WAGO®

INNOVATIVE CONNECTIONS

Table of Contents

Since its establishment in 1951, WAGO has been pioneering innovative connection systems in electrical engineering and electronics. The idea for a screw-less termination system was born in 1951; the first terminal blocks with spring clamp termination technology were presented at the Hanover Fair the same year. Precisely designed and manufactured, spring-loaded connections not only guarantee a faster and easier connection, but also offer a higher safety level since the contact quality is largely independent of operator skill.

Now, WAGO is the leading specialist of Spring Pressure Termination Technology and is providing components for automation technology. In 1977, the success story of the CAGE CLAMP® began – "vibration-proof, fast and maintenance-free connections." Safe operation for countless devices, systems and installation depends on the unconditional reliability of our products.

1951
The first WAGO spring clamp

At Home in the World

Over 50 Years of Innovations

WAGO USA

WAGO consists of the ELECTRICAL INTERCONNECTIONS and AUTOMATION divisions. Electrical connection products based on Spring Pressure Termination Technology are part of the ELECTRICAL INTERCONNECTIONS division. WAGO's AUTOMATION division provides solutions that are based on both fieldbus and spring pressure termination technologies, as well as interface modules for the industry, process technology and building systems sectors.

ELECTRICAL INTERCONNECTIONS

AUTOMATION

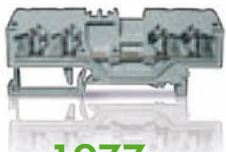● Production sites
● Sales companies
○ Representatives

Pluggable electronic functions on rail-mounted terminal blocks

1985

1998
POWER CAGE CLAMP

2001
WINSTA® connection system

2004
Compact splicing connectors
for all conductor types

2006
TOPJOB® S rail-mounted
terminal blocks

1977
Rail-mounted terminal blocks
with CAGE CLAMP®

1974
WAGO PUSH WIRE®
connector for
junction
boxes

WAGO Minden Headquarters

WAGO Sondershausen

WAGO Switzerland

WAGO China

WAGO Brazil

TO-PASS® – scalable
telecontrol technology

2008

WAGO *JUMPFLEX®* transducers
and relay modules

2006

WAGO-I/O-SYSTEM,
IP20

1995

WAGO *SPEEDWAY 767,*
modular I/O-SYSTEM, IP67

2005

WAGO System – From Simple Installations to Complex Building Automation

WAGO sets standards for energy efficiency, convenience and safety. Not only do systems and components readily adhere to current building standards, they have been engineered to adapt to future standards. Our product range is geared for modularity, giving you the ability to select individual components for customized solutions. *PUSH WIRE®* connectors for junction boxes, rail-mounted terminal blocks, *WINSTA®* connectors and universal automation components ensure your system will handily meet future challenges.

WINSTA® Linect®

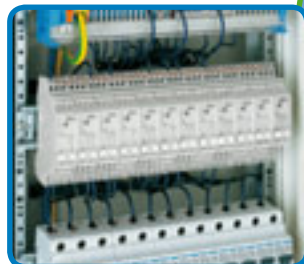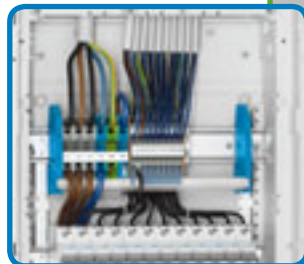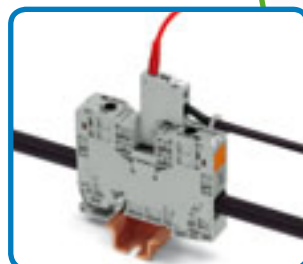WINSTA® connectors

WAGO in Building

Automation

Relays, interface modules, power supplies

TOPJOB®S rail-mounted terminal blocks

High-current terminal blocks

Distribution boxes

WAGO-I/O-SYSTEM

TO-PASS®
telecontrol technology

WINSTA® boxes

PUSH WIRE® connectors for junction boxes

Lighting connectors

PUSH WIRE® connectors

Your partner from installation to building automation!

Added Value Through Optimized Operating Costs:

Demands for increased building comfort, safety, flexibility and efficiency are on the rise. In the future, it will be possible to easily and quickly adapt a building to suit these requirements with supreme flexibility. Modern building automation extends a communications network throughout the entire building, creating individual sections. This increases property values while minimizing operating costs. It also provides fault management and security functions.

Facility Management with WAGO

HVAC Control Centers:

Automatically controlled heating and ventilation equipment increases occupant comfort while simultaneously enhancing a building's efficiency by minimizing energy-related costs. Central monitoring and remote access are included.

For a Comfortable Atmosphere:

Whether office, reception, laboratory or conference room, specific usage determines the required lighting levels. The lighting controller automatically adjusts the lighting conditions and can be incorporated into a comprehensive energy-saving plan.

For Comfort and Warmth:

Highly precise and independent temperature controllers in each room provide ideal room temperatures. They can also automatically adapt to an occupant's preferences and compensate for fluctuating temperatures to keep heat/warmth constant.

For a Pleasant Working Environment:

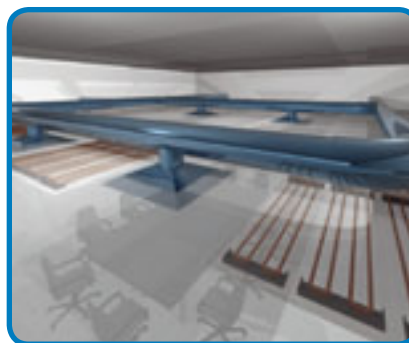An optimally controlled room enhances work efficiency.

For Glare-Free Work Spaces:

An automatic blind controller creates glare-free lighting and well-regulated shade – depending on room usage. It also provides a pleasant atmosphere by balancing the amount of solar heat and shade.

Integrated Building Automation -

Enhanced Energy Efficiency

Sun protection

Heating/cooling

Automation

The options for integrated and facility-wide automation of buildings are very diverse. From tailored lighting control to weather-dependent sun protection to demanding HVAC applications, even the most complex tasks can be solved. In addition to conventional digital and analog sensors (e.g., for blind switches or temperature sensors) bus-enabled sensors can be used. Similarly, digital, analog and bus-enabled actuators can also be used. In addition, synergies are developed by using the same sensors for different applications. For example, a presence detector can detect room occupancy, switch the light on and activate automatic sun protection.

Control

| Application 1: Sun protection | Application 2: Individual room control |
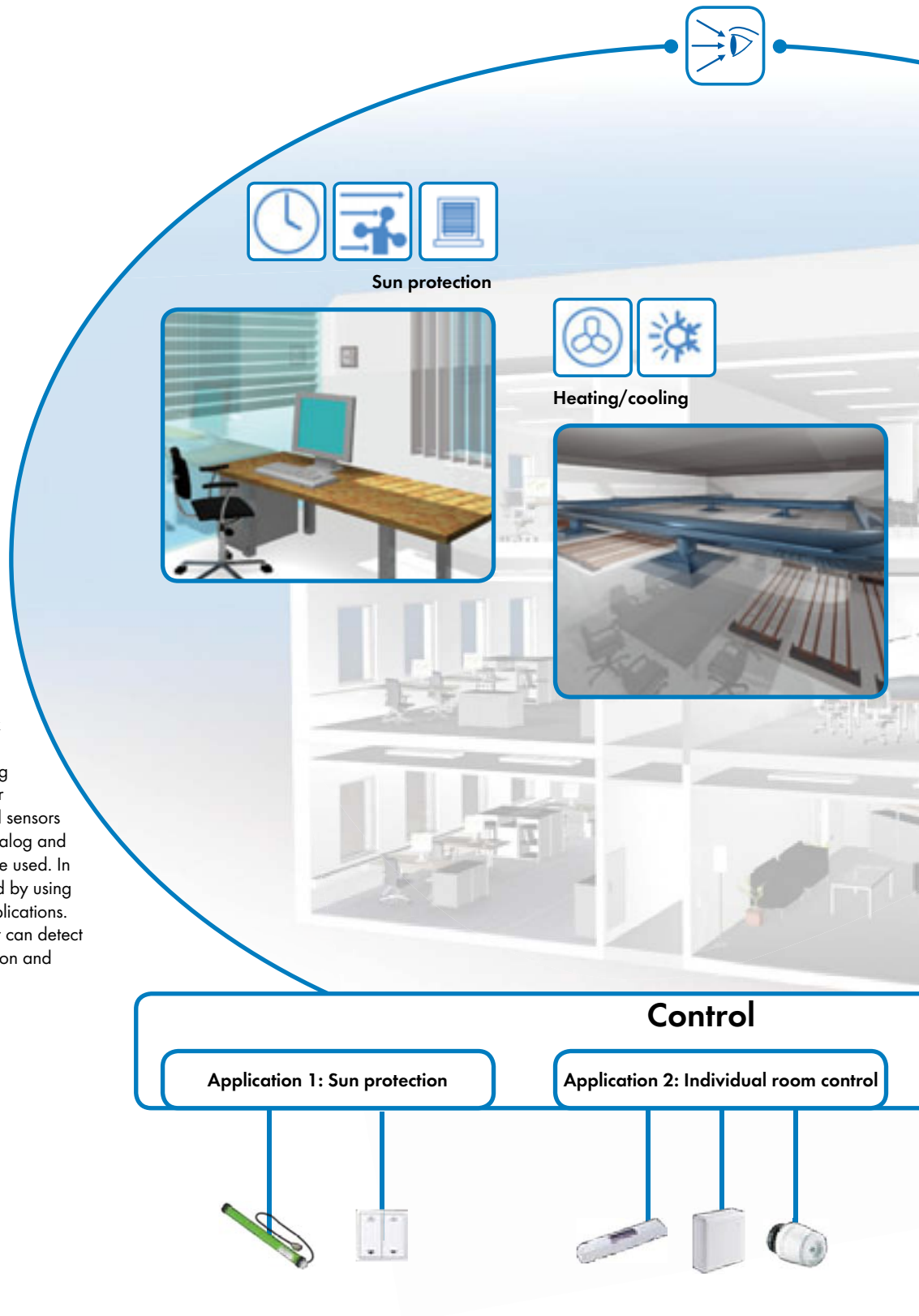
Lighting

Application 3: Lighting

Energy Efficiency:

Private and commercial buildings in Europe account for more than 40% of all primary energy consumption. This stark fact highlights significant opportunities for conservation via energy-efficient building designs. The Kyoto Protocol's recommendation of measures supports this, and paves the way for automated buildings to improve energy efficiency.

WAGO offers a comprehensive range of fieldbus controllers and industrial PCs that support established protocol standards. Configuration, programming and visualization are easily performed with the WAGO-I/O-PRO-CAA software package (in compliance with IEC 61131-3, CoDeSys Automation Alliance).

BACnet

KNX

LonWorks

MODBUS

BACnet Controller

The controller corresponds to the BACnet profile B-BC (BACnet Building Controller) and communicates via BACnet/IP.

BACnet objects can be created via WAGO-I/O-PRO-CAA programming software, where BACnet objects are created automatically for analog and digital inputs/outputs. The WAGO BACnet Configurator is available for easy configuration.

KNX IP Controller

The KNX IP fieldbus controller is freely programmable and communicates via standard 10/100 Mbit ETHERNET network. Commissioning is performed via ETS 3/4 network management tool, and a WAGO product database is available for this.

LON Controller

The LonWorks®-compatible fieldbus controller meets all LONMARK® guidelines, offering manufacturer-independent and unrestricted communication.

In addition, the WAGO LON controller supports all standard LON network variables according to the LONMARK® SNVT master list and is freely programmable.
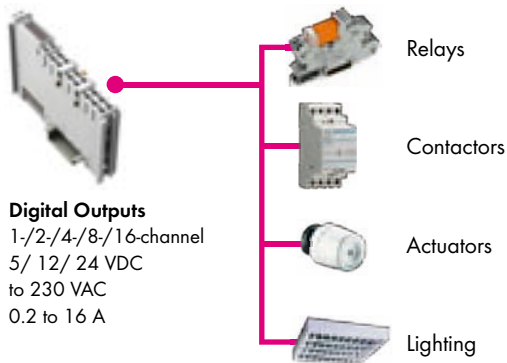
ETHERNET Controller and IPC

The IPC and ETHERNET fieldbus controllers support all standard protocols. For communication, MODBUS TCP/IP is used. Administration and diagnostics are supported by several leading protocols, such as SNMP, HTTP, DHCP, FTP. An internal server is available for Web-based applications.
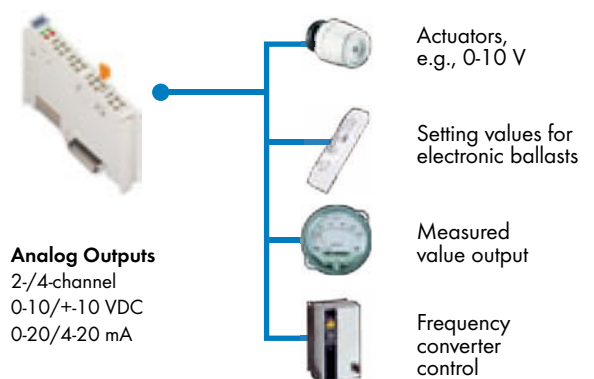
Controllers and I/O Modules

Digital Output Modules
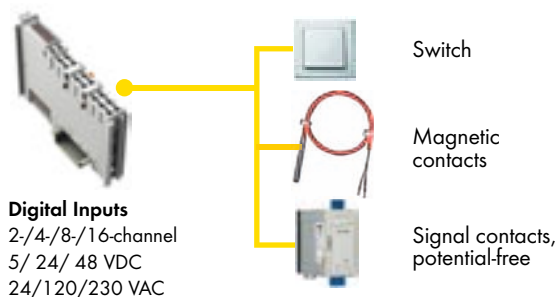
Digital Outputs
1-/2-/4-/8-/16-channel
5/ 12/ 24 VDC
to 230 VAC
0.2 to 16 A

Relays

Contactors

Actuators

Lighting

Analog Output Modules

Analog Outputs
2-/4-channel
0-10/+-10 VDC
0-20/4-20 mA

Actuators,
e.g., 0-10 V

Setting values for
electronic ballasts

Measured
value output

Frequency
converter
control

Digital Input Modules

Digital Inputs
2-/4-/8-/16-channel
5/ 24/ 48 VDC
24/120/230 VAC

Switch

Magnetic
contacts

Signal contacts,
potential-free

Analog Input Modules

Analog Inputs
2-/4-channel
0-10/ +-10 VDC
0-20/ 4-20 mA
0-1 A, 0-5 A
Pt100, Pt1000,
Ni1000, ...

Temperature

Humidity

Wind speed

Current transformer,
e.g., 100/5 A
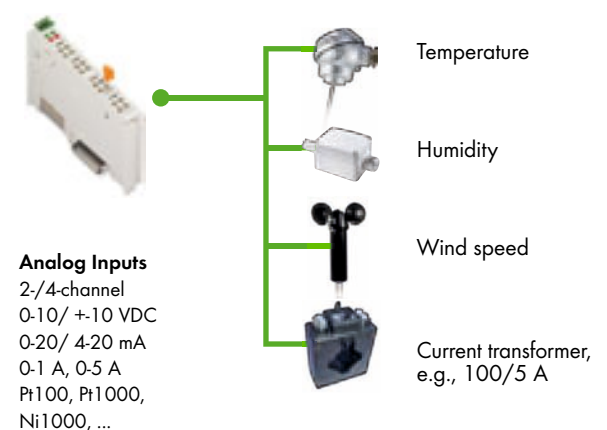
Communication RS-232 C/RS-485

Display

Romutec manual
operation interface

Level converter
for M-Bus

MODBUS
RTU/RS-485

SMI interface
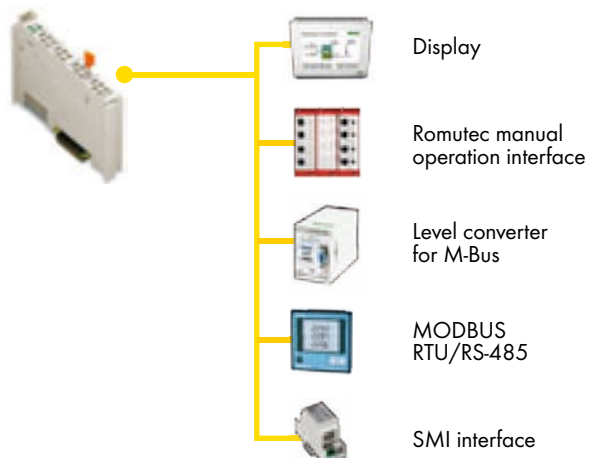
Specialty Modules

KNX/EIB/TP1 module

DALI/DSI master

EnOcean radio receiver

MP-Bus

RTC module
DCF-77 radio receiver

Counters
Up/down counters

KNX

DALI

enocean

MP BUS

Subsystems

The WAGO-I/O-SYSTEM 750 provides complete, field-side wiring for fieldbus-independent I/O modules.

The system's modularity enables virtually any combination of digital/analog inputs and outputs, as well as complex sub-bus modules, to be connected to a fieldbus controller. When a controller is connected to modules, it functions as either a stand-alone control unit without higher-level fieldbus connection, or as a universal interface when connected to a fieldbus.

This ensures high availability of the sub-applications, simple structures and fast response times while maintaining unrestricted flexibility.
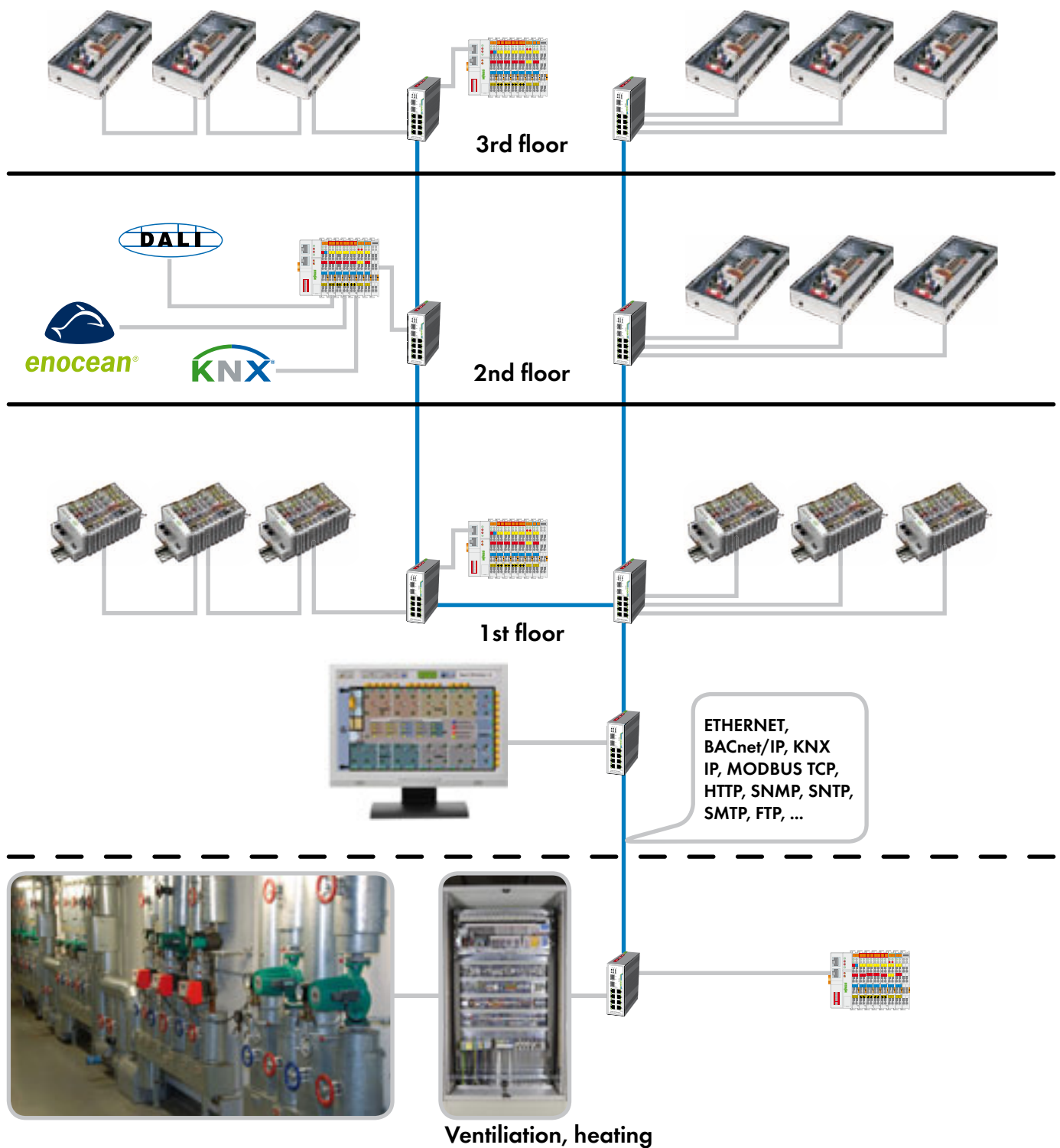
Data is exchanged via subsystems below the field level. Programmable controllers process sensor signals and control actuators.

The WAGO-I/O-SYSTEM supports interfaces such as DALI, MP-Bus, KNX/TP1, M-Bus, EnOcean, SMI and serial protocols. The I/O functions as a global connector, unifying different building automation technologies into one efficient system.

Network Structure

A condition for the decentralized, intelligent automation is the unrestricted availability of all relevant data. ETHERNET permits direct access to the required data.

Compliance with IT standards makes cost-effective communication via local and global networks possible (LAN, WAN, Internet).

3rd floor

DALI

enocean®

KNX®

2nd floor

1st floor

ETHERNET, BACnet/IP, KNX IP, MODBUS TCP, HTTP, SNMP, SNTP, SMTP, FTP, ...

Ventiliation, heating

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Possibilities

Versatile WAGO automation components can be installed either in a room or within a sub-distribution panel. From there, either individual rooms or entire building areas can be developed.

The WAGO-I/O-SYSTEM 750 provides complete, field-side wiring for fieldbus-independent I/O modules.

If a project requires decentralized, bus-enabled sensors and actuators from varying technologies, the WAGO-I/O-SYSTEM will serve as a multifunctional interface. In this instance, the WAGO-I/O-SYSTEM will readily connect specific bus systems used in different sections.

230 V

KNX

DALI +230 V

Floor distributor
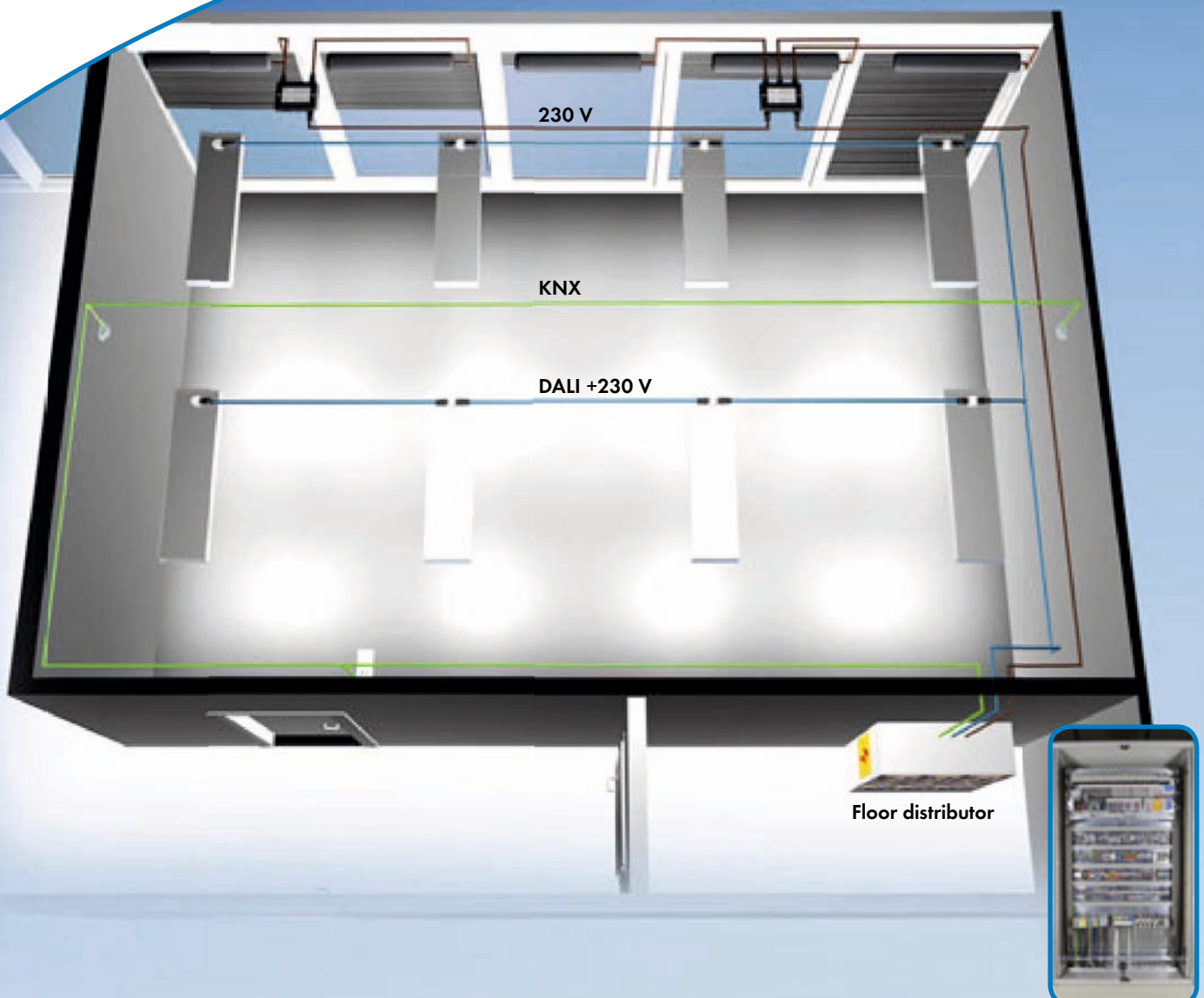
Sensors and actuators are wired point-to-point to the automation equipment.

Conventional electrical installation components such as switches, window contacts, shutter drives, lamps, etc. can be used.

24 V/ 230 V

DALI

24 V/230 V

24 V/230 V

230 V
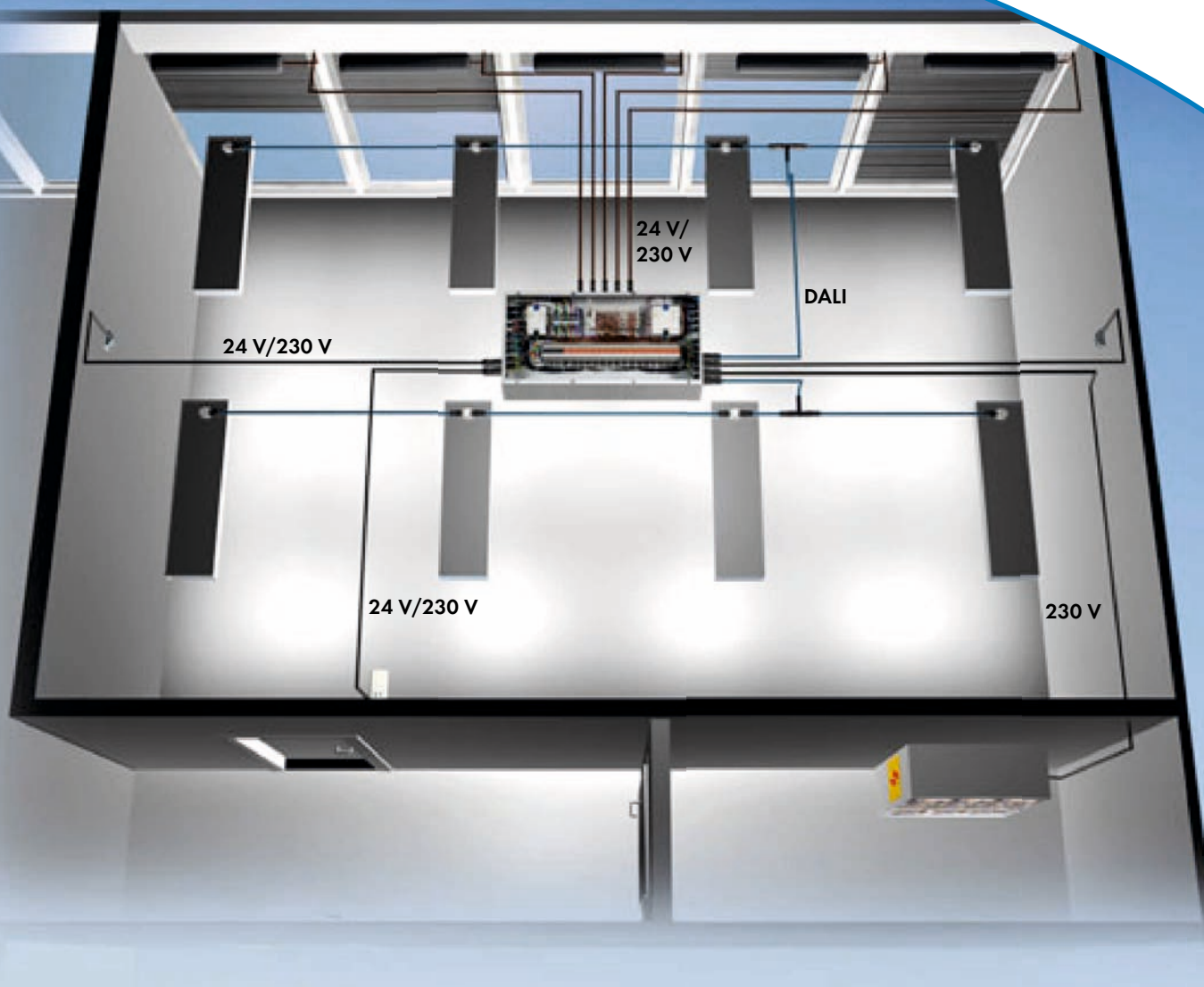
WAGO Software Package

AUTOMATION COCKPIT

The **AUTOMATION COCKPIT** is the WAGO-I/O-SYSTEM 750 integrated development environment for configuring, planning and programming control panels and controllers. The **AUTOMATION COCKPIT** can create visualizations and control applications. All familiar WAGO tools, such as ETHERNET-Settings, I/O-CHECK and I/O-Update can be accessed device-specifically from the software.

AUTOMATION COCKPIT has an interface that lists all configured projects.

The Benefits:

- All settings at a glance
- Navigation within, and between projects
- Configurations and programming can be transferred from existing projects into another project
- Logical structure of the project view
- Communication relationships between the various devices of a project using easy-to-follow dialog boxes
- Extensive project management permits network and device configuration
- Input all data points just once – they'll then be available within the entire project

The IEC-61131-3 programming environment (CoDeSys software) is integrated for device programming.

AUTOMATION COCKPIT also handles version management of the installed CoDeSys software versions.

Project view
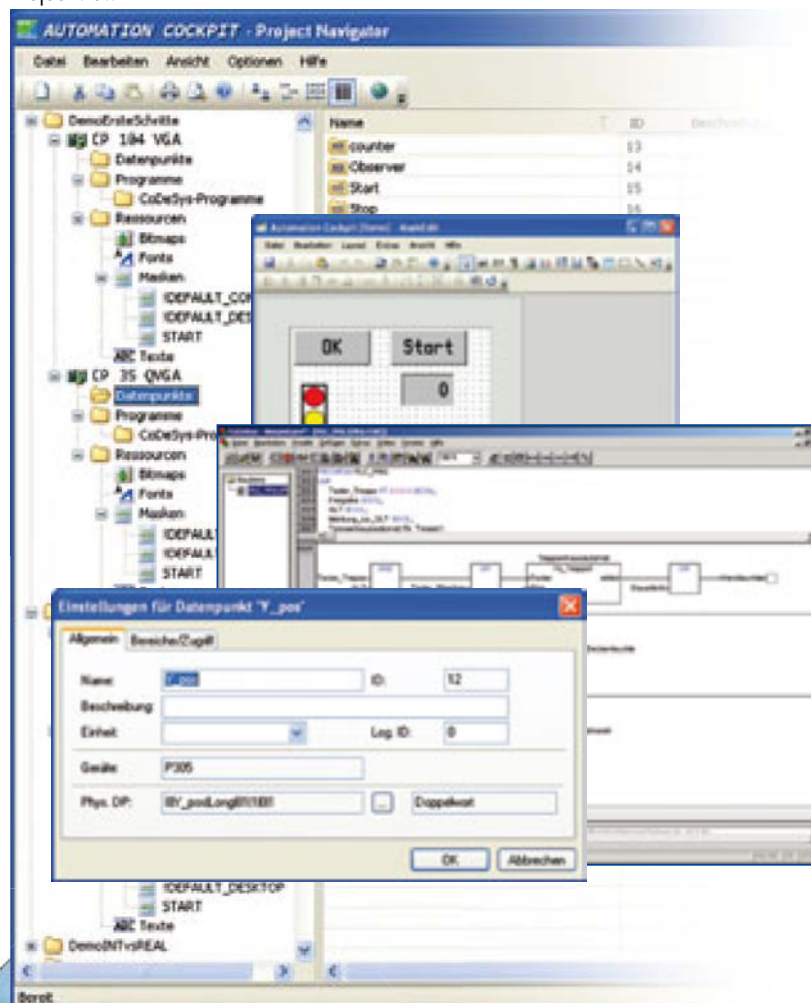
One Tool - Many Options
WAGO-I/O-PRO-CAA Software

The WAGO-I/O-PRO-CAA software is a basic programming tool. It contains the freely selectable and graphic/text-based programming languages FUP, KOP, AWL, ST, CFC and AS according to the international standard IEC 61131-3.

In addition to individual programming, function blocks can also be accessed from pre-designed libraries.

Graphically designed programs, e.g., using the FUP (Function Plan) programming language, are simple to create and are easily understood.
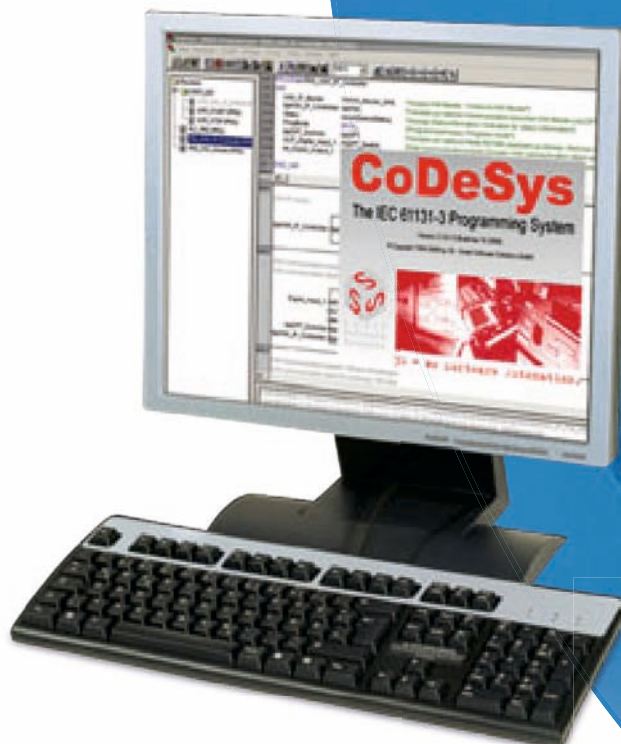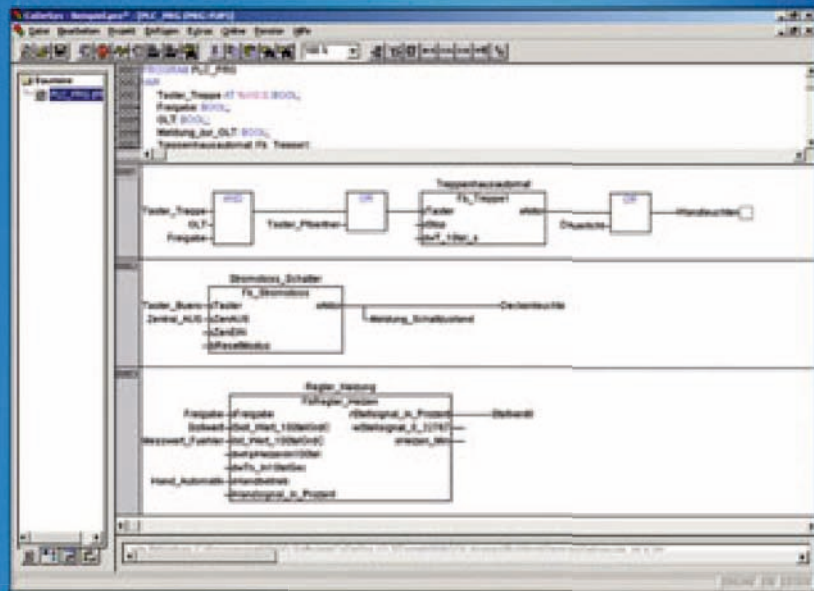
Building Automation
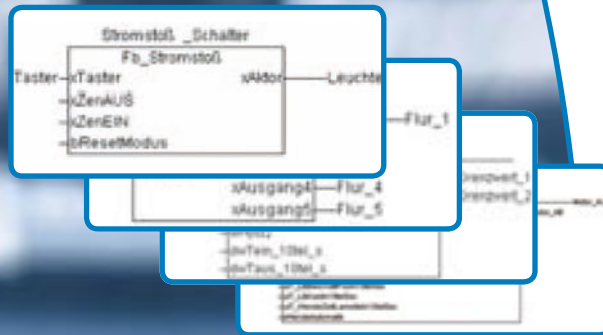
WAGO provides a large number of pre-designed functions in order to simplify programming. From simple room applications, such as lighting, dimming control and anti-glare control to HVAC modules and system macros to communication applications. The latter interfaces with DALI, EnOcean radio technology, MP-Bus, making it possible to send SMS and e-mail.

Users directly employ libraries for efficient and error-free applications.

Libraries exist in the following areas:

Room optimization
- Lighting
- Dimmers
- Lighting scenarios
- Constant light control
- Sun protection
- Shading
- and more

HVAC
- Error message monitoring
- Frost protection monitoring
- Free night cooling
- Room/air intake temperature cascade control
- Mixed air valve control
- and more

Communication
- EnOcean radio technology
- DALI
- MP-Bus
- KNX/EIB
- SMS
- E-mail
- and more

DOWNLOAD

All current libraries and application notes can be downloaded at **www.wago.com**.

Application 1

Application 2

Application 3

Application 4
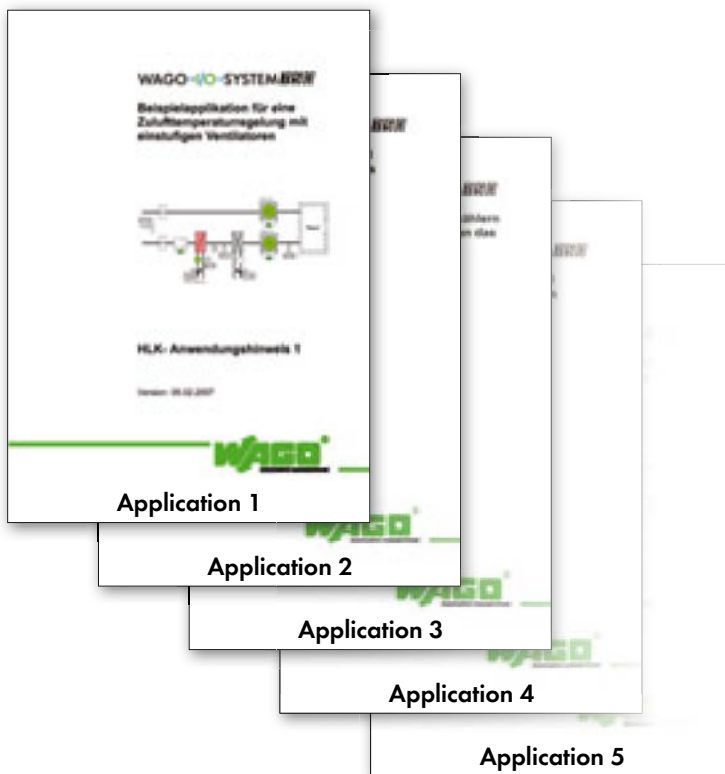
Application 5

Turnkey Application Notes

WAGO has an extensive library of detailed application notes for complex tasks, including: measurement, control, regulation technology (system macros, e.g., cascaded control systems with re-circulated air) and other building-automation applications.
In addition, the application programs are already functional. The application notes can be consulted, or used directly as templates for your own programming. The programs are executable and some have the WAGO-I/O-CAA software environment. This interface can be used via WEB browser of controllers equipped with WEB server. Other application note examples: M-Bus meter reading, connection to bidirectional EnOcean gateways, energy data acquisition via 3-phase power measurement module, and much more.

M-Bus

KNX
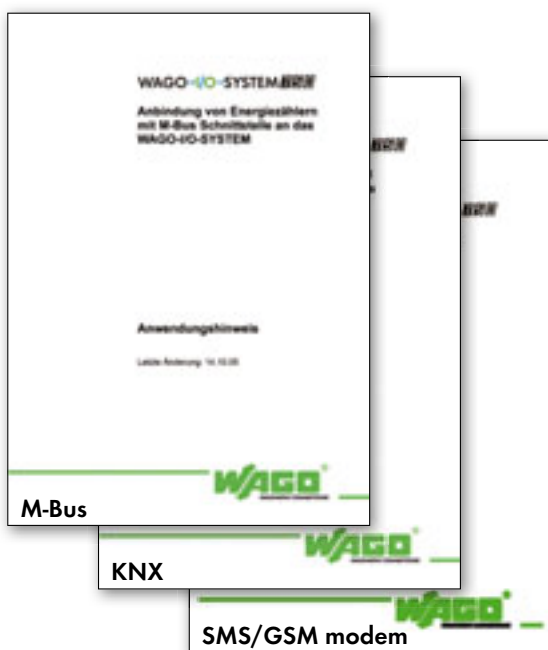
SMS/GSM modem

Concept

Our Concept:

Planning, commissioning and subsequent building operation must demonstrate maximum efficiency and a high degree of adaptability.

Pre-configured programs and pre-defined hardware significantly streamline planning and commissioning. The more applications created within a project, the greater the benefit.

Flexible building operation (e.g., conversions and room remodeling) via special maintenance levels eliminate external service costs.

Assemble, commission and configure according to project specifications.

WAGO flexROOM combines these strengths into a standard module. The contained control unit and application software are tailored to room requirements.
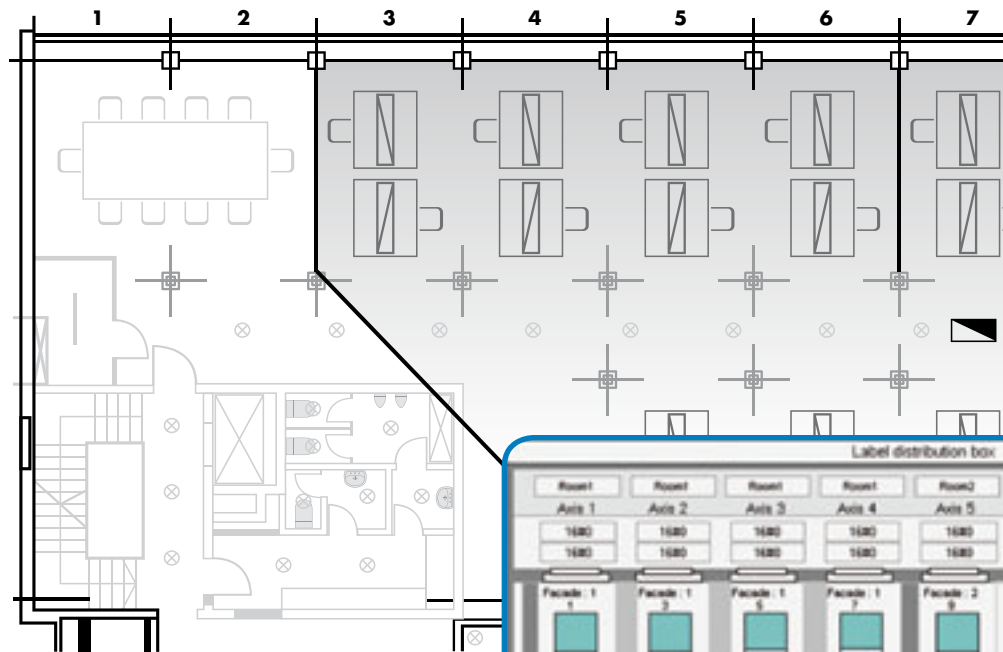
Parameterization

For each room, parameters can be stored for lighting, shading and room control. All parameters are saved in the distributor, can be stored centrally if desired and are available as a data set for a Building Management System (BMS). This convenient solution ensures that all local requirements are met and the interface to the BMS prepared. All changes to a distributor can be made locally or via the BMS. MODBUS IP, KNX and BACnet are available for interfacing with h the BMS.
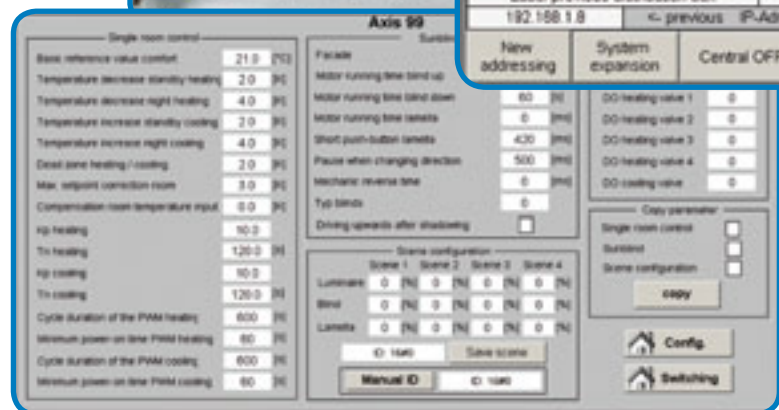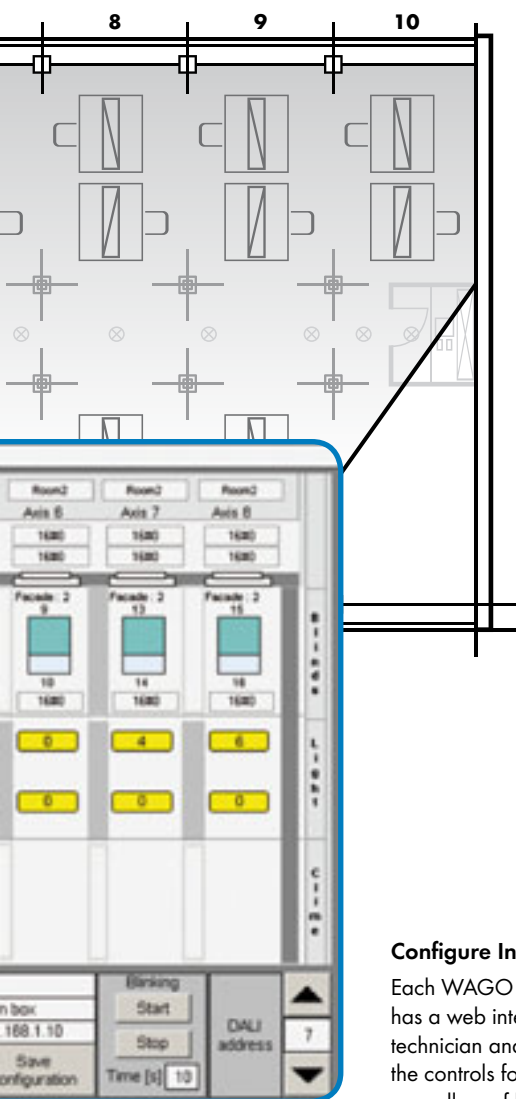
Configure Instead of Program!

Each WAGO flexROOM distribution box has a web interface. Both the commissioning technician and the end-user can configure the controls for each room via Web browser, regardless of location and distribution box. Complete wall relocations and the setting of room assignments, lighting and shading groups can be changed from the parameter interface. No additional software is required.

Advantages of flexROOM

For easy installation in any electrical distribution systems, complete sets are also included in the distribution boxes in addition to predesigned and tested hardware configurations.

No specialized technical knowledge is required, a simple Web browser with a graphical interface handles commissioning. The network structure and choice of building automation are simple – only the communication protocol from MODBUS TCP/IP should be specified.

The plant operator remains independent because plant maintenance and subsequent program changes (e.g., change in room occupancy) can be made independently. This can dramatically reduce maintenance-related costs while improving overall building planning.

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The products and solutions described on the previous pages form a solid foundation for building automation.

The design and integration of complete automation solutions and peripheral systems, requires control modules and components.

As a system partner, WAGO is ready to help with a complete line of automation components.

Key Components at a Glance:

- **Power supplies**
  The *EPSITRON®* Series provides 24V to power the WAGO controllers and IPCs

- **Network infrastructure components**
  From a simple switch to configurable communication capabilities with fiber optic connection

- **ETHERNET individual**
  ETHERNET connector RJ-45 DIY cutting and terminating

- **Screwless rail-mounted terminal blocks**
  WAGO TOPJOB® S is a range of screwless rail-mounted terminal blocks for building installation with conductors rated 1.5 - 16 mm² (16 - 6 AWG).

Pre-Packaged Solutions to Meet Your Needs

WAGO also offers complete custom pre-assembled and wired WAGO distribution boxes. These solutions reduce assembly time, ensure error-free installation and simplify startup.

Talk to us. WAGO product specialists have the experience and efficient solutions to assist you from initial specs to final install.

RJ-45 connectors

Complementary WAGO Products

- **Transfer modules**
  For RJ-45 patch cables and universal connections, such as RS-232 as 9-pole Sub-D connection

- **Relays**
  To control consumers, such as lights, shutter drives and much more.

- **Radio switches**
  Battery-free EnOcean radio switches for easy, unrestricted installation on walls completely eliminates control cabling

- **Monitors and panels**
  Touch screens and control panels from 3.5" to 15" are the interface between human and machine in the WAGO *PERSPECTO* series

- **WINSTA® connectors**
  Innovative connectors from the WAGO *WINSTA®* system for professional, pre-assembled and fast building installation. Solutions for conductors up to 4mm² (12 AWG), and rated currents up to 25A

- **WINSTA® boxes**
  Decentralized and independent control units (*WINSTA®* boxes) for convenient control of lighting and sun protection

- **Scalable telecontrol solutions**
  WAGO *TO-PASS®* – From fault detector to intelligent telecontrol PLC. Message per SMS, fax, e-mail, telephone or mobile and fast data value acquisition.
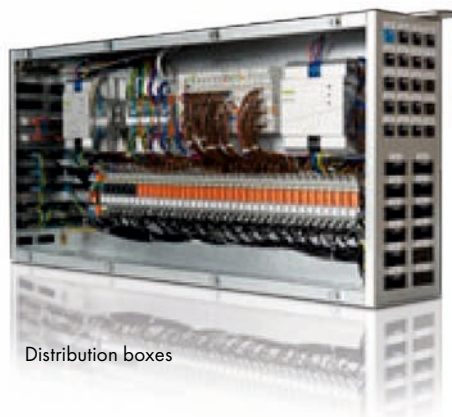
Distribution boxes
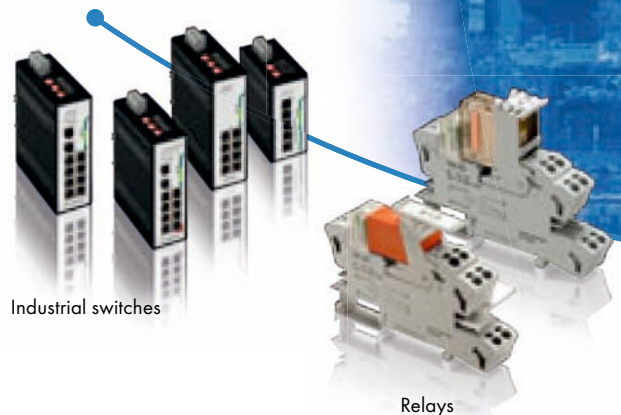
Industrial switches

Relays

TOPJOB®S rail-mounted
terminal blocks

TO-PASS® telecontrol
module and GPRS modem

EPSITRON®
power supplies

WINSTA® connection system

PERSPECTO® panels

EnOcean radio switches

Flat cable
PVC, halogen-free

EIB, KNX

Round cable
PVC, halogen-free

Power

Bus

Bus

Power

IN

OUT

WINSTA® IDC
For a high degree of flexibility
2.5 – 16 mm² / 76 A / 400 V

IN

OUT

WINSTA® IDC
For bus systems
0.5 – 1.5 mm² / 3 A / 50 V

WINSTA® EIB
For bus systems
Max. Ø 0.8 mm / 3 A / 50 V

WINSTA® MIDI
For the majority of applications
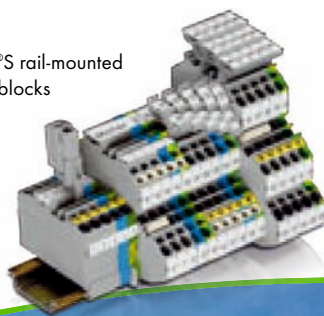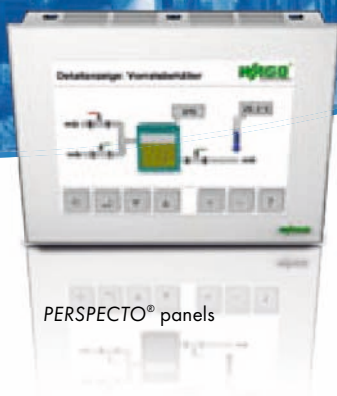0.5 – 4 mm² / 25 A / 400 V

WINSTA® MAXI
For high performance
0.5 – 6 mm² / 35 A / 400 V

WINSTA® MINI
For use in space-restricted applications
0.25 – 1.5 mm² / 16 A / 400 V

WINSTA® RD
For round conduits and ducts
1.5 and 2.5 mm² / 20 A / 250 V

The Idea:

- Quick and on-time installation and startup of even complex electrical distribution systems
- Secure and error-free "plug and play"
- Flexible and easily-expandable system

WINSTA® System Components

WINSTA® is a pluggable connection system that is ideally suited to building system requirements. As with other WAGO innovations, WINSTA® provides simple pluggable electrical connections, making it safe, error-free and quick. With pre-assembled and quality-inspected components such as cables and distribution connectors, WINSTA® installation times are drastically reduced.

The WINSTA® system forms the electrical interface from the power supply and distribution to the consumers (e.g., lights) including information technology such as bus lines in the building automation.

The WINSTA® product family consists of WINSTA® MINI, MIDI, MAXI, RD, KNX and IDC.

WINSTA® – The New Installation Standard

Under-floor installation

Cable ducts

Ceiling installation

Benefits

For Designers:

- Easily design turnkey building automation solutions
- *WINSTA®* is universal, engineered to manufacturer-independent standards – this ensures compliance with future requirements
- Free *WINSTA®* designer planning tool
- Design support and custom solutions
- Documentation

For Investors and Operators:

- Minimal installation and fast startup expedite delivery
- Simple and inexpensive implementation

For Electrical Installers:

- Rapid installation
- Error-free installation
- Fast expansion
- Easy to modify
- Modern electrical system
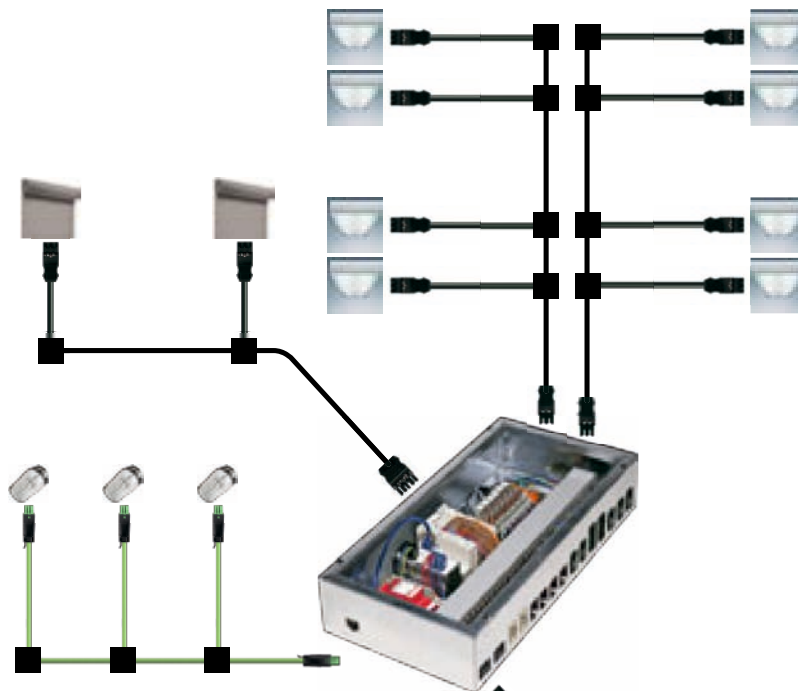
Service and Support

The WAGO Portal is home to all important Building Automation product- and service-information.

In addition to an online catalog, product data sheets, manuals, support documentation and bid forms are also available.

www.wago.com

Project Support

Reference projects are:

- Commercial buildings
- Office buildings
- Shops, display facilities
- Public buildings
- Hospitals

We advise and support

- Conceptual design
- Network planning
- Application design
- Component selection
- Assistance in preparing your bid
- Planning and project design

We can help you...

- Technical support for implementing your building projects

WAGO Seminars

WAGO products uniquely blend state-of-the-art development and manufacturing with practicality and usability. To ensure design engineers, system technicians and installers harness every product benefit for 100% performance, WAGO offers custom product seminars.

**WAGO Seminar Center
Goals:**

- Optimal product knowledge for maximum performance
- Reduced project costs through savvy implementation
- Active group discussions for knowledge transfer

WAGO's state-of-the-art Seminar Center has been developed as a professional environment that facilitates effective learning.

WAGO Company Courses

Along with open seminars, we offer subject-specific seminars at your company.

- For special topics (e.g., current projects)
- Tailored to fit your schedule with on-site courses
- 1:1 practical topics

Technical Support *AUTOMATION*

For technical applications and inquiries, please contact our technical department.

- Qualified fieldbus specialists
- Targeted fault analysis
- Spare parts service

Approximately 40% of all German end energy consumers are tied to building conditioning. Space and hot water heating account for one-third of this; two-thirds are devoted to cooling and artificial lighting.

These statistics further drive the need for increased energy efficiency for all private, public and commercial facilities. Of course, energy efficiency translates into financial efficiency. Enhanced energy efficiency for buildings is one of the primary measures in achieving the CO_2 savings targets by 2020.

Several standards support the path to increased efficiency. In Europe, a tool was created with EN 15232 to determine energy requirements for non-residential buildings.
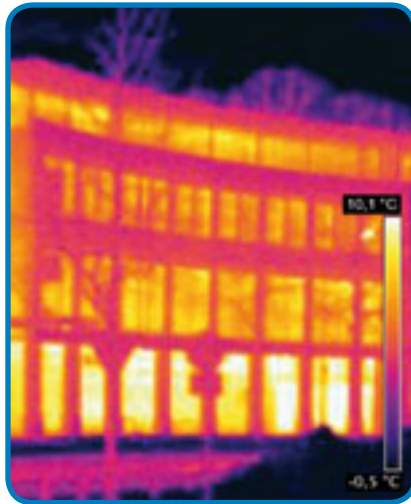
With the information obtained, buildings can be evaluated before construction and equipped accordingly. Existing buildings can also be evaluated and optimized.

Building automation plays a central role for the efficient operation of buildings. By networking building management systems with state-of-the-art room control, primary installations and building automation give the operator an effective platform for energy optimization.
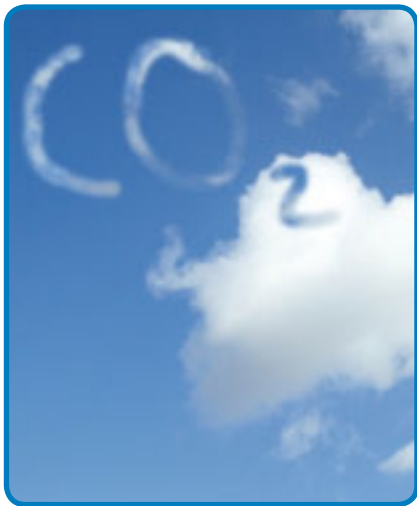
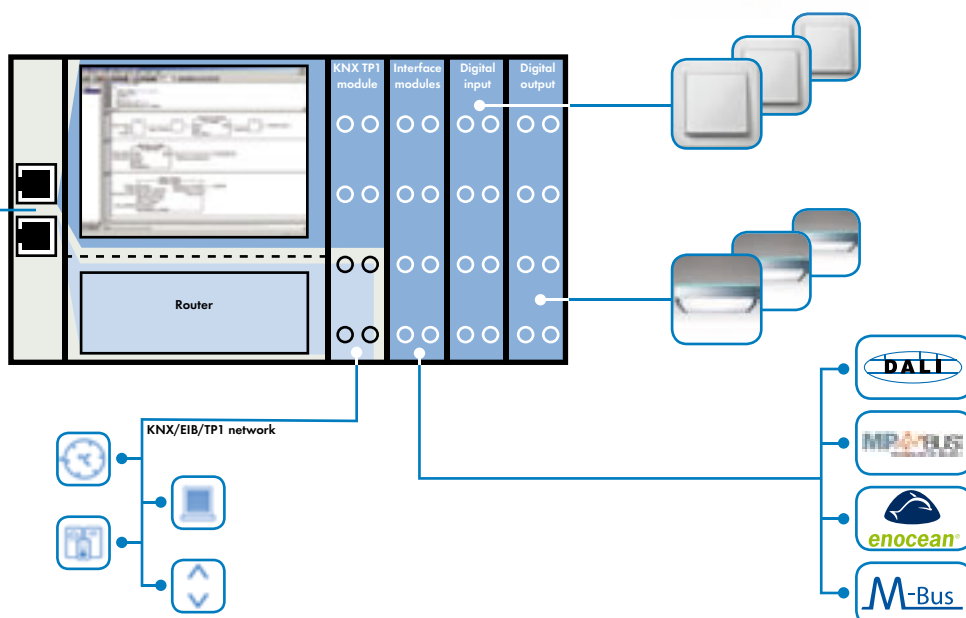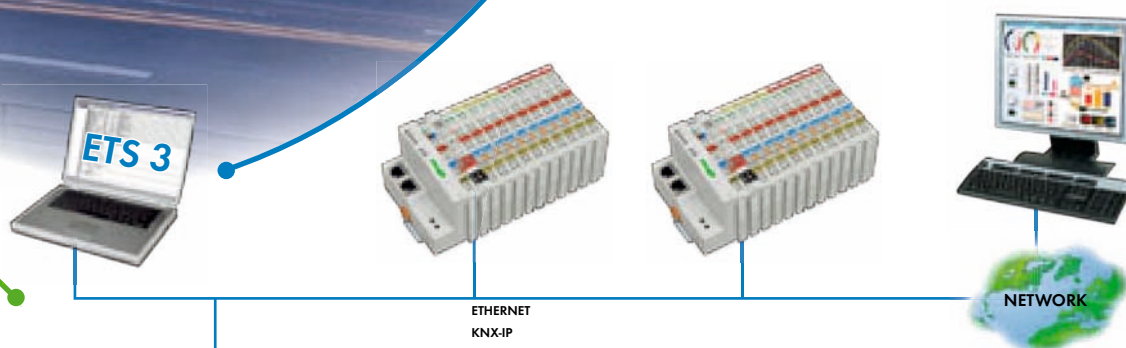WAGO has developed a variety of solutions to optimize building efficiency. And, these solutions can be integrated at any point in the build process. In fact, intelligent automation can significantly increase energy efficiency during retrofits or facility upgrades, thus reducing operational costs. The greatest potential for optimization lies in existing buildings with inefficient, non-networked automation.

Global communication standards paired with maximum data speeds make ETHERNET an indispensable automation technology. With its KNX IP controller, WAGO offers a product that links the KNX/EIB world with ETHERNET and is also a freely programmable KNX IP device.

The new KNX/EIB/TP1 module provides a link to TP1 networks (standard KNX/EIB two-wire networks).

ETS 3

Application Example

ETHERNET
KNX-IP

NETWORK

| KNX TP1 module | Interface modules | Digital input | Digital output |

Router

KNX/EIB/TP1 network

DALI

MP-BUS

enocean

M-Bus

Software

Combining the WAGO KNX IP controller with the KNX/EIB/TP1 module creates complex applications that were previously impossible. The KNX IP controllers communicate with the ETS 3/4 and with one another directly via an ETHERNET network. Connectivity to conventional sensors and actuators, as well as complex connections to DALI, EnOcean radio technology, etc., are cost-effectively unified on the KNX IP controller.

WAGO-I/O-PRO-CAA Software

The WAGO-I/O-PRO-CAA software is a basic programming tool. It contains the six graphic/text-based programming languages FUP, KOP, AWL, ST, CFC and AS according to the international standard IEC 61131-3.
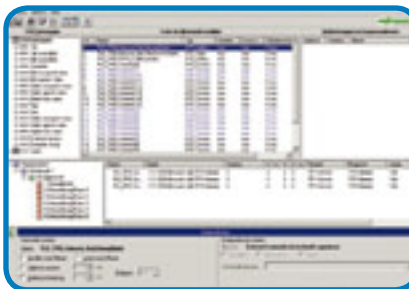
This allows each user to select the application-appropriate language, creating convenient applications for all areas of HVAC and room automation.

Graphically designed programs, e.g., using the FUP (Function Plan) programming language, are simple to create and are easily understood.

Libraries

WAGO provides an extensive suite of pre-designed functions to streamline programming. From simple room applications, such as lighting, dimming control and anti-glare control to HVAC modules and system macros to communication applications. The latter interfaces with DALI, EnOcean radio technology, MP-Bus, for the ability to send SMS and e-mail.

WAGO ETS PlugIn

WAGO KNX products are configured using the standard programming tool, ETS 3. WAGO's custom-developed plug-in supports the assignment of group addresses and application downloading.

Additional Benefits:

Innovative WAGO KNX/EIB components are seamlessly integrated in the WAGO-I/O-SYSTEM. This provides a wide range of input and output modules, specialty modules to sub-bus systems such as DALI, and controllers for higher-level networks such as BACnet. Cost-effective control units replace several individual KNX/IEB components as room and zone controllers. Communication with several thousands of devices from other manufacturers is also guaranteed with the KNX/EIB standard.

Innovation has earned the WAGO-I/O-SYSTEM a sterling reputation as the building automation standard-bearer among designers, electrical installers, system technicians and operators. Every node and controller they purchase and install is a testament to our ability to make buildings smarter and more efficient – those in the know go with the WAGO-I/O-SYSTEM.

Integrated Web Server

Using WAGO-I/O-PRO-CAA, both graphical operator and visualization interfaces can be easily created and downloaded to the Web server which is integrated into the BACnet controller. These Web pages can be accessed from any workstation PCs connected to the TCP/IP network via standard browsers.

KNX / EIB	
Item Description	**Item No.**
KNX IP controller	750-849
KNX/EIB/TP1 module	753-646

In Control of Any Situation

The BACnet controller connects the WAGO-I/O-SYSTEM with the BACnet protocol. It can be used for any automation application from basic rooms to HVAC facilities.

Generation of BACnet Objects

For digital and analog hardware data points, the appropriate BACnet objects are automatically created in the server upon start-up. Other BACnet objects can be easily created using WAGO-I/O-PRO-CAA and interface with the IEC 61131-3 application.

Communication

The controller makes required BACnet services available and makes standardized data exchange with other BACnet devices possible.

RS-232 Interface

The integrated RS-232 interface communicates with external devices.

Features:

- Device profile B-BC (BACnet Building Controller)
- Freely programmable to IEC 61131-3
- Highly modular I/O
- RS-232 interface
- Integrated Web server
- Easy configuration using the WAGO BACnet Configurator

BACnet in Building Automation

BACnet is a communication protocol standardized in accordance with DIN EN ISO 16484-5 for building automation. The BACnet protocol standardizes communication between products from different manufacturers. Device profiles, services, communication objects, object properties and transmission media have been defined in this standard to meet this goal. The WAGO 750-830 BACnet/IP Controller corresponds to the profile for a BACnet Building Controller (B-BC).

Software

WAGO-I/O-PRO-CAA Software

The WAGO-I/O-PRO-CAA software is a basic programming tool. It contains the six graphic/text-based programming languages FUP, KOP, AWL, ST, CFC and AS according to the international standard IEC 61131-3.
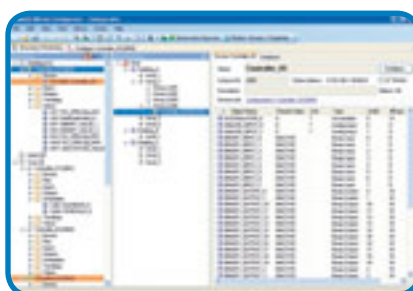
This allows each user to select the application-appropriate language, creating convenient applications for all areas of HVAC and room automation.

Graphically designed programs, e.g., using the FUP (Function Plan) programming language, are simple to create and are easily understood.

Libraries

WAGO provides an extensive suite of pre-designed functions to streamline programming. From simple room applications, such as lighting, dimming control and anti-glare control to HVAC modules and system macros to communication applications. The latter interfaces with DALI, EnOcean radio technology, MP-Bus, for the ability to send SMS and e-mail.

WAGO BACnet Configurator

The BACnet Configurator is a useful tool for configuring and operating the BACnet controller for a BACnet network. The configuration interface allows logical structuring of the network, addressing of the controller and configuration of the clients and servers to be performed. Additionally, a value browser is provided to enable the properties of BACnet objects to be viewed.

Integrated Web Server

Using WAGO-I/O-PRO-CAA, both graphical operator and visualization interfaces can be easily created and downloaded to the Web server which is integrated into the BACnet controller. These Web pages can be accessed from any workstation PCs connected to the TCP/IP network via standard browsers.

Additional Benefits:

The freely programmable WAGO 750-830 BACnet Controller is compliant with the "BACnet Building Controller" (B-BC) defined in the BACnet Standard, along with the associated, defined BIBBs (BACnet Interoperability Building Blocks).

The sheer diversity of available input and output modules, specialty modules for sub-buses such as KNX/EIB, MP bus and DALI complete the system, making the WAGO BACnet Controller very versatile.
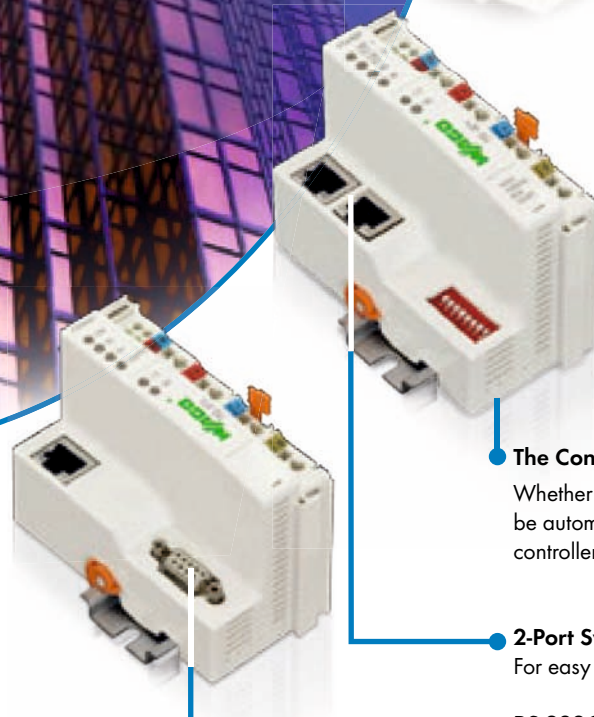
BACnet	⊕BACnet
Item Description	**Item No.**
BACnet controller	750-830

35

MODBUS

The Controller for Many Applications

Whether rooms or HVAC systems need to be automated, high-performance WAGO controllers are always the right choice.

2-Port Switch
For easy wiring

RS-232C Interface
For directly connecting level shifters, modems, etc.

Additional Benefits:

The freely programmable WAGO ETHERNET controllers are available in several versions, making the line ideal for any application. In other words, in addition to a large selection of input and output modules, specialty modules for sub-buses such as DALI, various controller designs are available. In addition, the integrated MODBUS protocol makes very fast and efficient communication via standard ETHERNET networks possible.

Innovation has earned the WAGO-I/O-SYSTEM a sterling reputation as the building automation standard-bearer among designers, electrical installers, system technicians and operators. Every node and controller they purchase and install is a testament to our ability to make buildings smarter and more efficient – those in the know go with the WAGO-I/O-SYSTEM.

MODBUS TCP in Building Automation

The well-established Modbus TCP protocol extends 1979's Modbus protocol for PLCs. Unlike industrial automation, there is no standardized protocol for building automation. However, a new development is the usage of TCP/IP as a transmission medium (ETHERNET TCP/IP-based client server communication). The advantage: Modbus is a simple, streamlined protocol that ensures exceptionally rapid data transmission.

The MODBUS/TCP user finds a number of powerful controllers and IPCs for DIN-rail mounting in the WAGO portfolio.

Software

WAGO-I/O-PRO-CAA Software

The WAGO-I/O-PRO-CAA software is a basic programming tool. It contains the six graphic/text-based programming languages FUP, KOP, AWL, ST, CFC and AS according to the international standard IEC 61131-3.

This allows each user to select the application-appropriate language, creating convenient applications for all areas of HVAC and room automation.

Graphically designed programs, e.g., using the FUP (Function Plan) programming language, are simple to create and are easily understood.

Libraries

WAGO provides an extensive suite of pre-designed functions to streamline programming. From simple room applications, such as lighting, dimming control and anti-glare control to HVAC modules and system macros to communication applications. The latter interfaces with DALI, EnOcean radio technology, MP-Bus, for the ability to send SMS and e-mail.

Integrated Web Server

Using WAGO-I/O-PRO-CAA, both graphical operator and visualization interfaces can be easily created and downloaded to the Web server which is integrated into the BACnet controller. These Web pages can be accessed from any workstation PCs connected to the TCP/IP network via standard browsers.

MODBUS TCP	MODBUS
Item Description	**Item No.**
ETHERNET controller	750-841
ETHERNET controller	750-871
ETHERNET controller	750-873

LONWORKS

Technology

The controller makes it possible to connect up to 62 I/O modules. This corresponds to 496 digital or 248 analog datapoints

Internal Communication

Links specially address IEC -61131-3 variables to the Neuron Chip via LNS-compliant PRIOs plug-in. This plug-in supports all SNVTs from the LONMARK® SNVT Master List.

Freely Programmable LonWorks® Controller

Generation of any application program required using the WAGO-I/O-PRO CAA tool in accordance with IEC 61131-3

Network Connection

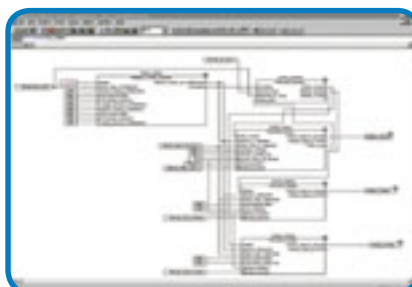Twisted Pair, 78 kbps, FTT 10A, support for any Standard Network Variable Types (SNVT)

Features:

- LonWorks®-compliant controller
- Compatible with all network variables based on the LONMARK® SNVT Master List
- Network connection: Twisted Pair, 78 kbps
- Freely programmable to IEC 61131-3
- Highly modular I/O
- LNS plug-in for commissioning

Software

LONWORKS® is distinguished by flexible cross-discipline topology and functionality. LonWorks®-compatible hardware and software components satisfy LONMARK® Directives and readily communicate across manufacturers. The sheer number of components currently available on the market demonstrates that LonWorks® is an open and interoperable system for building automation. In addition to hardware, WAGO also provides software for the implementation of cross-discipline networks. When combined with the WAGO-I/O-PRO CAA tool and LNS Plug-In PRIO, users can successfully implement extremely complex applications.

WAGO-I/O-PRO-CAA Software

The WAGO-I/O-PRO-CAA software is a basic programming tool. It contains the six graphic/text-based programming languages FUP, KOP, AWL, ST, CFC and AS according to the international standard IEC 61131-3.
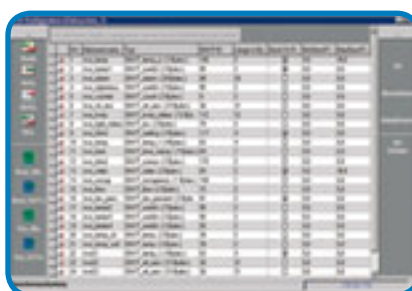
This allows each user to select the application-appropriate language, creating convenient applications for all areas of HVAC and room automation.

Graphically designed programs, e.g., using the FUP (Function Plan) programming language, are simple to create and are easily understood.

Libraries

WAGO provides an extensive suite of pre-designed functions to streamline programming. From simple room applications, such as lighting, dimming control and anti-glare control to HVAC modules and system macros to communication applications. The latter interfaces with DALI, EnOcean radio technology, MP-Bus, for the ability to send SMS and e-mail.

LNS Plug-In PRIO

Allocation of the IEC -61131-3 variables to standard network variable types is simplified with WAGO LNS Plug-In PRIO. This plug-in is compatible to all SNVTs from the LONMARK® SNVT Master List (length 1-31 Bytes). This ensures the greatest degree of interoperability with products from other manufacturers.

Additional Benefits:

Pairing the freely programmable LONWORKS® controller together with the WAGO-I/O-SYSTEM seamlessly matches interworking components. The large selection of input and output modules, specialty modules for sub-buses, such as DALI, EnOcean radio technology, MP-Bus and a number of other ready-to-use program modules provide a wide range of possible applications.

In this process, consistent adherence to the LONMARK® specifications and the option of using all the SNVTs included in the LONMARK® SNVT master list provides a virtual guarantee for trouble-free communication with a wide range of international LON® products.

LonWorks® (LON®)	
Item Description	**Item No.**
LonWorks® coupler	750-319
LonWorks® controller	750-819
Data exchange coupler	750-319/004-000

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DALI

DALI stands for Digital Addressable Lighting Interface and is a protocol, which is defined in the IEC Standard 62386.

The DALI standard, a protocol used across manufacturers, ensures the interoperability of electronic ballasts in lighting applications. This standard replaces the 1-10V dimmer interface.

A DALI Master can control up to 64 devices. Each device can be assigned to 16 individual groups and 16 individual settings.
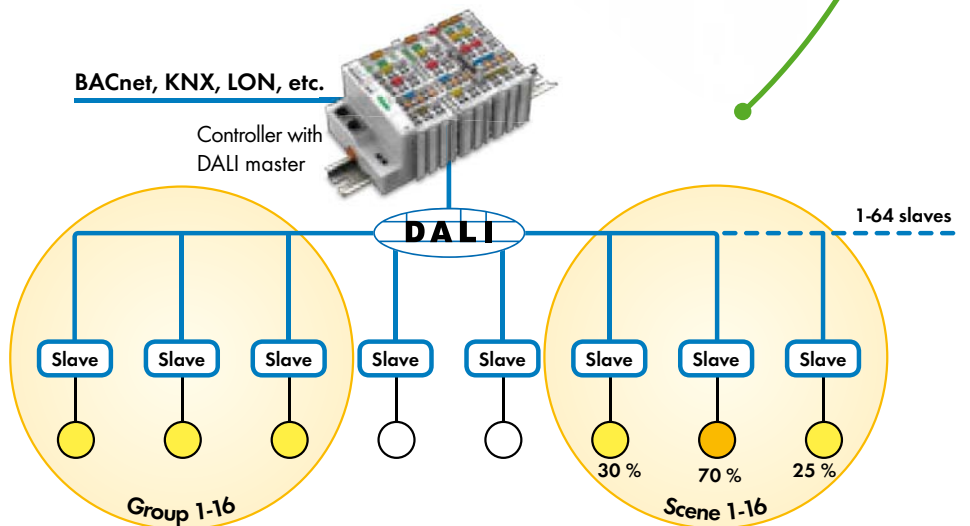
The topology of the DALI bus is not specified. Line, tree, star or mixed structures are possible.

DALI systems control individual lights or groups of lights. Parallel wiring of the control groups is not required. Assignment of individual lights to operating elements, as well as grouping of lights, can also be performed later and is possible at any time without rewiring.

BACnet, KNX, LON, etc.

Controller with DALI master

DALI

1-64 slaves

| Slave | Slave | Slave | Slave | Slave | Slave | Slave | Slave |

30 %   70 %   25 %

Group 1-16   *Scene* 1-16

System Features:

- Digital transfer via 2 wires
- 64 slaves, 16 groups, 16 settings per DALI chain
- Status confirmation of individual lights
- Storage of configuration data in the electronic ballast, such as group association(s), light scene value(s), dim rate, emergency lighting value (system failure level), power ON level
- Cable lengths up to 300m (depending on cable cross section)

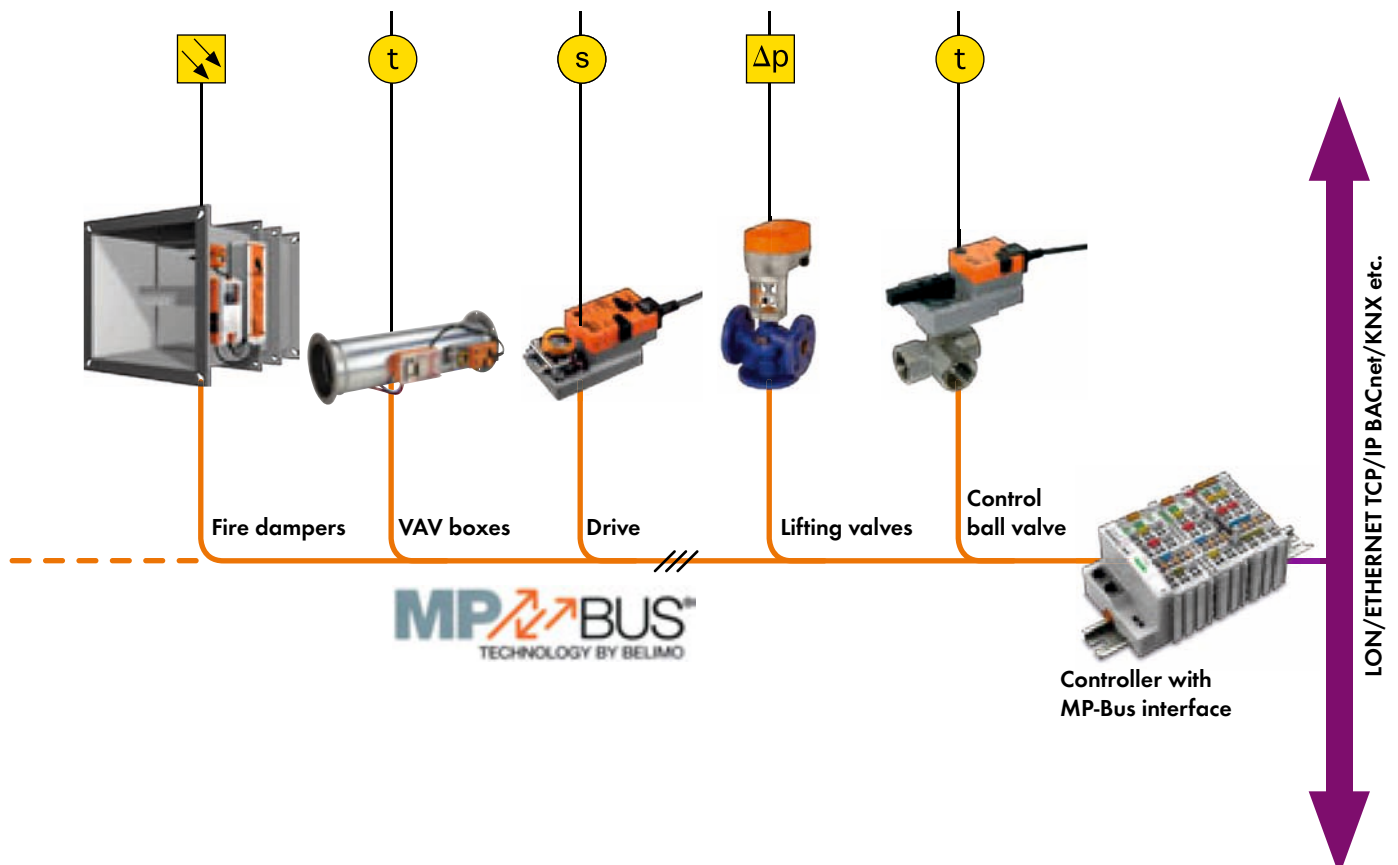40   *Additional information at www.dali-ag.org*

MP-Bus

The MP-Bus controls HVAC actuators for dampers, regulator valves or VAV air volume controls. Devices that are equipped with an MP-Bus connection can communicate with a higher-level control system via bus cable. The actuators have connections for active and passive sensors (temperature, humidity, ON/OF switch, etc.), and are accessible via MP-Bus.

System Features:

- Up to eight drives can be controlled via MP-Bus from one MP master
- One active or passive sensor and one switch can be connected to the MFT2/ MP drives
- There are no limitations for wiring topology – star, ring, tree or mixed forms are allowed
- Data can be exchanged between a master and the slaves, such as absolute volumetric flow, relative volumetric flow, min/ max limits, angular position, sensor value, operating status and fault messages

Additional information at www.belimo.com

Fire dampers   VAV boxes   Drive   Lifting valves   Control ball valve

Controller with MP-Bus interface

LON/ETHERNET TCP/IP BACnet/KNX etc.

Radio switches and sensors based on EnOcean technology harvest ambient energy to power themselves. Switches, for example, can be supplied using mechanical operation energy, sensors with the temperature difference to the environment or with light energy.

Each transmitter has a unique number and can be registered by a receiving unit that's up to 300m away. Despite the limited energy available, these high-efficiency electronics can transmit the signal several times, increasing transmission integrity.

WAGO EnOcean radio technology facilitates connecting hard-to-reach or moving machine components. This innovative approach improves application aesthetics and sophistication.

System Features:
- Maintenance-free battery through energy harvesting
- Long range – up to 300m line of sight, or 30m within buildings
- Unlimited number of sensors
- Four billion code numbers provide for clear transmitter/receiver assignment
- Repeated, time-shifted transmission of the radio telegrams at very short transmission times, results in a high level of protection against external interferences

Additional information at www.enocean.com

EnOcean Dolphin

The EnOcean Dolphin system architecture has expanded to include bidirectionally communicating sensors and actuators. The interoperability of EnOcean Dolphin makes it possible to combine products from different manufacturers into a continuous system.

EnOcean Dolphin is also backward compatible.

Advantages – Enabled by EnOcean
- Maintenance-free battery through energy harvesting
- EnOcean is the radio standard in building automation
- Bidirectional communication – even with self-energizing sensors
- Self-powered actuators (e.g., radiator valve control)
- Interoperability of end products
- Reliability for sensor-intensive systems

RS-232/-485

EIA-/RS-232, EIA-/RS-485/ and EIA-/RS-422 are definitions for serial interfaces.

RS-232 only supports point-to-point connections.

RS-422 has one transmitter and several receivers.

RS-485 allows several transmitters and receivers on one segment.

For the three different interfaces, specific electrical properties have been defined. A specific protocol is not assigned to the respective standard, i.e., the protocol can be selected based on the application.
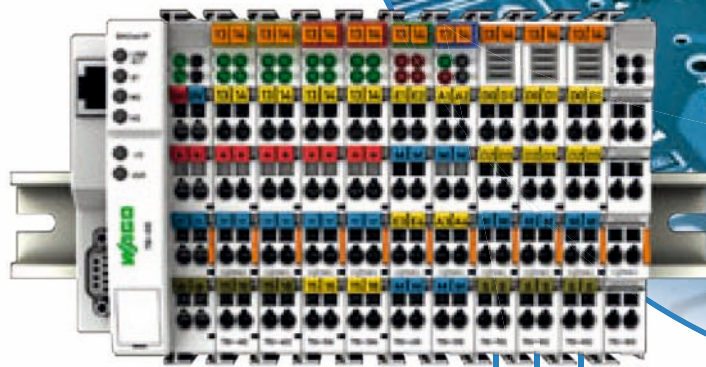
Examples of bus protocols that are built on the RS-485 standard along with other media: MODBUS RTU, BACnet MS/TP, PROFIBUS, as well as several manufacturer-specific protocols. Converters are often used that either convert the physical signal of the standard interface into the required signal level (level shifter without own intelligence) or convert from a protocol to another protocol (protocol converter/gateway).

For example, level converters are for SMI or M-Bus, protocol converters are available for the EnOcean technology.

System Features:

• Protocol-independent interface
• RS-232 for peer-to-peer connections
• RS-485, e.g., for MODBUS RTU

M-Bus

The M-Bus (Meter-Bus) is a cost-effective fieldbus for the transfer of energy consumption data. A central master – a WAGO controller with downstream level converter in its simplest form – communicates with the slaves via a 2-wire bus (per segment up to max. 250 slaves: heat meter, water meter, electricity meter, gas meter, etc. as well as sensors and actuators of any kind).
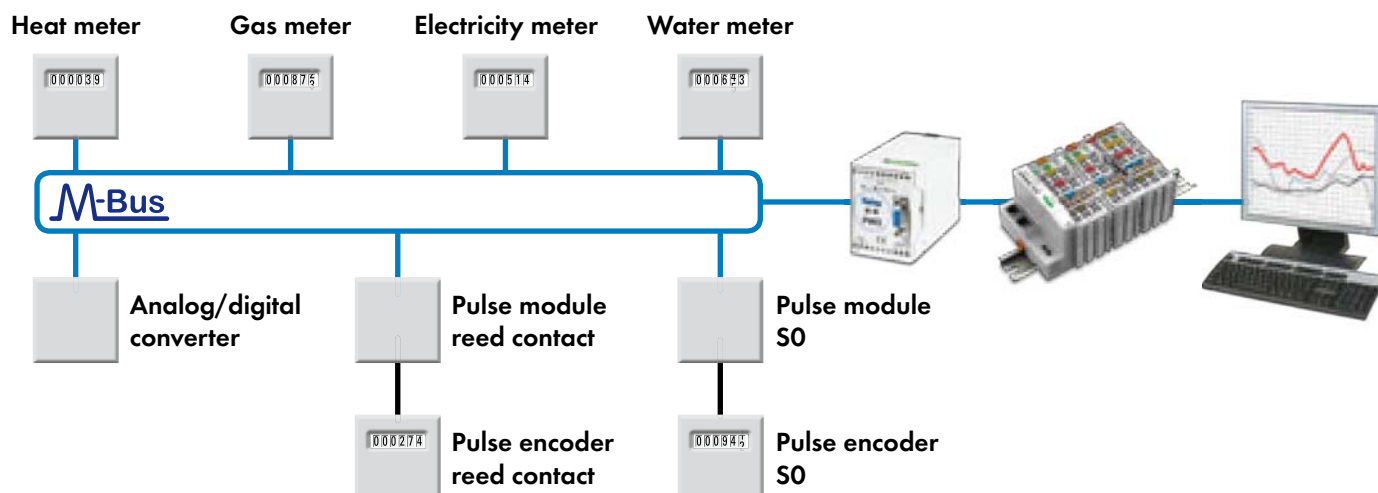
Manufacturers are increasingly implementing the electrical M-Bus interface including protocol level in consumption meters.

M-Bus

System Features:

- All consumption meters are connected to a central office by a single cable (bus)
- Select bus nodes are supplied directly via the 2-wire bus
- Devices from various manufacturers can be connected to a bus system, i.e., the user is not bound to a meter manufacturer

Additional information at www.m-bus.com

Heat meter	Gas meter	Electricity meter	Water meter

M-Bus

Analog/digital converter

Pulse module reed contact

Pulse module S0

Pulse encoder reed contact

Pulse encoder S0

3-Phase Power Measurement Module

The 3-phase power measurement module measures the electrical data in a three-phase supply network. The voltage is measured via network connection to L1, L2, L3 and N. The current of the three phases is connected to the module directly up to 5A and is fed to IL1, IL2, IL3 and IN via current transformers.

Therefore, the 3-phase power measurement module provides comprehensive network analysis via fieldbus. Based on the values for voltage, current, effective and apparent power consumption, the user is able to measure and evaluate energy consumption.

System Features:

- Direct measurement up to 5A, also via current transformer
- Small width – just 12mm
- Comprehensive evaluation via visualization display elements
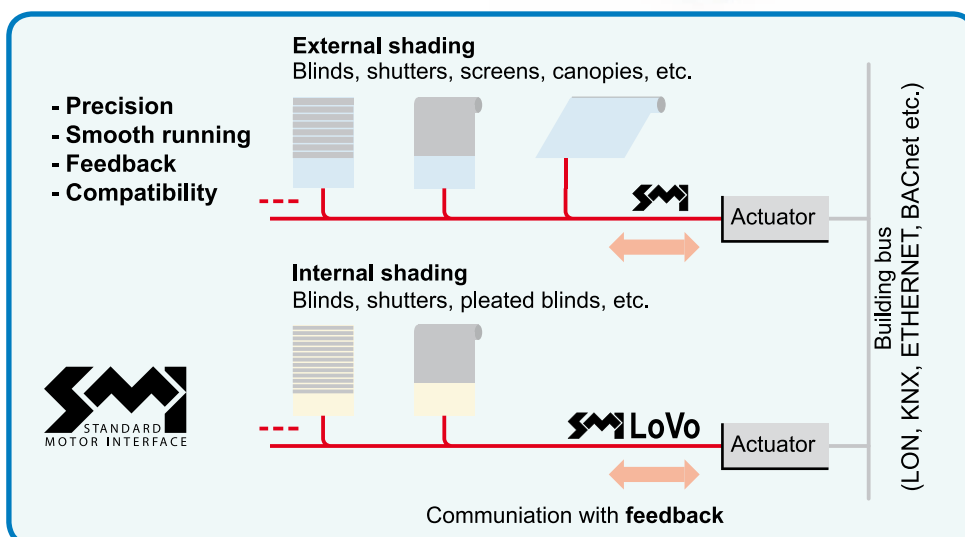
Additional information at www.wago.com
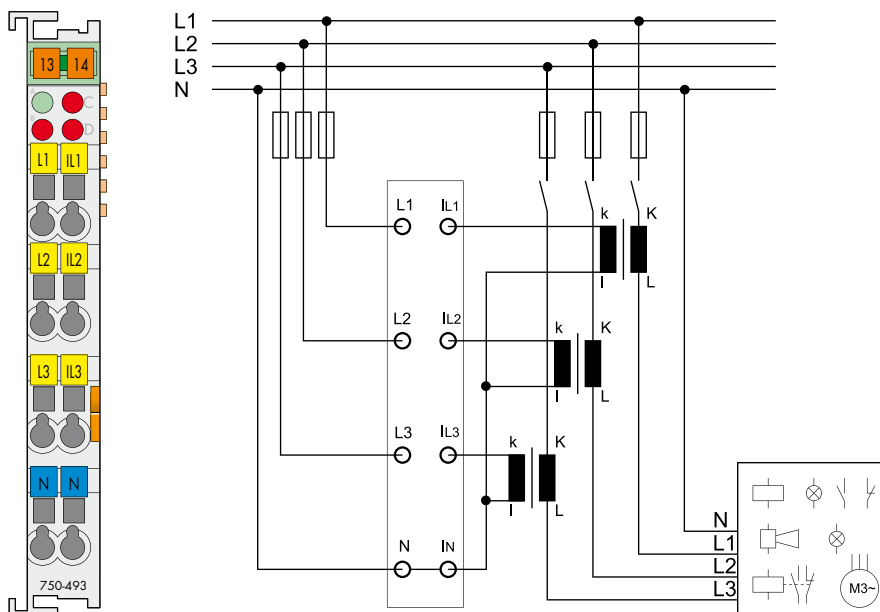
U1 = 232 V	U2 = 233 V	U3 = 232 V
I1 = 7.08 A	I2 = 7.2 A	I3 = 10.64 A
P1 = 1612 W	P1 = 1632 W	P3 = 2400 W
cos Phi1 = 0.98	cos Phi2 = 0.99	cos Phi3 = 0.98

Configuration

SMI

SMI stands for STANDARD MOTOR INTER-FACE and is the uniform electrical connection between shutter and sunblind drives. Leading European manufacturers have formed the SMI Consortium to develop the digital motor interface. Both switching commands and telegrams can be used to control drives via this uniform interface.

System Features:

- Depending on the application, up to 16 drives can be controlled electrically in parallel
- Electronic control units and drives are connected by a 5-wire line with power supply and data transfer
- Precise startup from intermediate positions
- Query of current motor positions
- Feedback from motor with diagnostic findings

Additional information at
www.standard-motor-interface.com

Diagram

- Precision
- Smooth running
- Feedback
- Compatibility

External shading
Blinds, shutters, screens, canopies, etc.

Internal shading
Blinds, shutters, pleated blinds, etc.

Actuator

Actuator

Building bus
(LON, KNX, ETHERNET, BACnet etc.)

Communiation with **feedback**

STANDARD
MOTOR INTERFACE

WINSTA® Sunblind Box

The *WINSTA®* Sunblind Box is a decentralized, stand-alone control unit that controls up to 4 sunblind motors operated via standard switches. Output group configuration, operating time and "slat/sunblind" mode selection are performed via DIP switch.

Networking boxes provides extended functionality:

1. The sunblinds of all connected boxes are moved into the upper or end position via a central 24V control line. Either a weather station, timer or central switch can enable this functionality.

2. The boxes also connect to a serial bus, allowing a higher-level control system to access up to 16 boxes connected to one bus segment. This operating mode allows both individual channels and groups of boxes to be addressed.

System Features:

- Stand-alone control unit (4 channels) for easy entry into the automation of blinds
- On-site operation via standard switches
- Easy configuration via DIP switches: operating time, group configuration, blinds/slats mode

Alternative:

- Central function via networking of a 24V control signal
- Bus connection of up to 16 *WINSTA®* Sunblind Boxes to a higher-level controller either directly with the original equipment or for later retrofitting
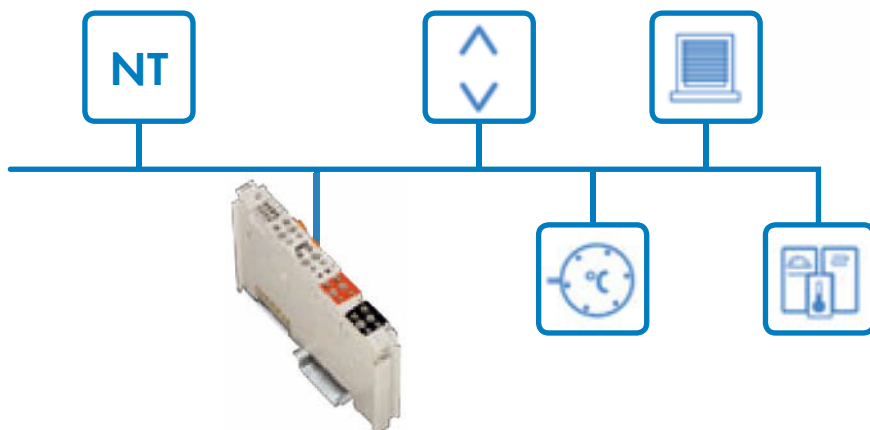
Additional information at www.wago.com
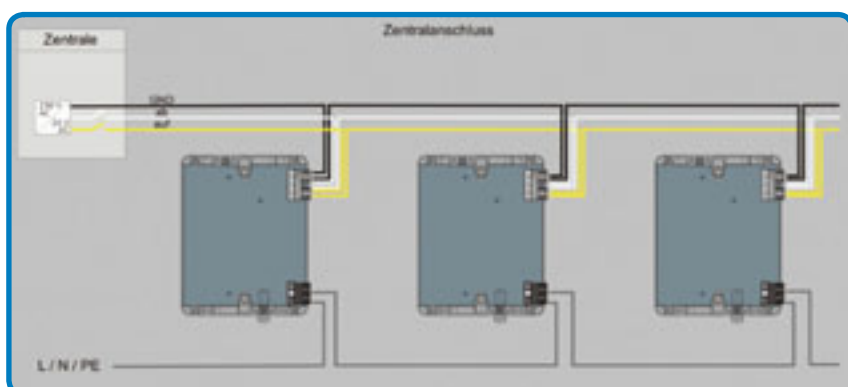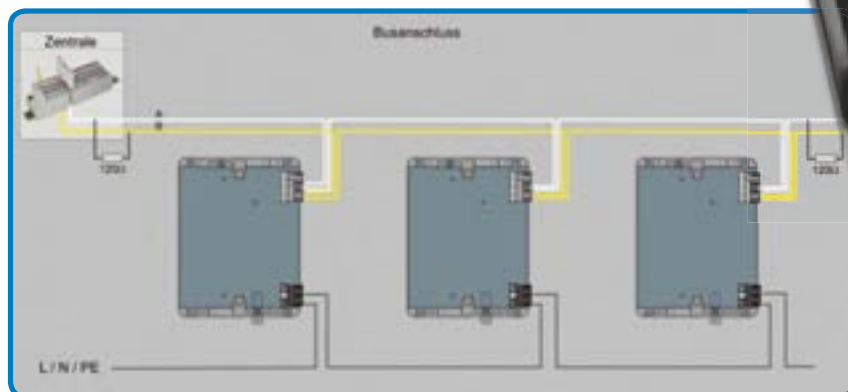
KNX/EIB TP1
(Twisted Pair)

KNX/EIB is well established as a flexible bus system for building automation. KNX ensures manufacturer-independent compatibility and interoperability of various devices and systems. To commission KNX devices and networks, there is a central tool with the Engineering Tool Software ETS.

System Features:

- Up to 64 KNX nodes in a line
- Power supply within the line by KNX power supply unit
- Configurable via product databases
- Certified products guarantee interoperability

Additional information at www.knx.org

AS-Interface

AS interface is an international standard for fieldbus communication that eliminates complex parallel wiring of sensors and actuators. The "Yellow Cable" is a brand name whose two wires transfer energy and data simultaneously. The AS interface solution is more of an intelligent cabling system than a true fieldbus, allowing simple sensors and actuators to be wired via a two-line bus including power supply.

System Features:

- Applications include factory automation, process engineering and building automation
- Free topology choice, tree structures ranging up to 1000m
- Up to 62 AS interface slaves can connect to a master

Additional information at www.as-interface.net

PROFIBUS
ETHERNET TCP/IP
BACnet
KNX-IP
LON

PROFIBUS DP

WAGO-I/O-SYSTEM

Configuration, for example, via WAGO-I/O-CHECK

IP20

DI DO

Slaves: digital input/digital output

IP67

AI AO

Slaves: analog input/analog output

Safety-at-work monitor

M

Motor outgoing feeders

DI DI

Safety-at-work slave

AS-Interface power supply unit
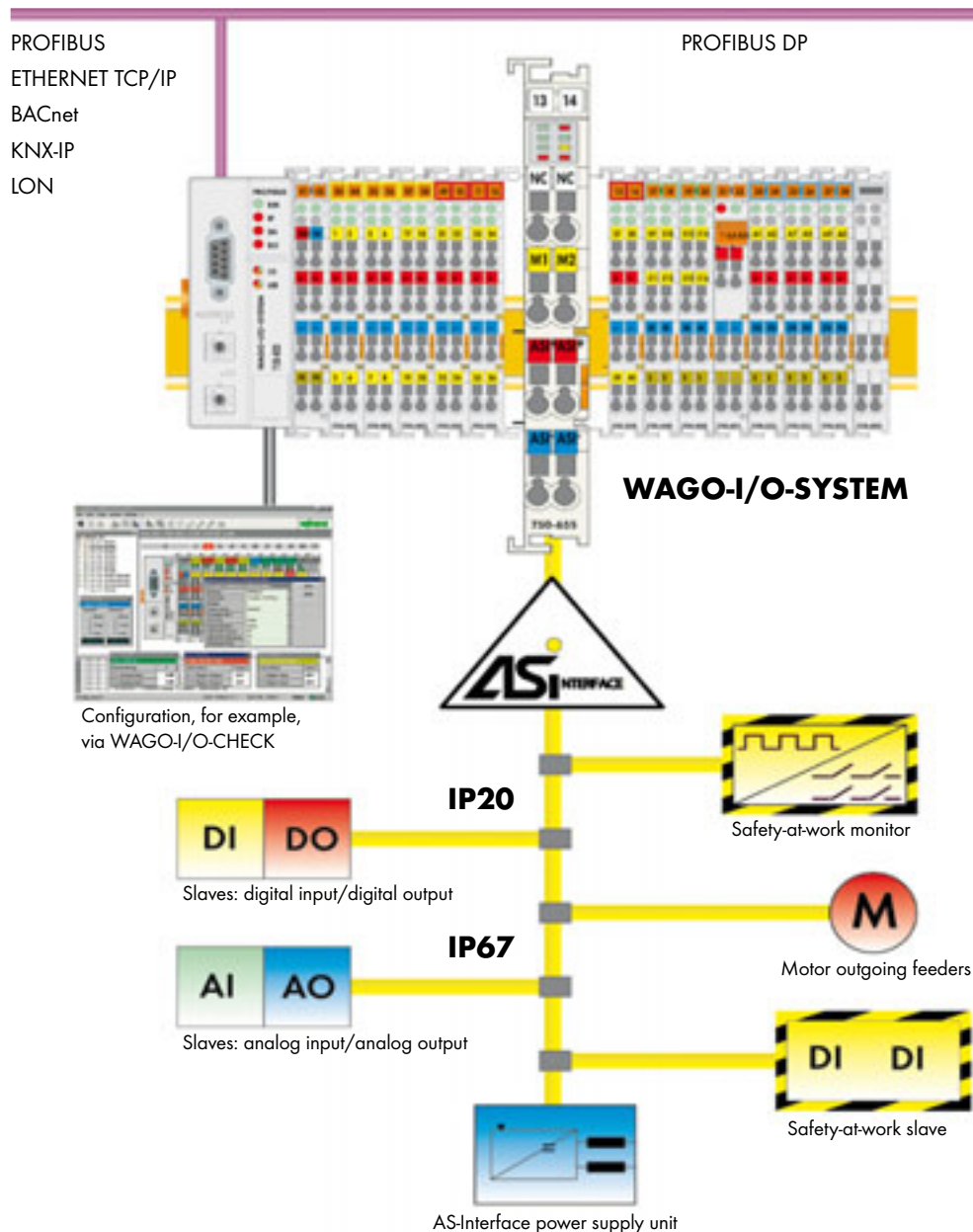
This Brochure is Just the Start

All product and user information in the "WAGO in Building Automation" brochure, as well as solutions found within libraries and applications, are state-of-the-art.

However, we are continually developing product extensions, evolving technology and providing both useful details and process solutions. Our customers are continuously combining their ingenuity with our innovation to create interesting, reference projects that lead to functional synergies.

This brochure is intended for long-term usage as a general reference point. We offer continuously updated information about WAGO building automation on our web site.

Summary

The WAGO Web Site Provides Current Information

At www.wago.com, we have set up the "Building Automation" Internet portal, which is continuously updated with information and references.

Go to the portal at "Applications > Building Automation" to obtain comprehensive information by bus system to about hardware and software products.

Go to "Service > Downloads" to obtain the latest documents, data sheets and preconfigured application examples.

www.wago.com

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