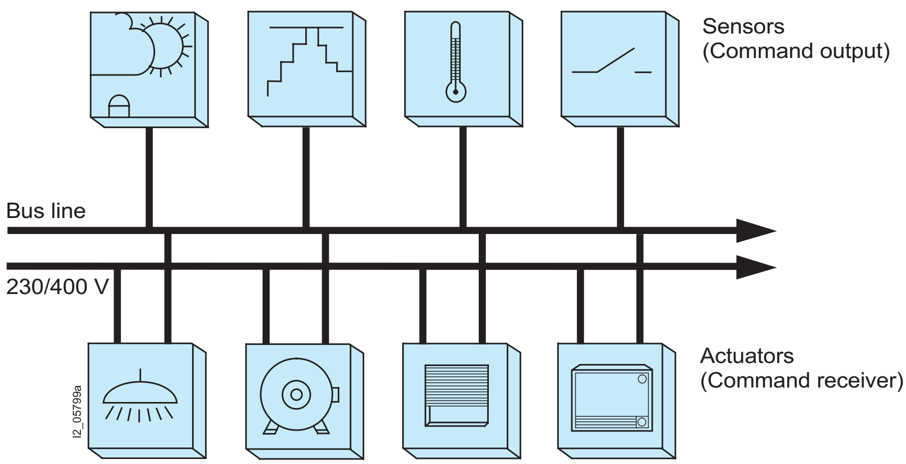
Overview

Controlling, monitoring and signaling



General

Higher demands on flexibility and operational ease of electrical installations, combined with the wish for the maximum possible reduction in energy requirements, have led to the development of building control systems. The bus technology implemented in these systems is based on a common European concept, the European Installation Bus (EIB). A large number of manufacturers have joined together to form the European Installation Bus Association (EIBA).

One of the tasks of the member companies of the EIBA is to ensure the availability of bus-compatible products. This makes it possible to use devices made by different manufacturers in one and the same EIB plant.

The wish for greater operational ease and enhanced technical versatility entails increasingly complex electrical installations. Conventional electrical installations are simply no longer up to this task. With *instabus EIB* these comprehensive requirements can be satisfied both economically and transparently.

System advantages

In conventional electrical installations, each function requires its own cable and each control system its own separate power supply. With *instabus EIB*, however, all operating functions and procedures can be controlled, monitored and signaled over a single common cable. This means that power can be supplied to the loads without the need for any diversions.

As well as a reduction in the amount of cables and wiring required, this also gives rise to other advantages: initial installation in a building is considerably simpler and any subsequent extensions or modifications are also easy to implement. The *instabus EIB* systems can be quickly and easily adapted for new applications or new room layouts by simply reassigning (re-parameterizing) the bus devices - no rewiring is required.

This reparameterization process is carried out, e.g. using a PC connected to the *instabus EIB* system. The configuration and commissioning software ETS (**E**IB **T**ool **S**oftware) needs to be installed on the PC as it is needed during commissioning of the system.

With the corresponding interface, *instabus EIB* can also be connected to the control centers of other building management and automation systems (e.g. SICLIMAT X) or to a public telephone network (e.g. ISDN). This means that *instabus EIB* is as economic to use in private homes as it is in public buildings, such as hotels, schools, banks, office blocks or complex commercial buildings.

Transmission technology

instabus EIB is a distributed, event-controlled bus system with serial data transmission for controlling, monitoring and signaling the functions of building control systems.

All connected bus devices can exchange information with each other over a shared transmission route. Data transmission is serial and according to precisely defined rules (bus protocols). This involves packing the information to be transmitted in a telegram and transferring it over the bus from one sensor (command output) to one or more actuators (command receivers).

Each receiver acknowledges receipt of the telegram if data transmission was successful. If the telegram is not acknowledged, data transmission is repeated up to three times.
If the telegram is still not acknowledged, data transfer is aborted and the error is flagged in the transmitter memory.

Data transmission using *instabus EIB* is not electrically isolated as the power supply (24 V DC) for bus devices is transmitted along the same bus cable. The telegrams are modulated for this direct voltage, whereby a logical "0" is transmitted as a pulse. If a pulse is not received, this is interpreted as a logical "1".

The individual data of the telegrams are transmitted asynchronously. However, start and stop bits ensure that transmission is synchronized.

Access to the bus as a shared physical communications medium for asynchronous transmission must be uniquely defined. For this purpose, *instabus EIB* uses the CSMA/CA procedure. The CSMA/CA procedure is a procedure that ensures random, collision-free bus access without restricting bus data throughput.

All devices can listen to the network, but only the actuators actually addressed respond.
A device must first listen to the bus and can only transmit when it is free, i.e. no other devices are transmitting (**C**arrier **S**ense).
If the bus is free, basically any device can begin transmission (**M**ultiple **A**ccess).

If two devices begin to transmit simultaneously, the device that has higher priority takes precedence (**C**ollision **A**voidance), while the other device holds back and restarts transmission at a later time.
If both devices have the same priority, the device with the smaller physical address takes precedence.

General data

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Addressing

Every letter requires an address before it can be delivered by mail. Bus devices are addressed in a similar way, whereby in this case, the mail method is not suitable.

During configuration using ETS, each bus device is assigned its own physical address, which uniquely identifies it, much the same way in which a postal address uniquely defines the recipient of the letter. However, the physical address must be specified in the correct bus language and is oriented on the topological structure of the *instabus* EIB system.

The physical addressing is used by the ETS solely for commissioning the individual bus devices or for service and diagnostic tasks. In this case, the devices are addressed in a similar way to standard mail delivery.

However, when the *instabus* EIB systems is in normal service, the logical or so-called group address is used for telegram communication. This is not oriented on the bus topology, but on the operational functions (applications) of the *instabus* EIB system.

In contrast to mail delivery, where the post office takes a letter to the address specified on the letter, the configured group address is entered by the transmitter in each telegram. Each device listens to this telegram on the bus, reads the specified group address and checks whether it corresponds to its own address or not.

During configuration of the *instabus* EIB system with ETS, each bus device is told the group address to which it must respond.
Thus, in contrast to conventional mail delivery, several group addresses can be assigned to a single bus device.

When a bus device listens to a telegram on the bus, it reads the group address, checks whether the address corresponds or not and accepts it if appropriate (and if transmission was successful). If the address of the telegram does not correspond, the bus device rejects it.

Topology

Up to 64 bus-enabled devices (nodes) can be connected to the smallest unit (a line) of the *instabus* EIB system and operated. Using line couplers, which are connected to the so-called main cable, up to 15 lines can be joined together to form an area.

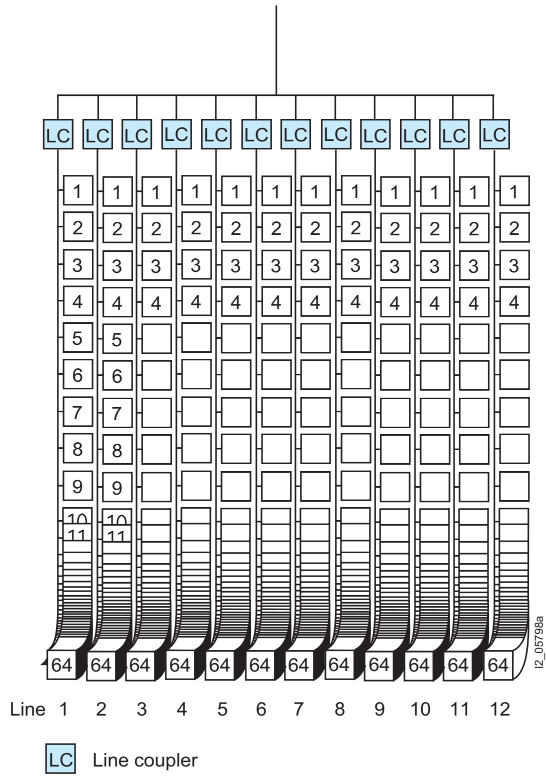
Backbone couplers, which are connected to the so-called backbone line, can connect up to 15 areas to form a single larger unit.
The interfaces (gateways) to external systems (SICLIMAT X, ISDN etc.), or to additional EIB systems, are connected to the backbone line.

Even though over 12,000 devices joined together in a single unit, the clear logic of the system is retained. During operation, there is no information chaos at all as telegrams only cross the interfaces to other lines and functional areas when devices there are addressed over a group address. In this case, the line/backbone couplers provide the necessary filter function.

The physical address is oriented on this topological structure: each device can be uniquely identified by its area, line and device number. For the assignment of the devices to the operational functions, the group addresses are divided into main groups and subgroups.

During configuration, the group addresses for different management functions can be divided into up to 14 main groups, e.g. for
- Lighting control
- Shutter/blind control
- Room control for heating, ventilation and air-conditioning.

Each main group can contain up to 2048 subgroups, depending on user requirements. The group addresses are assigned to the devices irrespective of the physical address. This means that each device can communicate with any other device.



Overview

Technology

Each line requires its own power supply unit for the devices. This ensures that even if there is a line failure, the rest of the *instabus* EIB system can still function.

The power supply unit provides the individual devices of the line with SELV (safety extra-low voltage) 24 V DC and can handle either 320 mA or 640 mA, depending on the individual design. It has power and current limiters and is therefore short-circuit resistant. Brief interruptions to the power are buffered by a 100 ms buffer period.

The bus load depends on the type of devices connected. The devices are ready for operation as long as a minimum of 21 V DC is available and they typically draw 150 mW, or up to 200 mW if additional power is required in terminal units (e.g. LEDs). If more than 30 devices are installed over short cable distances (e.g. in the distribution board), the power supply must be installed in close proximity.

A maximum of two power supply units are permissible on one line. There must be a minimum distance of 200 m (cable length) between the two power supply units.

If more power is required, two power supply units can also be connected to the *instabus* EIB in parallel over a shared choke. This increases the permissible current load of the line to 500 mA.

The cable length of a line, including all junctions, must not exceed 1000 m. The distance between a power supply unit and a device must not exceed 350 m. In order to completely preclude the possibility of telegrams colliding, the distance between two devices must not exceed a maximum of 700 m.

The bus cable can be installed parallel to the mains cable. It can have both loops and branches. A cable terminating resistor is not necessary.

The devices are connected to the bus either over pressure contacts or over bus terminals. To connect using pressure contacts, simply snap the devices to be installed on the DIN EN 50 022-35 mm × 7.5 mm mounting rail with integrated data rail. The transition from the data rail to the bus cable is made through a connector. The devices, which may be designed for surface or flush mounting, wall or ceiling mounting and box-mounting, are connected to the bus cable over bus terminal.

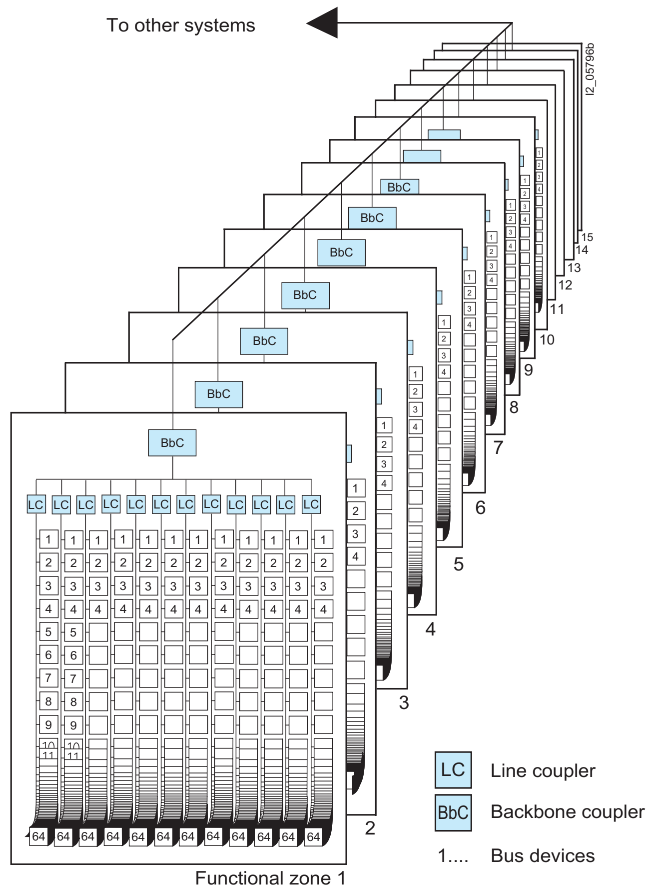
Bus devices

Each device basically comprises a universal **B**us **C**oupling Unit (BCU) and a task-specific **A**pplication **U**nit (AU), which exchanges information with the BCU over the **P**hysical **E**xternal **I**nterface (PEI). The BCU receives telegrams from the bus, decodes them and controls the AU. In turn, the AU delivers information to the BCU, which encodes it and sends it on to the bus as a telegram.

During configuration and commissioning using ETS, the BCU is given paramterization data for the function to be executed. For this purpose, the BCU has a **Micro****p**rocessor (µP) with an non-volatile ROM (**R**ead **O**nly **M**emory), a volatile RAM (**R**andom **A**ccess **M**emory) and a non-volatile EEPROM (**E**lectrically **E**rasable **P**rogrammable **ROM**).

The ROM contains system-specific software that cannot be changed by the user. The parameterization data for the function to be executed by the BCU are stored in the EEPROM by the ETS. The µP stores current data in the RAM.

The assignment of the PEI pins varies from AU to AU. An AU connected over the PEI can only communicate error-free with the BCU if a suitable application program has been loaded in the EEPROM of the BCU using the ETS.



General data

Technical data

System data		
Bus cable Cable type	mm^2	YCYM 2 × 2 × 0,8 one core pair (red, black) for signal transmission and power supply, one core pair (yellow, white) for additional applications (SELV or language)
Cable installation		Flush mounting, semi-flush mounting, surface mounting
Cable length of one line (core diameter: 0.8 mm) • Length between two bus devices	m	max. 1 000 (including all junctions)
• Length between a bus device and the power supply unit (320 mA)/choke	m	max. 700
• Length between power supply unit (320 mA) and choke	m	max. 350, must be mounted next to each other (on the mounting rail with integrated data rail)
Bus device Number of areas		max. 15
Number of lines per area		max. 12
Number of bus devices per line		max. 64
Topology		Lines, star topology or tree structure
Power supply System power supply	V DC	24 (SELV - safety extra-low voltage)
Power supply per line		1 power supply unit (320 mA) and 1 choke or 1 power supply unit with integrated choke (640 mA)
Power supply per line with increased power requirements		max. 2 power supply units at minimum distance of 200 m
Transmission Transmission technology		Distributed, event-controlled, serial, symmetrical
Baud rate	bit/s	9 600

Device features (unless otherwise specified)		
Degree of protection to EN 60 529		IP 20
Safety class		Bus: safety extra-low voltage SELV 24 V DC
Overvoltage category		III
Rated insulation voltage U_i	V	250
Pollution degree		2
EMC requirements		to EN 50 081-1 and prEN 50 082-2 (severity 3), prEN 50 090-2-2, EIB manual
Resistance to climate		prEN 50 090-2-2, EIB manual
Conditions of application Field of application		for fixed installation indoors, for dry rooms, and installation in heavy-current distribution boards
Ambient temperature in operation	°C	-5 to +45
Humidity during operation	%	max. 93
Storage temperature	°C	-40 to +55
Humidity during storage	%	max. 93
Certification		EIB certified
CE marking		according to EMC Directive (residential and commercial buildings), Low Voltage Directive