KNX – World's First Standard for Home & Building Control – EN 50090

Editorial

Editorial Konnex Journal
Light and Building Fair

The year 2003 was a memorable year for KNX, Konnex Association, its founding legacy associations and the supporting manufacturers, service providers and interested parties.

First of all, one of the goals of Konnex Association as set out in its statutes was achieved at the end of 2003, when the media and the protocol of the KNX standard were officially approved by CENELEC as part of the EN 50090 series. With this, the KNX standard became the first European Standard for intelligent buildings!

Secondly, some organisational changes were implemented, including the transfer of a part of the staff of the legacy associations to the Konnex' payroll and the delegation of all legacy association tasks to Konnex (including EIB certification schemes)

• the modification of the EIBA statutes to become the centre of competence for KNX/ETS software packages and the nomination of Mr. Goossens as Director General

• the move at the end of the year of Konnex Association and EIBA to new refurbished premises at the outskirts of Brussels.

Thirdly, an immense leap forward also constituted the positive conclusion of the IPR (Intellectual Property Rights) clearance process amongst members, who agreed that all patents necessary for the development of KNX compatible products based on the KNX standard version 1.0 are free for use by fellow-member companies in KNX certified products.

In 2003, the first products built on the KNX extensions therefore saw the light, amongst others the first KNX RF compatible devices as well as LTE compatible products.

In Autumn of 2003, the first true Konnex Scientific Conference was organised at the University of Kassel, which attracted quite a number of participants from both industry as well as the scientific world. The number of KNX Scientific members in the mean while grew to more than 20 from countries as far away as China.

Also at the end of last year, Konnex Association and the European Association of Manufacturers of Domestic Appliances (CECED) concluded a co-operation agreement, for the definition of a KNX mapping for the CECED agreed application specifications for domestic appliances.

It is the objective of 2004 to further consolidate the 2003 success, by

• the participation of Konnex to various international fairs, a.o. Light + Building

• the approval of the now European KNX standard in CEN and ISO circles, as well as the standardisation of further parts (e.g. interworking) of the KNX standard in Europe.

• the publication of version 1.1 of the KNX standard amongst the Konnex members, including such extensions as RF and "KNX over IP".

At the occasion of the Light and Building Fair, at the Konnex Association booth EIBA will launch the long awaited ETS 3 version, which compared to ETS 2 will consist of two versions: one version focussing on the non-skilled KNX installer ("Starter") and one on the trained KNX installer ("Professional").

We would therefore like to invite you on behalf of Konnex Association and EIBA to our L+B booth, which will be located in Hall 8, booth G30.

See you there !

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Konnex Scientific Partnership

Konnex Association endorses EIB Scientific Partnership

Since the merging of the specification, certification and promotion activities of the legacy associations into Konnex Association and the publication of the KNX specifications version 1.0, it was agreed that Konnex should also endorse the EIB scientific Partnership to the full extent.

For its own Scientific Partnership, Konnex established statutes, which can be summarised as follows: for an annual fee amounting to a mere 250 Euros, the Konnex Scientific Partner

- receives at the beginning of each year, a CD-ROM containing the current version of all available KNX software packages and the entire set of KNX documentation;
- has access to an FTP server, where new versions of the documentation and tools can be downloaded (provided the membership is renewed each year);
- can delegate one person for free to the annual scientific conference;
- contact the KNX technical hotline for any questions related to on-going projects on KNX;

- use the Konnex Scientific Partnership logo.

How to become Scientific Partner?

If you are interested in joining the Konnex Scientific Partnership, the necessary application form is available from the Konnex web pages and should be completed and returned to Konnex Association (attention of Mrs. Johnson). On these web pages, the statutes of the Scientific Partnership are also available, along with the list of available documentation and tools.

Konnex Scientific Conference in 2003

Last year the Konnex Scientific Conference was organised at the University of Kassel on the 8th and 9th Oc-tober 2003. It was well attended by both industry as well as delegates from universities and institutes of technology all over the world. To get an impression of last year's conference please visit our website www.konnex.org.

Konnex Scientific Conference in 2004

Also this year Konnex will organise a Konnex Scientific conference to wich you are invited to participate. If you would like to present a paper at the conference in which the KNX technology plays a role, feel free to send it to us.

We will announce on our website when and where this event will take place and how you can inscribe for participation. ∎

Find out more:
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The KNX Standard; World's first open standard for Home & Building Control – EN 50090

At the end of 2003 Konnex Association achieved one of its objective as defined in its articles.

The Technical Committee of CENELEC (European Committee for Electrotechnical Standardization) ratified in December 2003 the positive vote cast by the national committees in May 2003 on the subset (media and protocol) of the KNX standard. In this way, KNX became the first European Standard for Home and Building Control (registered under the EN numbers 50090-3-1, 50090-4-1, 50090-4-2, 50090-5-2 & 50090-7-1).

Applications for endorsement of the European standard with other standardisation bodies like CEN (Europe) and ISO (worldwide) have already been filed, in order to ensure that the KNX standard becomes in the very near future a worldwide standard for Home and Building Control.

At that moment the KNX standard will replace its legacy standards in the different standardisation bodies.

On the European level, Konnex Association as Co-operating partner to CENELEC plans to also submit the RF medium as well as the KNX Interworking Model to CENELEC for approval and inclusion in the EN 50090 series. Moreover, Konnex Associations also envisages to submit the 'KNX over IP' specifications for approval to CEN TC247. KNX is the world's first approved standard in the area of communications for Home and Building Control that:

- Is completely free of additional royalty fees for Konnex members if implemented in KNX certified products;
- Is completely independent from any specific hardware/software technology platform;
- Has application profiles as an integral part of its standard;
- Has a formal product certification procedure to ensure multi- vendor interworking.
- Has an integrated software tool for planning, commissioning and diagnostics, i.e. the ETS.   ■
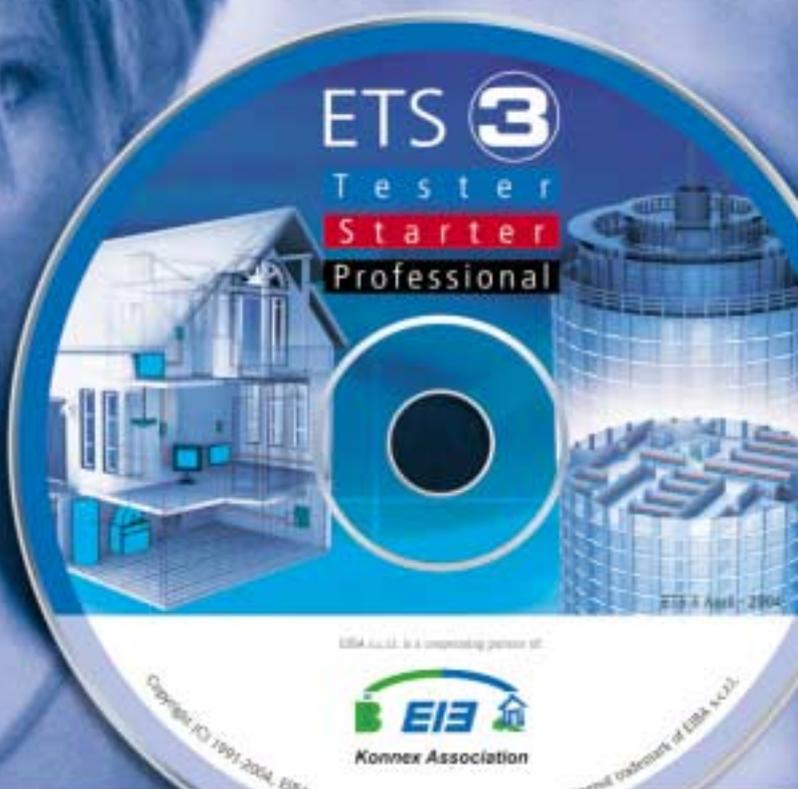

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Home appliances and devices understand the same "language"

Ceced's first: CHAIN, a standard for home automation systems

A household appliance interoperability platform to build an effective, user friendly home automation solution, has been announced by Ceced (European Committee of Manufacturers of Domestic Equipment), the association of 200-plus industrial companies in the appliance sector.

The Ceced Convergence Working Group of major European home appliance manufacturers is the first to jointly define, develop and support a common protocol which enables domestic appliances to fully interoperate in an automated home system. The new platform, called Chain (Ceced Home Appliances Interoperating Network), defines the protocol for connecting appliances in a single multibrand system designed for control and automation of key services in a home: e.g., remote control of appliance operation, energy or load management, remote diagnostics and automatic maintenance support to appliances, downloading and updating of data, programs, and services from the Web.

Products complying with the protocol will receive a special certification, to be agreed with the leading international associations which develop and maintain open communications protocols on home automation. Such a certification is a guarantee to the customer that the product is compliant with the common standard, while fully delivering its performances within the home automation system. The connections inside the house will either use power lines or go through radio frequency to avoid any impact on the structure and finishing of the building. Smart users and appliance installation crews should manage to install the whole system without calling for specialist's assistance.

"Household appliances become the first set of fully interoperable
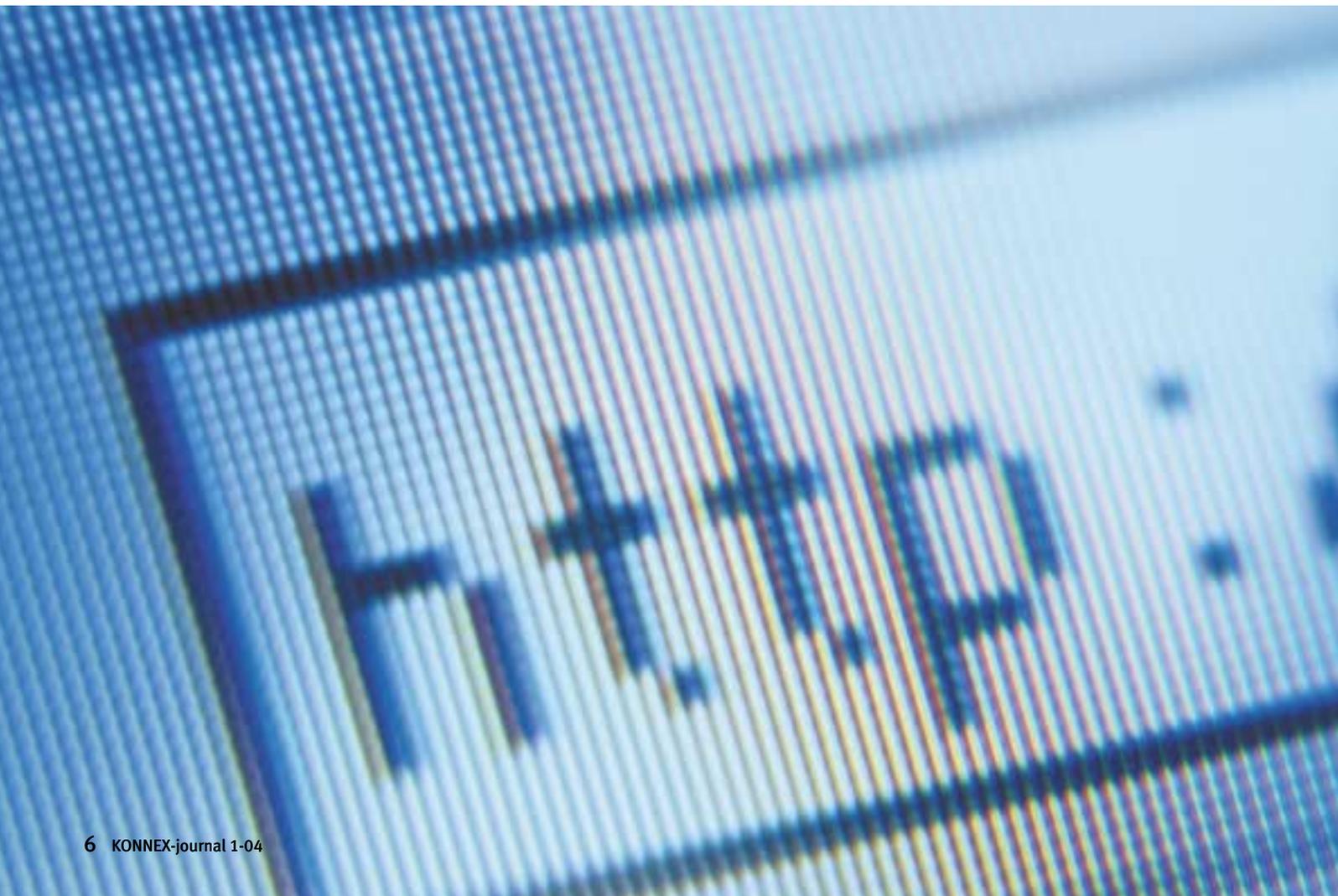
home devices and equipment: they confirm the leading role in the increasing automation of everyday domestic chores – commented Mr. Luigi Meli, director general, Ceced – The very large appliance installed base opens the possibility of reaching the industrial critical mass to lead the actual implementation of home automation solutions. We are commited to work with other interested parties for further development of an open-system interoperable framework".

The key steps taken by the Ceced Convergence Working Group have been summarised by its convenor, Mr. Fabrizio Dolce, Electrolux: "We applied a clear approach in our work: we started from the user's viewpoint of the most attractive applications of the appliances, then we defined the suitable technology to guarantee ease of installation and a seamless link within an automated home. The basic concept of the whole standard is the separation of communications (i.e. the connectivity technology) from the

functions (i.e., applications) that each device has been designed to perform. On the basis of the common architecture, the brand-specific added value solutions and appliance performances have been preserved. We defined a wide open, interoperable framework, open to all leading communications protocols".

The Convergence Working Group issued an Application Interworking Specification in three volumes. A fourth volume deals with the implementation of the specifications within each selected communications protocol. It will be jointly agreed with the leading home-bus protocol organisations.

The coming steps will refine the interface to answer user demand in an easy and effective way. A Ceced Demonstrator will show how Working Group's specifications could be implemented into a multibrand test system linking appliances, controls, and devices of a home automation/networked home system. ■

Ceced (European Committee of Manufacturers of Domestic Appliances), established 1958 and headquartered in Brussels, includes in its 200-plus membership the 13 largest European producers of large and small electric household appliances, manufacturers of home ventilation, air conditioning and heating equipment, and national industry associations of 13 countries. Direct jobs within member companies number over-200,000, while indirect jobs are about 300,000. Cumulated yearly turnover of Ceced member companies amounts to EUR 40 billion.

The following manufacturers support the CHAIN standard:
• ARCELIK,
• BOSCH SIEMENS HAUSGERÄTE GmbH,
• ELCO BRANDT S.A.,
• CANDY ELETTRODOMESTICI S.r.l,
• DE'LONGHI S.p.A.,
• ELECTROLUX HOLDINGS Ltd,
• FAGOR Electrodomesticos S.Coop,
• GORENJE d.d.,
• LIEBHERR HAUSGERÄTE GmbH,
• MERLONI ELETTRODOMESTICI S.p.A,
• MIELE & Cie. GmbH & Co.,
• WHIRLPOOL EUROPE S.r.l.

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Test, Start, become Professional !

ETS 3 Productfamily

On Light + Building 2004 (18-22 April, Frankfurt) the CD-ROM with the new ETS 3 will be introduced. The CD-ROM contains the complete ETS 3 software family as well as other (supporting) software and information. The CD-ROM will be distributed for free at our booth in Hall 8/G30. Simply register at the booth and obtain your free copy.

Available Versions of ETS 3
ETS 3 Tester:

The ETS 3 Tester is the demo-version of the ETS 3 Starter. Target group is the "Newcomer in bus technology". Just like the starter version, the tester version will fully function for a limited period of time. After this period the ETS 3 Tester will fall back in demo-mode. This means that the download mechanism will be disabled. With the help of the ETS 3 Tester the user is able to submit the ETS 3 Starter to a first "TEST", thereby supported by a Computer Based Training (CBT) concept, also available from the same CD-ROM.

The CBT helps the user to learn how to use the ETS 3 Starter at his own pace.

ETS 3 Starter

Once the "NewComer" understands the software and the basics of KNX, he/she is now able to sell KNX actively. After installation, the ETS 3 Starter will run for a limited period of time (30 days); when buying a licence it will run without any limitations. Without a valid licence the ETS 3 Starter will run as a Tester.

The Starter version is meant for small, residential buildings (1 line, 64 devices) with limited applications. Possible applications are Lighting Control, Shutter control and individual room temperature control as well as central control.

ETS 3 Professional

The Professional version of ETS 3 replaces the current ETS 2 generation. It gives FULL power to the professionals. To mention but a few improvements: USB support, Multitasking (Threading) including simultaneous download of devices, design while downloading, etc. With ETS 3 Professional it is possible to customize the user interface to your own wishes. The parameter view is shown as a tree giving a better overview. The professional version integrates both project design and commissioning functionality into one single working environment. This optimises the workflow efficiency dramatically. More "Windows" functions have been added as well, like the very powerful undo & redo function.

ETS 3 on Light + Building
18 – 22 April

The ETS 3 versions are available from L+B onwards. A presentation of the software versions will be given at the booth, in hall 8, booth G30. You are invited to a demonstration.

Training centre Bfe will support us to present the CBT concept for the ETS 3 Tester. We will present the ETS 3 ➜

Wouter van den Bos   **Marc Goossens**

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System software lowers costs

Software and services for KNX development

The KNX standard represents a complex communication system, new components for which entail considerable development investment. With a new system software product, Weinzierl Engineering GmbH in Tyrlaching offers a certified platform upon which the most complex of components can be developed quickly, and effectively.

The heart of the components is a microcontroller which is responsible for both communication with the bus and execution of the application concerned. The Siemens TP-UART chip is employed for access to the Bus. The simple c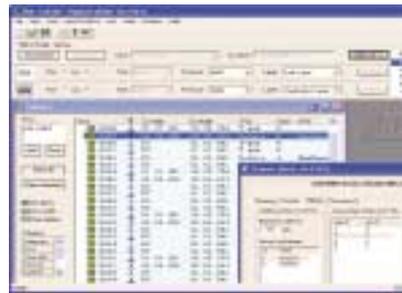ircuitry considerably reduces the product costs. The system software is an operating software specially developed for KNX components, providing unrestricted compatibility with the ETS software.

Weinzierl provides a powerful bus monitor for efficient analysis of components

New system software lowers the cost of investment in KNX component development

and systems in the form of the "Net'n Node" PC program. This program is also available with immediate effect in an integrator's version for effective troubleshooting in KNX installations. ■

"Net'n Node" PC program for efficient analysis of components and systems

Starter on two corners of the booth, where training centre DIAL will support us in presenting the KNX Training concept with the ETS 3 Professional. ■

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web: www.weinzierl.de

Savings in maintenance

KNX Emergency luminaires by Gewiss

GEWISS is the first company to produce and market a complete range of emergency luminaires named STARTEC EIB. The luminaires are in accordance with the European Standards EN61547, EN60598-1 and EN60598-2-22.

Emergency luminaires switch on when the mains fail, in order to avoid a panic phenomena among persons and to indicate the way out inside the building.

In most of European countries the installation of emergency luminaires is mandatory by law in public buildings (e.g.: airports, hospitals, schools). The law also defines the type and the periodicity of the tests to be performed in order to maintain their efficiency.

GEWISS Emergency Luminaires can be completely controlled through a KNX network. For each luminaire it is possible:
- To send command: battery and functional test execution, mode selection (maintained, not maintained)
- To read the status: emergency, rest mode, test running
- To read alarms: tube alarm, battery alarm
- To read measure: percentage of battery charge

Thanks to the above functions it is possible to make a big step forward in emergency lighting applications in terms of cost savings and of a more effective maintenance policy:

- Automatic execution of the tests: controlled by a central unit (e.g.: PC)
- Maintenance-interventions optimisation : maintenance personnel know before starting for the intervention the complete list of fault-luminaires and for each one both the problem (e.g.: tube or battery) and the exact position inside the building (e.g.: 23rd floor, room 101). ■

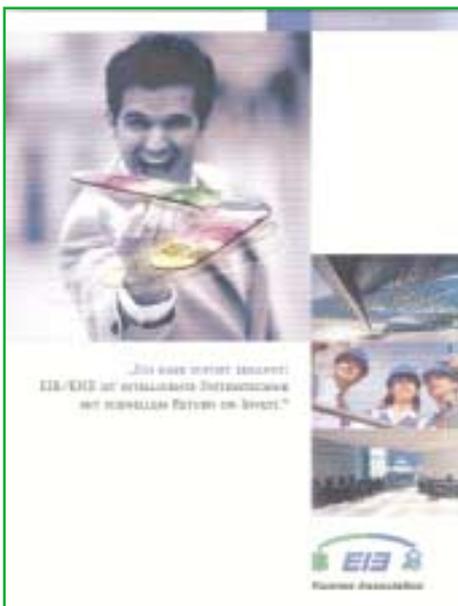Find out more:
■ Gewiss Press Office
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www.gewiss.com

Investors prefer to take the bus

EIB/KNX: intelligent system technology with rapid return on investment

This is the title of a brochure on home and buildings systems technology aimed especially at investors. The brochure describes KNX from the aspect of flexibility, economy, added value, compatibility, and long-term viability. Aimed specifically at owners of office and other non-residential buildings, the descriptions are clear and concise. Reference examples illustrate how KNX is used to solve the most diverse of tasks. Engineering offices and installers can adopt this brochure for discussions with customers or as an active publicity instrument, for example for distribution at their own events or for mailshots. The brochure provides sufficient space at the back for a company stamp.

Order the German brochure from the German EIB/KNX Group. The English version will come soon. ■

Find out more:
■ Deutsche EIB/KNX-Gruppe
Fax: +49 (69) 63 02-3 83
e-mail: eiba@zvei.org
www.eiba.de

Busch Installationsbus® EIB

6108 U UP EIB pushbutton interface

The KNX flush-mounting pushbutton interface is used to integrate conventional switches and buttons into the Busch Installationsbus®. The EIB button interface is connected to the terminals of conventional buttons and switches, e.g. 2020 US, 2020 US-205, 2000/6 US and 2000/5 US, by means of four contact pins. The button interface makes the 2000® SI/SI Linear, Reflex SI/SI Linear, future, alpha exclusive®, alpha nea® and solo® ranges EIB-compatible.

Power is supplied to the EIB pushbutton interface and the conventional switches/buttons from the bus.

Product benefits:

• Simple installation, straightforward setup.

• Any of the UP switch ranges can be used with the Busch Installationsbus® EIB, with the exception of the impuls and the AP ranges.

• The cost-effective solution for the decorating market

The buttons/switches employed can be selected by means of the ETS application. After selection, the desired sensor functions are configured: switching, dimming, etc. ■

Find out more:
■ Busch-Jaeger Elektro GmbH
Lüdenscheid
Tel: +49 (23 51) 9 56-0
www.busch-jaeger.de

Terminal with Internet connection

A giant leap towards the "intelligent house"

With its new "SmartTerminal", Gira, located in Radevormwald, has extended its range of KNX products with a central control unit for domestic properties which includes Internet and e-mail functionality. The "SmartTerminal" offers intuitive twist/push button operation and menu guidance. In addition, four freely configurable buttons are available in the main menu to which master functions can be assigned, such as "Top News" or "Light Scenarios". A large colour display is used for visualisation. The backlighting of the control button serves for orientation purposes and as a visual alarm.

The Gira "SmartTerminal" permits user-friendly control of the entire Instabus KNX installation throughout the building. A range of scenarios can be created, accessed and modified on the control unit itself. Time control and occupancy simulation routines can be programmed. The user can also call up online services such as weather reports and up-to-date traffic messages, or send and receive e-mails. Alarm or fault messages etc. can be sent automatically through the KNX-Internet interface.

The front plate of the Gira "SmartTerminal" is manufactured from glass, enabling the unit to be integrated perfectly into the Gira modular function column and combined there with many other functions to form a single unit. The "SmartTerminal" can however also be installed as a surface or flush-mounting wall unit.

The building structure generated by the ETS 3 is transferred automatically when the "SmartTerminal" is set up, obviating the need for programming on the unit. The functionality of the unit will be extended continually; units can be updated at www.smart_terminal.gira.de. ■

Find out more:
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Electrical installation systems
Postfach 1220, D-42461 Radevormwald
Tel: +49 (21 95) 6 02-0
Fax: +49 (21 95) 6 02-3 39
e-mail: info@gira.de
www.gira.de

Milestone for Home Automation

Siemens starts marketing Home automation system serve@Home!

Integration of serve@home

A significant step has been achieved for the future of the networked home. After intensive preparatory work and several months of field tests in homes, the Siemens home automation system serve@Home is entering its first marketing phase.

As the first manufacturer in its sector, Siemens is launching a complete range of home appliances that can be networked and, from early on, is helping to set the unstoppable trend towards home automation.

Here, Siemens is once again underpinning its position as innovation leader in the home appliance market.

Siemens-Electrogeräte is focusing on a selective market introduction in its marketing of the new system. With serve@Home, retail business is moving in new directions in terms of consulting, planning, installation and services. It is therefore important to begin with a select number of properly trained dealers so as to ensure quality when this new system is introduced. Main distributors will gradually be built up in the largest German cities.

The next stage is to involve other European countries in the marketing. "An important target group for the system is initially the "early adopters", i.e. people who are open to new technologies very early on," says Roland Hagenbucher, CEO of Siemens-Electrogeräte GmbH. "We offer our customers two options for achieving a networked home: one consists of purchasing home appliances which are equipped ex-works for networking and can be modernized at any time. Alternatively, in order to be able to use the new technologies immediately, the complete system can be purchased, i.e. home appliances incorporating the Gateway and System-Interface (SI) networking components. The basic package (Tablet PC, Gateway and Powerline-Interface) is offered at a recommended retail price of 3,999 euros, and includes a Siemens Stylistic Tablet PC worth around 2,500 euros."

There are already 11 products on the market including a cooker, and oven, extractor hoods, fridges and freezers, dishwashers, a washing machine and a tumble dryer. The additional charge for a networked appliance as opposed to a conventional one is 50 euros.
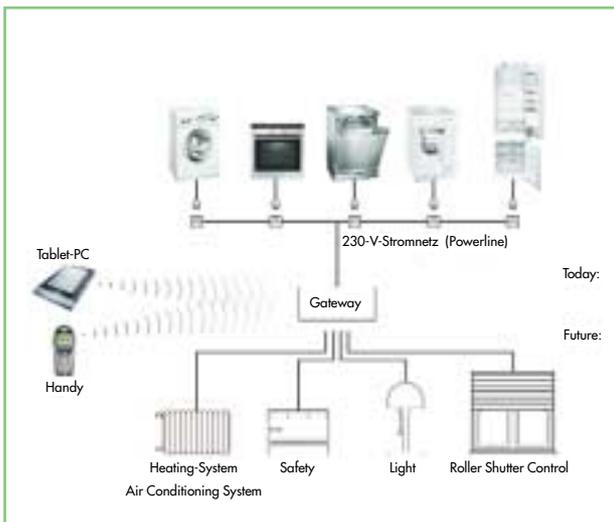
Find out more:
- Siemens Elektrogeräte GmbH
München
www.serve-home.com

Practical solutions for practical users

KNX control and signalling panels satisfy the needs of customers and architects

As a system integrator, the Gesellschaft für Prozesstechnik or "GePro", a Stralsund-based company in the process technology sector, repeatedly faced the following problem: to implement a central control facility into an KNX installation which does not overtax or confuse the user with excessive technology, and can be operated immediately by different personnel.

The engineers on Germany's Baltic coast had considered the products already available. "With regard to installation, in particular, we were not satisfied. The external appearance attractive design of the panels, this being essential for their use in hotels, restaurants, medical practices and solicitors' offices, conference rooms, etc.

The KNX control and signalling panels offer a wide range of internal functions. Round pushbuttons and integral green LEDs on the front plate are used to switch and dim lights, open and close shutters, and transmit values. The ETS is employed for parameterisation of the button functions. Separate objects serve to parameterse the LEDs to "ON", "OFF" or "Flashing". Orientation lighting is also possible.

control and signalling panel in its range:

- With 16 and 32 pusbuttons/LEDs
- With 8 pushbuttons/LEDs and 16 additional inputs
- Mini control and signalling panel with 8 pushbuttons

Besides the standard version in natural anodised aluminium, panels are now available from GePro in agate grey, anthracite, mahogany, and steel blue. LEDs are also available in red, and special versions can be ordered, for example for surface-mounting. Further versions are under development. ■

The new control and signalling panels for EIB systems are available with 32, 16 and 8 push-buttons

The panels are designed for easy fitting to standard flush-mounting enclosures

didn't match our criteria, either. This led us to consider building our own KNX control and signalling panels," explains GePro CEO Dipl.-Ing. Dirk Müller.

Kaiser's standard enclosures for flush and hollow-wall mounting were the starting point for the new products. Particular attention was paid to

so possible. Installation couldn't be easier: the front plate together with all pushbuttons and the control electronics is simply fitted onto the flush-mounting enclosure by means of four screws. The panels are supplied with software and if desired with pre-engraved label plates.

GePro now has several types of KNX

Investment in testing pays off

Third-party testing of KNX components

Before new KNX components are launched, they must first be registered with the Konnex Association. The manufacturer must then obtain certification testing from an independent KNX test institute within six months. Is this expense worthwhile?

This requirement is intended to ensure that components distributed by different manufacturers are interoperable with each other and function without problems within a system. KNX is the only Bus system for which such quality testing is so rigorously required and actually conducted.

Early identification of faults

During testing of interoperation, the inherent functionality of the component is also tested. A room tempera-

ture regulator for example must actually transmit its status should the ambient temperature change, and a shutter actuator must output a new position when a certain event takes place. The objective is for faults to be identified at an early stage in order for the quality of the component, and beyond that that of the Bus system, to be assured.
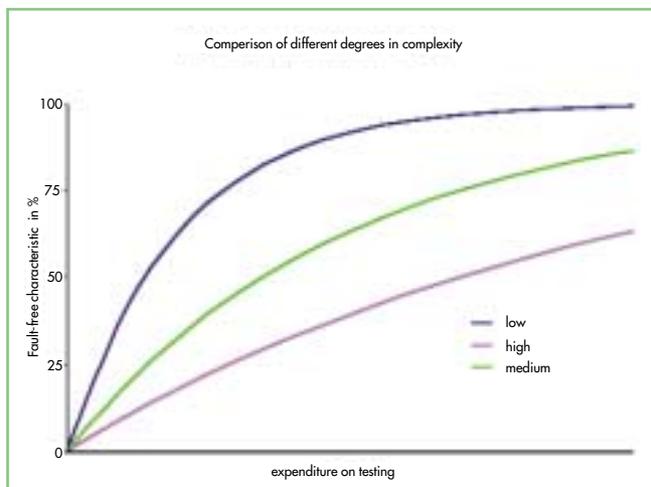
Experienced test institute

KNX components and their applications are growing in complexity. The more complex the component and the application, the higher the expenditure on testing. Diagram 1 demonstrates this with a comparison between three different degrees of complexity of a typical KNX standard product. As the diagram shows, the exponential fault-free characteristic of the test expenditure is several times higher at 50 % freedom from faults for a high-complexity component than for a low-complexity component.

Specified test strategies yield a high probability of faults being detected. Experience has shown however that test strategies developed by third parties are highly suited to the detection of faults not found by man-

ufacturers' tests. Both methods in combination thus yield optimum results.

Almost ten years' experience with EIB testing in DIAL at Lüdenscheid has shown that virtually any complex component will exhibit faults during testing. Third-party testing thus considerably improves product and system quality, and manufacturers are saved high consequential costs and warranty expenses.

➜

Comparison of different degrees in complexity

low
high
medium

Fault-free characteristic in %

expenditure on testing

Training contractors and planners around the world
Standardised & upgrade course for professionals

Since the beginning of April 2003, EIBA has formally delegated the certification of training centres to Konnex Association. With the number of training centres approaching the 100 limit, the number of countries, in which electrical contractors and planners are trained according to the EIB requirements for training centres is also steadily increasing: in the course of 2003, the Konnex Association Certification Department trained 7 candidate tutors in such countries as Spain (Jung Iberica), Denmark (ABB University) but also as far away as Hong Kong (Polytechnic University).

Outsourcing of approval tests

Manufacturers can save further costs by outsourcing the usual "approval tests" to the testing body. The manufacturer's personnel must otherwise first be trained in use of the components. Identified faults are then communicated to the developer for rectification. This process is repeated until no more faults are detected.

The external test body is then involved. Here too, testers must first familiarise themselves with the component. Should faults be detected, which is standards on complex components, the component is returned to development, and the whole process begins again. Conversely, if approval testing itself is outsourced to the test body, the costs of training and re-training of in-house testers are saved in full.

In conclusion, the test expenditure entailed by KNX is a good investment. The manufacturer saves high warranty costs, the system integrator and the installer are spared on-site problems typical of other bus systems, and building systems technology employing KNX enhances its image. ∎

Moreover, last year the Expert Group on Training defined a new standardised course next to the normal combined course. For such persons that possibly already hold the title of EIB partner, but want to extend their knowledge and skills for more integrated and sophisticated projects, there is now the possibility to attend upgrade courses of in total 40 lessons dealing with such topics as:
- visualisation
- heating control
- security applications
- sophisticated lighting control
- ETS add-on tools
- logic operations
- line/backbone couplers
- group object flag settings, etc.

Training centres can apply for certification to be able to carry out these training courses under the same conditions as for the combined courses, provided they have submitted proof of the availability of some additional equipment. Until now, 8 training centres have received authorization to organise upgrade courses. ∎

Annual conference for Training Centres

Last but not least, in the month of May 2003 Konnex Association organised the annual conference for Training Centres, which was this year hosted by the Elektrobildungszentrum in Dresden (Germany). The audience of more than 60 delegates from training centres from Germany, Belgium, Austria, Greece, Italy, Spain and France listened attentively to the novelties of KNX in the area of radio frequency, easy installation, ETS Professional and Starter Edition, KNX EIBnet IP. Also a number of manufacturers demonstrated their new product applications. Konnex Association has already scheduled held this year's event in March 2004, entirely devoted to the new ETS 3 software.

Weitere Informationen zu Schulungen und Zertifizierungen:
- Ufuk Unal
Certification Assistant
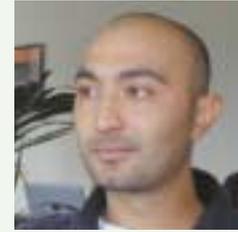Tel: + 32 (2) 77 58 76 53
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