# TELECONTROL TECHNOLOGY

## Power Grid Products and Solutions



WE INNOVATE!

WAGO®

# INTELLIGENT TELECONTROL

## System Provides Long-Term Investment Protection

**Transitioning to renewable energy is great for the environment; however, it presents tremendous challenges to energy suppliers, network operators and the grids themselves. It sounds so simple, yet the truth is that decentralization has required a complete 180 when it comes to electrical generation. And this has engineers rethinking:**

- The monitoring of supply points and substations
- Regulation of voltage, frequencies, reactive power and more
- Secure archiving, evaluation and transmission of data
- IT Security — Protected data transmission between a decentralized station and control system

In fact, both a white paper from the German Energy and Water Industry Association (BDEW) as well as the IT security catalog issued by the Federal Network Agency provide comprehensive guidelines on IT security. And the WAGO-I/O-SYSTEM 750 is ready to accommodate these security requirements. Thus, the following features have already been implemented in select controllers:

- OpenVPN encryption
- IPsec encryption
- MAC filter
- Separate TCP/IP ports

All of these requirements are also placed on other supply technology sectors, such as gas, water and heat. And this focus on security has made the WAGO-I/O-SYSTEM "the automation system for every application."

750-880/025-001
750-880/025-002



750-880/040-001

# SCALABLE CONTROLLERS

## for Telecontrol Technology

| PLC for Telecontrol Technology | | | | |
|---|---|---|---|---|
| Item No. | 750-880/ 040-001 | 750-880/025-001 750-880/025-002* | 750-8202/025-001 750-8202/025-001* | 750-8206/ 025-001 |
| Approvals | UL 508, CE, GL | | | |
| CPU | ARM 9; 80 MHz | | Cortex A8; 600 MHz | |
| Interfaces | | | | |
| LAN | 2 x RJ-45 | | 2 x RJ-45/Dual LAN | |
| I/O interfaces (serial) | – | | 1 x RS-232, 1 x D-Sub 9, socket (switchable) | |
| I/O interfaces (USB) | – | | | |
| Memory | | | | |
| Non-volatile memory (retain) | 32 KB | | 128 KB | |
| Program memory | 1 MB | | 16 MB | |
| Data memory | 1 MB | | 64 MB | |
| Memory expansion | SD and SDHC up to 32 GB | | | |
| Fieldbus (optional) | – | | | PROFIBUS DP Slave, CAN, CANopen |
| Programming | WAGO-I/O-PRO v2.3 | | | |
| Telecontrol protocols | Modbus/TCP (UDP), EtherNet/IP, IEC 60870-5-101/-103/-104, IEC 61850 / 61400-25 3964R/RK512 | | | |
| Operating temperature | -40 °C ... +70 ° C | -20 °C ... +60 ° C | | |
| EMC: CE-Immunity to interference | acc. EN 60870-2-1 | acc. EN 61000-6-2 | | |
| EMC: CE-Emission of interference | acc. EN 60870-2-1 | per EN 61000-6-4 | | |

*Number of modules: 4

750-8206/025-001

750-8202/025-001
750-8202-025-002

# SMART GRID — AN INTELLIGENT NETWORK FOR SMART SOLUTIONS
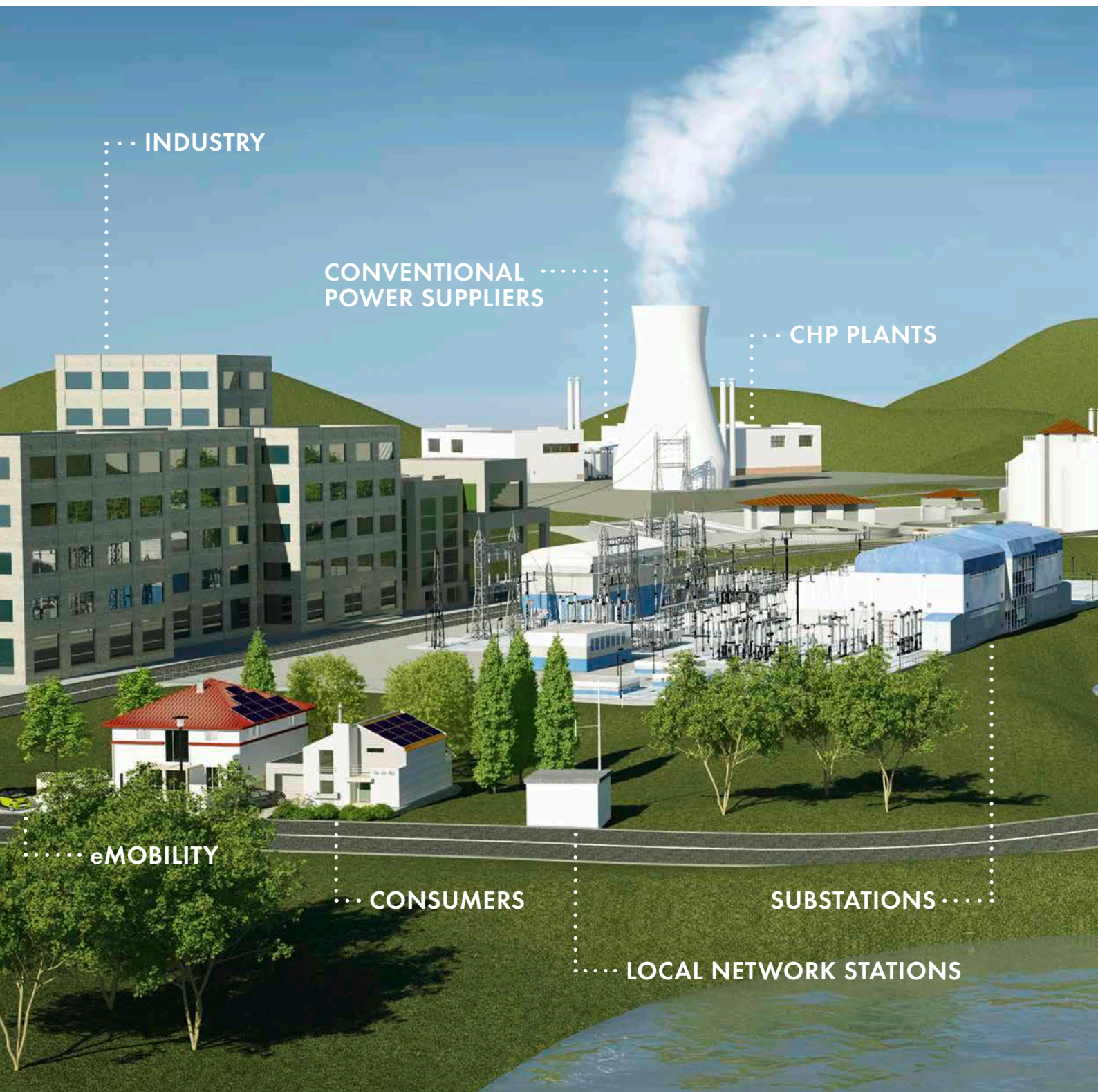


INDUSTRY

CONVENTIONAL POWER SUPPLIERS

CHP PLANTS

eMOBILITY

CONSUMERS

SUBSTATIONS

LOCAL NETWORK STATIONS

WIND FARMS

PUMPED-STORAGE PLANTS

BIOGAS

BIOGAS PLANTS

SOLAR FARMS

WAGO®

# SMART GRID CHALLENGE
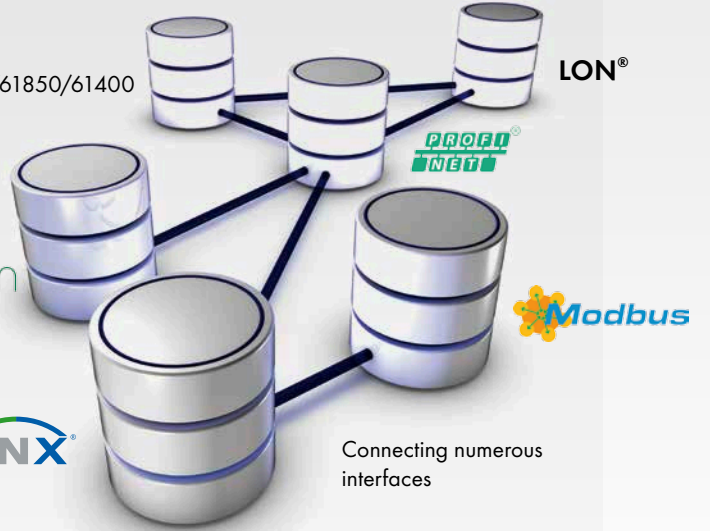
IEC 60870/61850/61400

LON®

PROFI NET®

CANopen

Modbus

KNX®

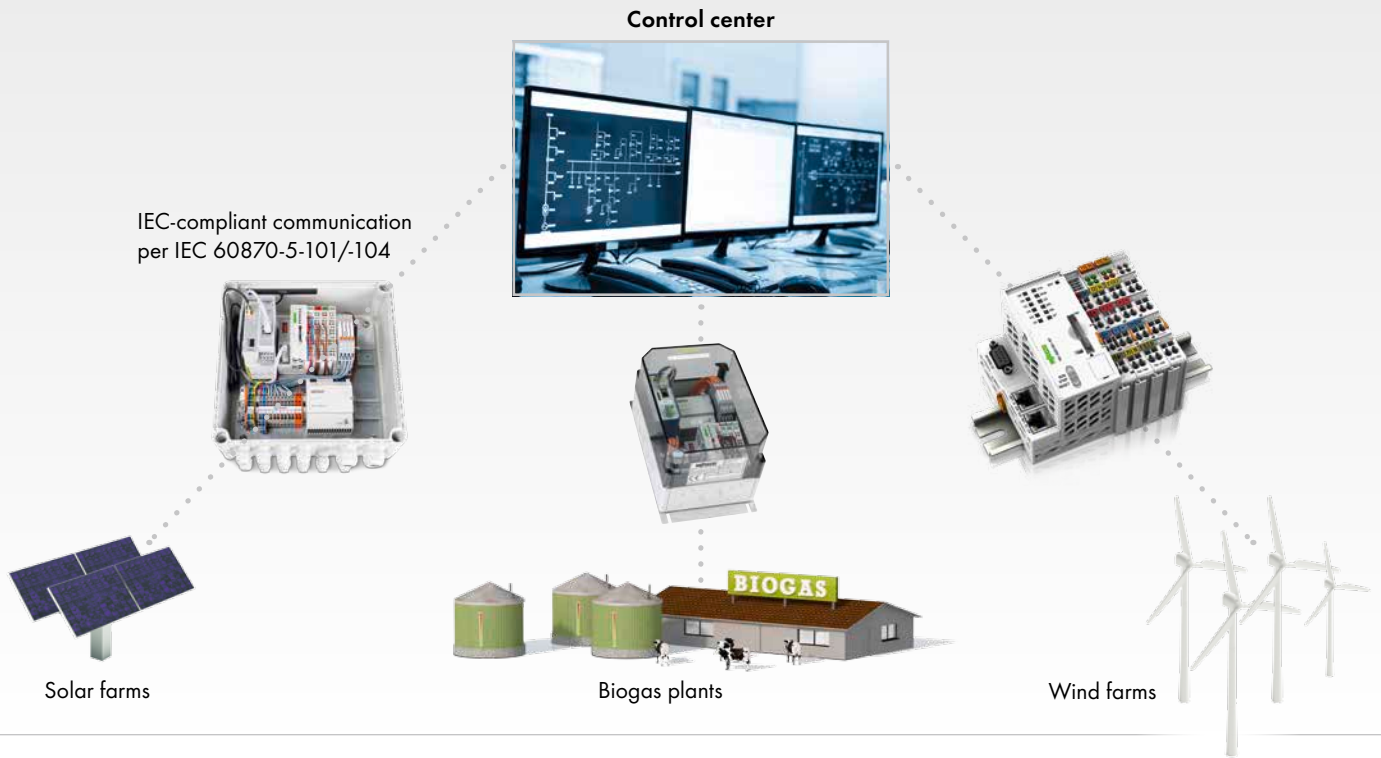Connecting numerous interfaces

**CODESYS**

Secure communication

Confined spaces
in existing systems

Minimizing integration efforts

# INTEGRATING DECENTRALIZED SUPPLIERS

## Easy, Efficient and Cost-Effective

**Control center**

IEC-compliant communication
per IEC 60870-5-101/-104

Solar farms          Biogas plants          Wind farms

## The Compact and Economical Telecontrol Solution for Plant Control and Monitoring

The revised Renewable Energy Sources Act (EEG) mandates that photovoltaic (PV) plants must have a technical interface for the network operator that enables remote-controlled power reduction. In the future, all plants (PV, wind, biogas) must disclose feed-in power data to the network operator.

- Remote control (direct marketing) per EEG
- Output reduction usually occurs in four increments — 0 %, 30 %, 60 % and 90 % or multi-level cos φ regulation
- Delivery of the current feed-in rate as measured or meter data
- System provides long-term investment protection
- The scalable WAGO-I/O-SYSTEM 750 allows system operators to easily pace government regulations via flexible hardware and software configurations

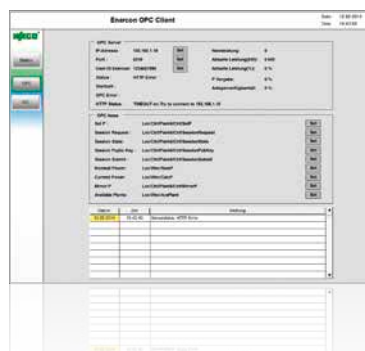# VIRTUAL POWER PLANTS

## Control and Networking



**The system's flexibility allows virtually all components of a power plant to be efficiently bundled with just one controller and permits remote control according to EEG**

### Hardware benefits:

- Connecting generator, consumer and storage system via one controller
- Multiple interfaces — PROFIBUS, CAN, KNX, LON®, IEC 60870/61850/61400 and MODBUS
- Dual LAN: Separate ETHERNET interfaces permit the creation of parallel networks
- IT Security: Encryption that follows Europe's most stringent energy and security guidelines per BDEW and BSI
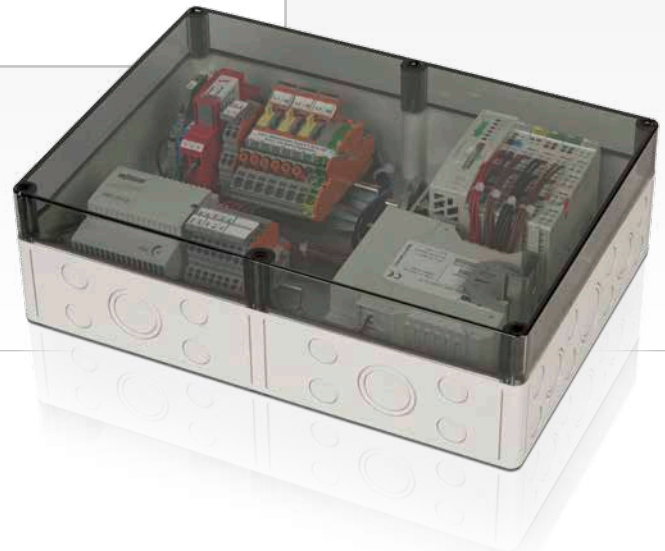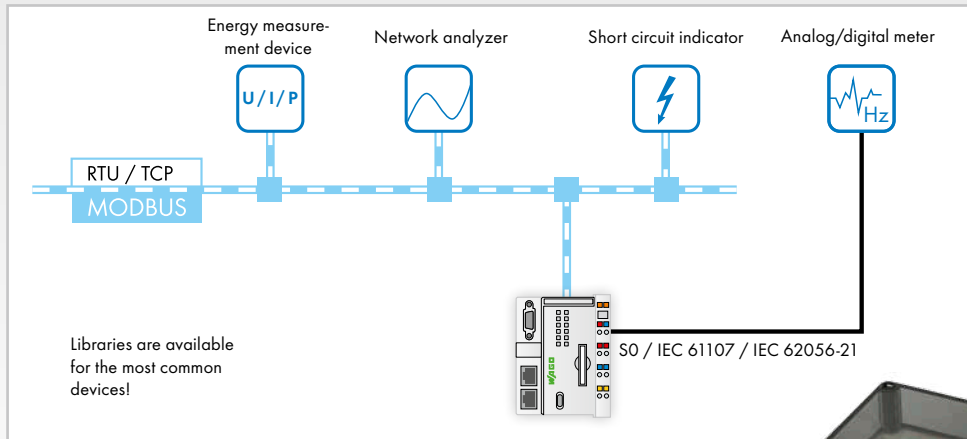
### Software benefits:

OPC/XML client, for example



WAGO-I/O-SYSTEM 750

IEC 60870/61850/61400

LON®

CANopen

PROFI NET®

Modbus

KNX®

WAGO®

# ENERGY GRIDS

## Network Analysis and Regulation



Energy measure-ment device — U / I / P

Network analyzer

Short circuit indicator

Analog/digital meter — Hz

RTU / TCP
MODBUS

Libraries are available for the most common devices!

S0 / IEC 61107 / IEC 62056-21

## Measurement, Regulation, Control and Telecontrol Technology All in One System

The ever-increasing decentralized infeed from EEG plants to low- and medium-voltage grids has made voltage regulation particularly complicated for grid operators. Ongoing control intervention is commonplace. Regulation — traditionally performed by large-scale power plants — has now shifted to the local grid level.



PFC200

- Network analysis (voltage, reactive power, effective power, current, cos φ, frequency, harmonic analysis and energy flow direction) in 3- and 4- conductor networks
- Direct integration of electronic household meters via Object Identification System (OBIS) and SML protocol; other methods upon request
- Direct connection with existing network analysis devices or short circuit indicators via Modbus/TCP or RTU
- Supports IEC 60870-5-101, -103 and -104, IEC 61850, as well as MMS and GOOSE communication standards
- Secure communication via IPsec or OpenVPN directly from the controller
- IEC 61131 programmable for control and regulation tasks
- Easy parameterization via Web visualization
- Integrated visualization allows all measurement values to be displayed on site via browser or Web panel
- Optional: Extended temperature model that withstands -40 °C to +70 °C
- Optional: Software solutions for measured value acquisition and evaluation, visualization, network analysis and communication
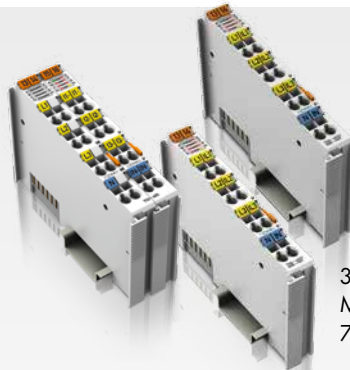
# CURRENT AND ENERGY MEASUREMENT TECHNOLOGY

## Recording and Analysis

Plug-in Current
Transformers, 855 Series

3-Phase Power
Measurement Modules,
750 Series

Rogowski Coils,
855 Series

Plug-In Current Transformers
with *picoMAX*® Pluggable Connectors,
855 Series

Split-Core Current Transformers,
855 Series

Visualization

## Comprehensive Network Analysis and Energy Measurement

- Identify, optimize and economize energy consumption
- Easy integration into existing systems
- Energy characteristics according to DIN EN ISO 50001

**Measured variables:**

- Energy consumption
- Voltage
- Current
- Phase position
- Active energy/power
- Reactive power/energy
- Apparent power/energy
- Cos φ
- Rotary field detection
- Power factor
- Four-quadrant operation
- Harmonic analysis (up to the 41st harmonic)
- N-conductor measurement

WAGO-I/O-SYSTEM 750

# DISTRIBUTION GRID INTELLIGENCE



## Automated Medium-Voltage System

A secure energy supply requires an effective and fast way to respond to critical network conditions and failures.
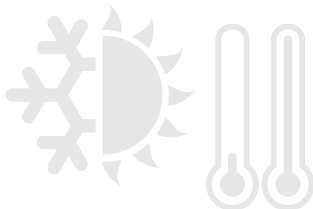
Remotely controlled medium-voltage systems allow:

- Faster reaction to network problems
- Support of on-site service personnel during switching operations via the control system

# WAGO-I/O-SYSTEM 750 XTR

Taking it to the eXTReme — The standard for 750 XTR

### eXTReme
temperature
from -40 °C to +70 °C

- No air conditioning required
- Compact footprint
- Lower energy and maintenance costs

### eXTReme
isolation
up to 5 kV of impulse voltage

**DIN EN 60870-2-1**

- Can be used in unshielded areas
- Ideal for standard telecontrol equipment
- Increased system uptime

### eXTReme
vibration
up to 5g of acceleration

**DIN EN 60068-2-6**

- Install close to vibrating and shock-generating system components
- Increased system uptime
- Investment security

# POWER TO HEAT

## Intelligent Heat Storage Systems Fueled by Renewable Energy



Power-to-heat conversion is a technology used for load management. This technology absorbs temporary oversupply from wind and solar power and converts it into heat.

It is particularly well suited to applications generating high amounts of heat (e.g., district heating grids).
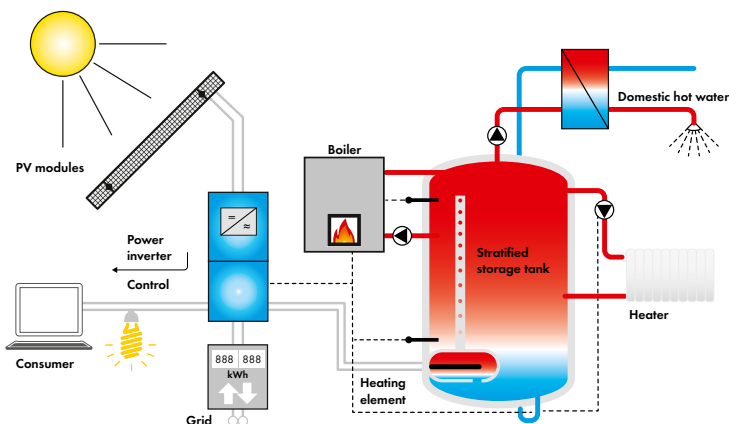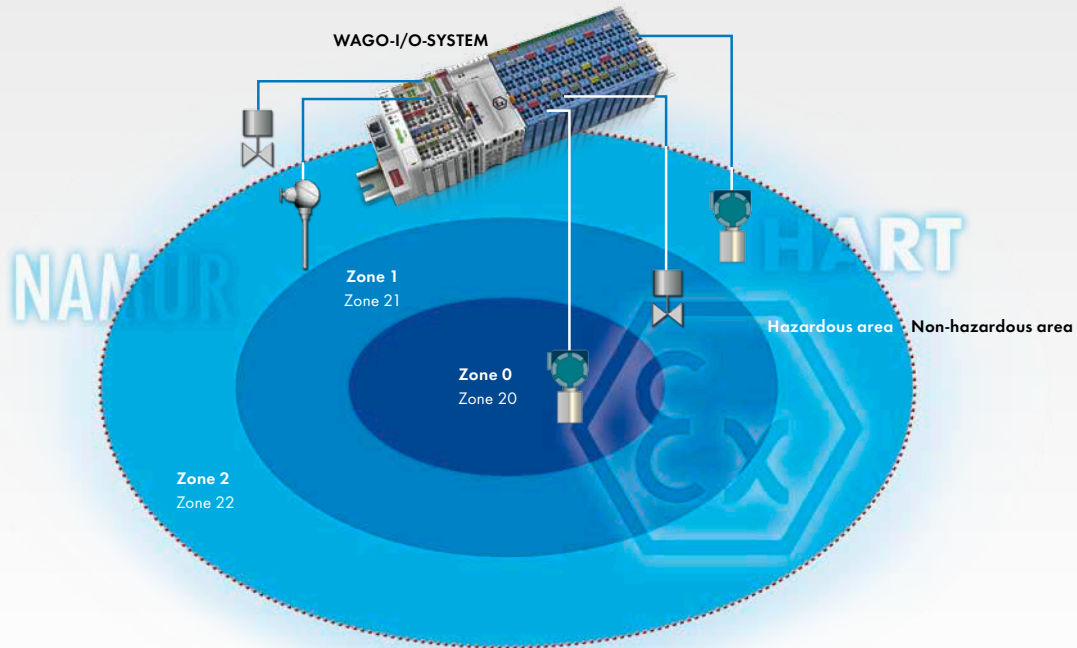
## Your advantages:

- Connecting heat generator and accumulator via one control system
- Multiple interfaces — PROFIBUS, CAN, KNX, LON®, IEC 60870/61850/61400 and MODBUS
- OPC/XML client
- Convenient measurement and monitoring of generator/ accumulator parameters (e.g., effective power, temperature and storage volume)
- Integration of current consumption forecasts and weather data
- Programmable to IEC 61131
- Communication via IEC 60870-5-101, -103/-104, 61400-25, 61850-7-420 telecontrol modules
- Easy parameter setting via configurator
- Scalable via 440+ I/O modules for diverse applications (e.g., 3-phase power measurement module for network analysis)



PV modules

Power inverter

Control

Consumer

Grid

888 | 888 kWh

Boiler

Domestic hot water

Stratified storage tank

Heater

Heating element

# POWER TO GAS

## Modern Gas Storage Systems Managed by the WAGO-I/O-SYSTEM



Using power-to-gas technology, electricity can be converted from renewable energy to hydrogen or synthetic natural gas and stored in the natural gas grid.

### Requirements:

- Grid-connected integration of electrolyzers for storing large amounts of electricity
- Integration into the power distribution or transmission grid
- Direct connection to an energy producer (e.g., wind or solar farm)
- Permanent monitoring and control of process parameters, e.g., from pressure regulators and producer gas separators — including explosion-proof components
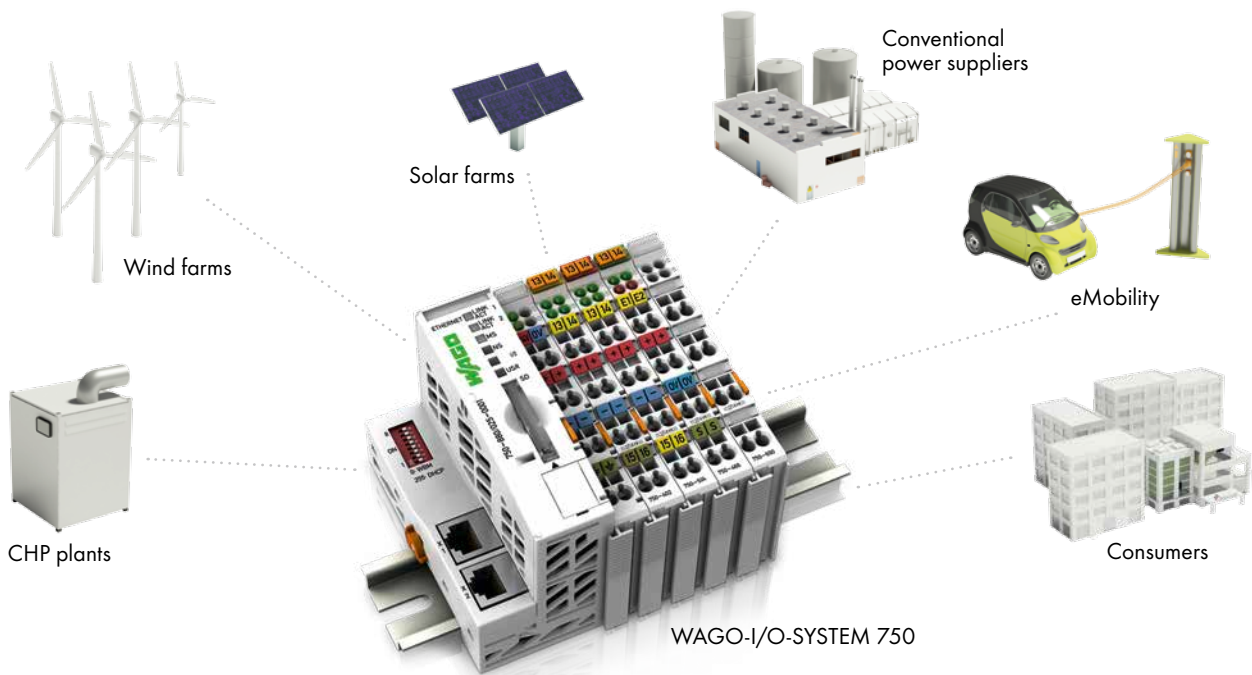
### Your advantages:

- Multiple interfaces — PROFIBUS, CAN, KNX, LON®, IEC 60870/61850/61400 and MODBUS
- Standard I/O modules and intrinsically safe Ex modules in one control unit*
- OPC/XML client
- Programmable to IEC 61131
- Communication via IEC 60870-5-101, -103/-104, 61400-25, 61850-7-420 telecontrol modules
- Scalable via 440+ I/O modules for diverse applications (e.g., 3-phase power measurement module for network analysis)

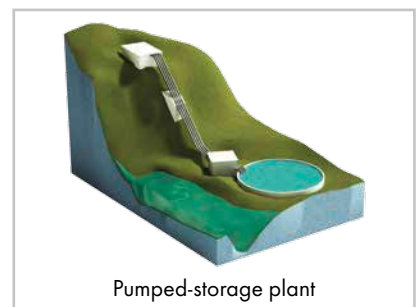*in explosion-proof (Ex) housing, based on the installation location

# ENERGY STORAGE MANAGEMENT

## Designed for the Future

### Energy-Efficient Charging and Discharging via Smart Controller



Conventional power suppliers

Solar farms

Wind farms

eMobility

CHP plants

Consumers

WAGO-I/O-SYSTEM 750

### Energy storage system examples:



Battery/Accumulator



Latent heat storage unit



Pumped-storage plant

### Your advantages:

- Convenient measurement and monitoring of feed-in or consumption rates (e.g., voltage, reactive power, effective power, current, cos ϕ, frequency and energy flow direction)
- Programmable to IEC 61131
- Communication via IEC 60870-5-101, -103/-104, 61400-25, 61850-7-420 telecontrol modules

- Easy parameter setting via configurator
- Scalable via 440+ I/O modules for diverse applications (e.g., 3-phase power measurement module for network analysis)

# PROTECTION DEVICES
## IEC 61850 GOOSE / IEC 60870-5-103 Client
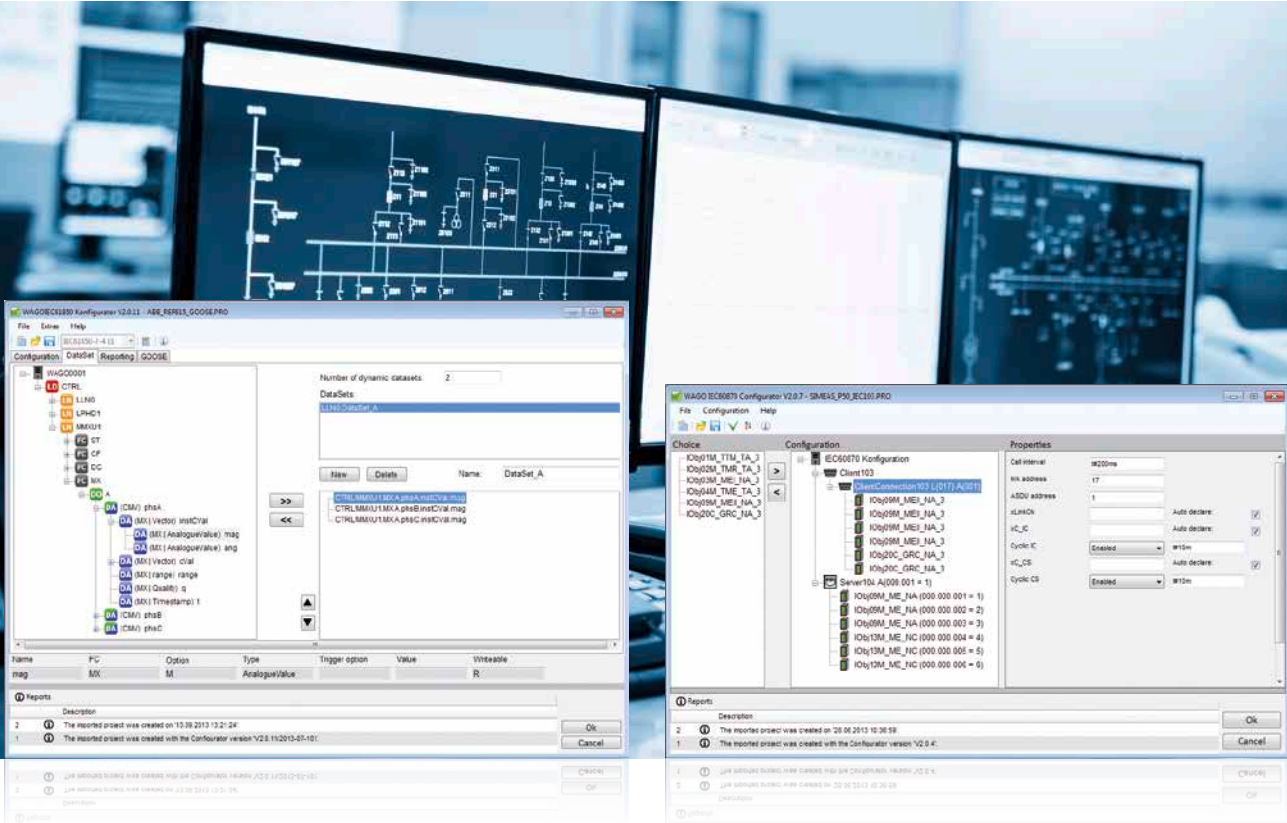


## Your advantages:

- Equipment connection, e.g., protection devices or power meters
- Easily set communication parameters via CODESYS' integrated configurator
- Parameter files for protection devices can be read
- Communication to the control system or data concentrator via IEC 60870-5-101/-104, IEC 61850, MMS, PROFIBUS and MODBUS
- Create gateways, e.g., for connecting to the network control system
- Compatible with WAGO controllers in every performance class

# GAS DISTRIBUTION STATION



## Unite Traditional Automation and Telecontrol Applications into One System

- Communication per IEC 60870-5-101, -103 /-104, 61400-25, 61850, MODBUS and others
- Redundant structures: The telecontroller communicates with up to four higher-level control systems
- Measure all variables — including signal acquisition from hazardous areas via Ex i I/O modules — without additional components for Ex separation, such as Zener barriers
- Certified to ATEX, IECEx, UL ANSI/ISA 12.12.01, UL508, shipbuilding, GOST-R and more
- The software PI controller implemented in the telecontroller replaces the separate industrial controller for gas pressure control
- DSFG protocol upon request

ETHERNET



Communication options, e.g., via IEC 60870-5-104

# SYSTEM SOLUTIONS

## WAGO's Extensive Portfolio

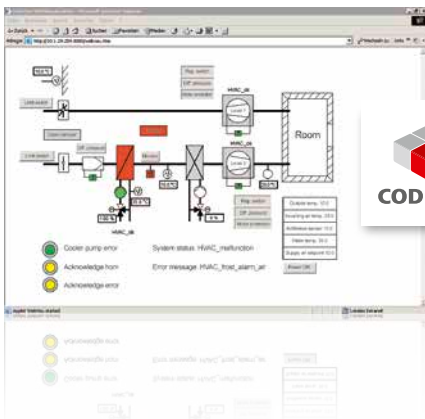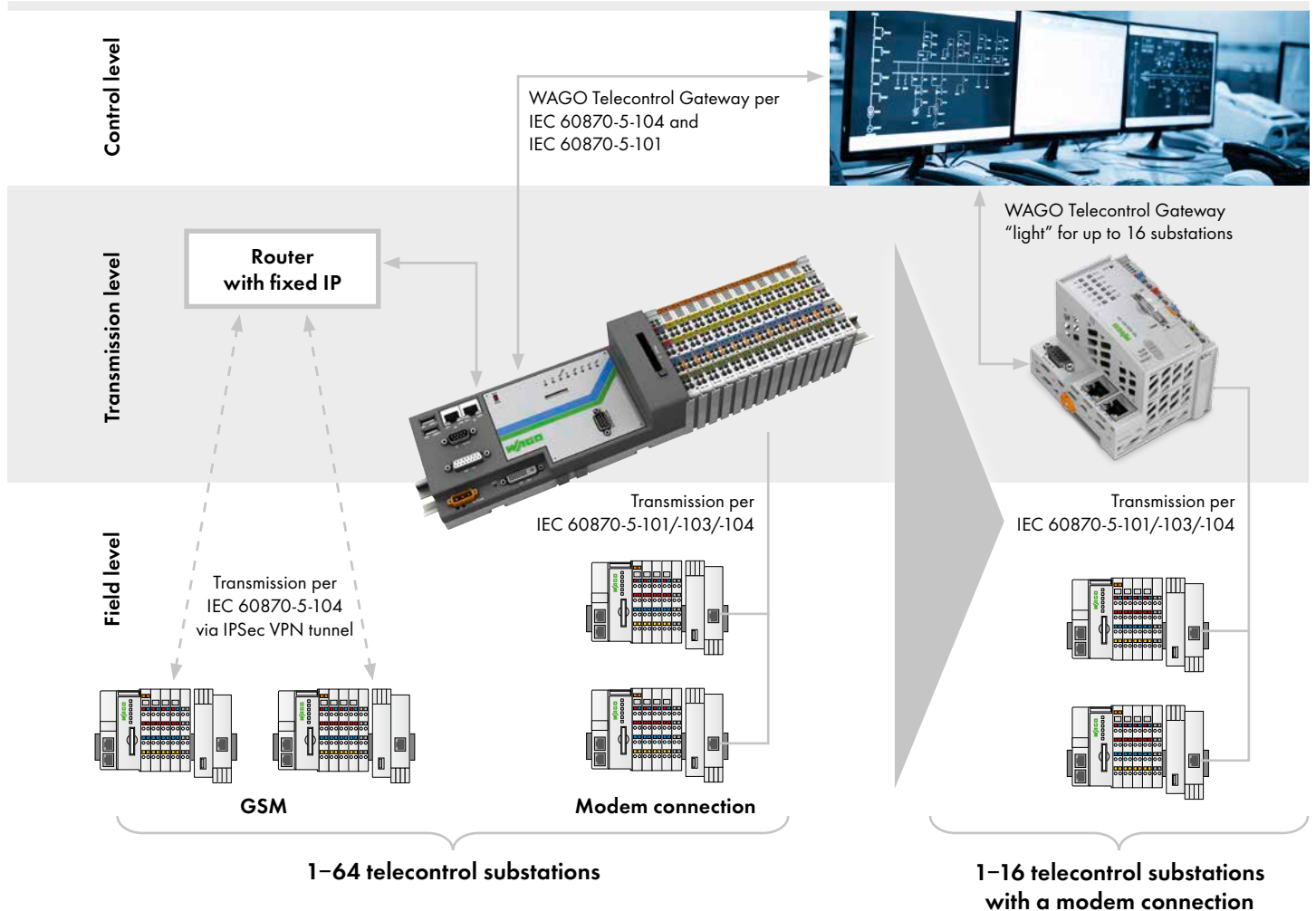| 01 | WAGO PORTFOLIO | WAGO-I/O-SYSTEM 750, Switches, *EPSITRON*® Power Supplies, Relays, *JUMPFLEX*® Signal Conditioners, Isolation Amplifiers, DIN-rail terminal blocks and more |
| --- | --- | --- |
| 02 | WAGO SYSTEM BOX | Standardized distribution boxes for easy integration |
| 03 | PROGRAMMING | Engineering, manufacturing and programming |

## Your advantages:

- Engineering, manufacturing and programming by WAGO
- Standardized distribution boxes for easy integration into industry-wide applications
- Just one contact for service and support
- Ready for on-site integration
- Easy installation and commissioning by the system integrator
- Efficient commissioning via SD card, parameter files or Web browser

CODESYS

# TELECONTROL GATEWAY

Configuration:

Control level

Transmission level

Field level

WAGO Telecontrol Gateway per
IEC 60870-5-104 and
IEC 60870-5-101

**Router
with fixed IP**

WAGO Telecontrol Gateway
"light" for up to 16 substations

Transmission per
IEC 60870-5-101/-103/-104

Transmission per
IEC 60870-5-101/-103/-104

Transmission per
IEC 60870-5-104
via IPSec VPN tunnel

**GSM**

**Modem connection**

**1–64 telecontrol substations**

**1–16 telecontrol substations
with a modem connection**

## Manufacturer-Independent Connection of Telecontrol Substations with up to Two Redundant Control Systems

### Your advantages:

- Communication per IEC 60870-5-101/-103/-104
- Connect to a substation via GSM, dedicated or dial-up line
- No control system limiting the number of connections
- Easy parameterization via Web-based management
- Transmitted data requires no parameterization
- Optional redundancy
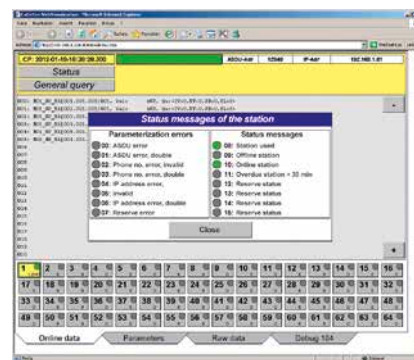
Web-Based Management

# SNMP GOES IEC 60870/61850
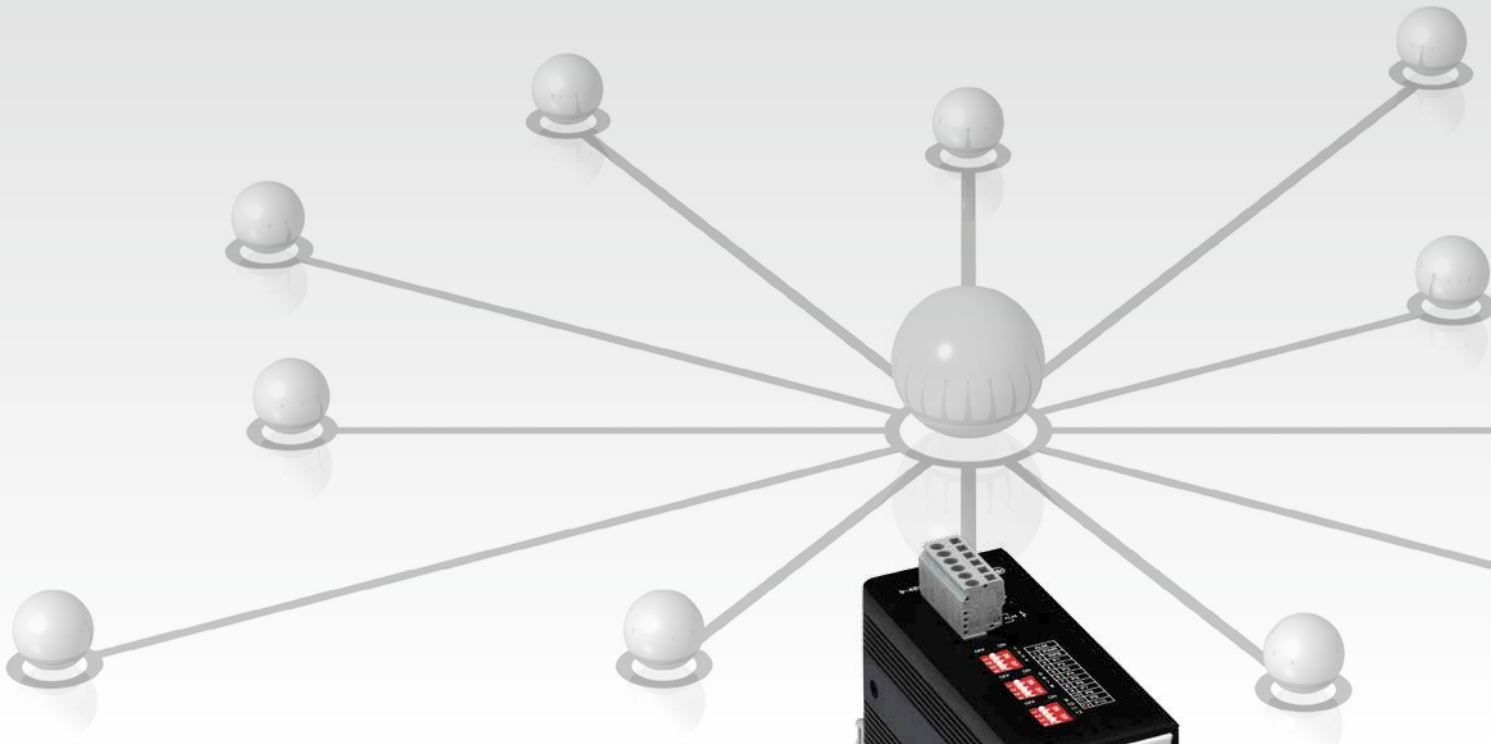
## Connecting Network Components with the Control System

- Integration of PCs, switches, modems, UPS systems via SNMP protocol
- Transmission of status information to the control system
- Device information can be read via GET command and transformed into IEC variables
- IEC variables permit device control via SET command
- Flexible parameterization via editable CSV file on SD card
- Pre-configured files are available for select components
- Additional device types can be integrated via Management Information Base (MIB)

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | IP address: | 192.168.1.100 | | | | | |
| 2 | SNMP password: | public | | | | | |
| 3 | Polling cycle [s]: | 30 | | | | | |
| 4 | | | | | | | |
| 5 | Port 4 ON/OFF status | Address: | 1 | 1 | 1 | OID: | 1.3.6.1.2.1.2.2.1.7.4 |
| 6 | Port 4 ON/OFF double command | Address: | 1 | 2 | 1 | OID: | 1.3.6.1.4.1.4249.2.4.100.2.1.7.19 |
| 7 | Temperature | Address: | 1 | 3 | 1 | OID: | 1.3.6.1.4.1.4249.2.5.6.2.1.3.1 |
| 8 | DSL NRM line 1 | Address: | 1 | 3 | 2 | OID: | 1.3.6.1.4.1.4249.2.5.4.3.1.15.1 |
| 9 | DSL NRM line 2 | Address: | 1 | 3 | 3 | OID: | 1.3.6.1.4.1.4249.2.5.4.3.1.15.2 |
| 10 | DSL NRM line 3 | Address: | 1 | 3 | 4 | OID: | 1.3.6.1.4.1.4249.2.5.4.3.1.15.3 |
| 11 | DSL NRM line 4 | Address: | 1 | 3 | 5 | OID: | 1.3.6.1.4.1.4249.2.5.4.3.1.15.4 |
| 12 | Status message | Address: | 1 | 4 | 1 | OID: | 1.3.6.1.4.1.4249.2.1.0 |

# WAGO-I/O-SYSTEM 750

One System for Every Application



## Fieldbus Couplers

- Fieldbus couplers connect the WAGO-I/O-SYSTEM 750 to a higher-level control system
- Fieldbus-independent — Support all standard fieldbus protocols and ETHERNET standards
- Space-saving design

## Programmable Fieldbus Controllers

- Controllers for all standard fieldbus systems and ETHERNET standards
- Quick start-up
- Programmable via CODESYS per IEC 61131-3
- Direct connection to a wide range of I/O modules within the WAGO-I/O-SYSTEM 750
- Flexible platform adapts to diverse applications and environments

**PROFINET**®

**EtherNet/IP**™

**DeviceNet**™

**EtherCAT**®

IEC 60870-5-101-/-103-/-104 Client/Server
IEC 61850 Client/Server
IEC 61400-25

**CAN**open

ASHRAE **BACnet**

## PFC200 Controllers

- Robust and maintenance-free
- Scalable performance
- Controllers for all standard fieldbus systems
  and ETHERNET standards
- High processing speed
- Multiple communication interfaces can be used simultaneously
- Separate ETHERNET interfaces permit the creation
  of parallel networks

## WAGO-I/O-*PRO* Software

- The Linux® operating system allows you to create
  your own firmware (Linux® developers only)
- Programmable via CODESYS per IEC 61131-3
- Can be combined with high-level languages
- Linux® 3.6 real-time operating system
- The Linux® platform enables the creation of "Custom Images"
- Flexibility for the implementation of IT security requirements
- SSH and SSL provide high levels of security
- Password-protected Web-based management prevents
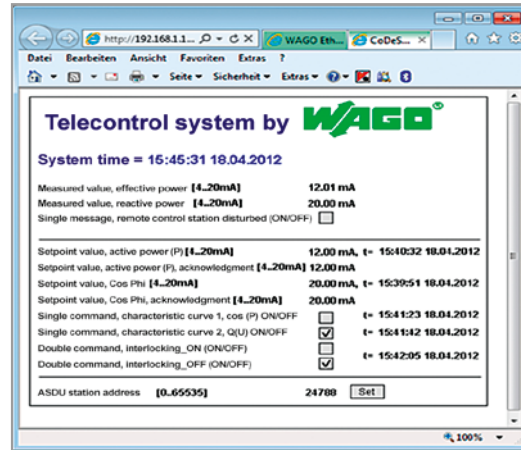  unauthorized users from changing system settings
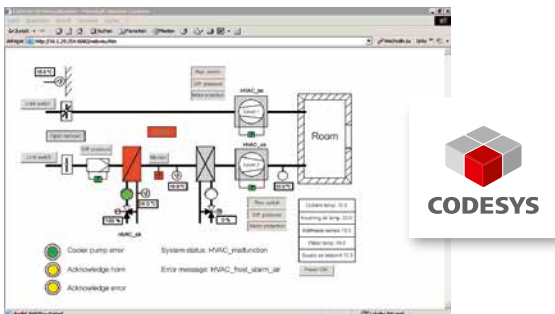
**WAGO**®

# WAGO-I/O-SYSTEM 750

## Advantages
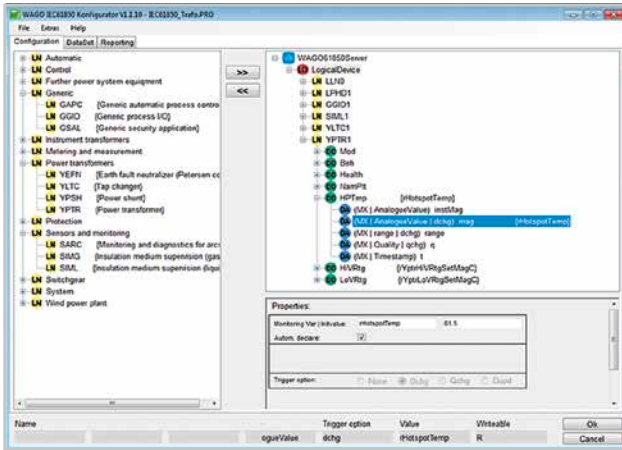


**Communication via telecontrol protocols**
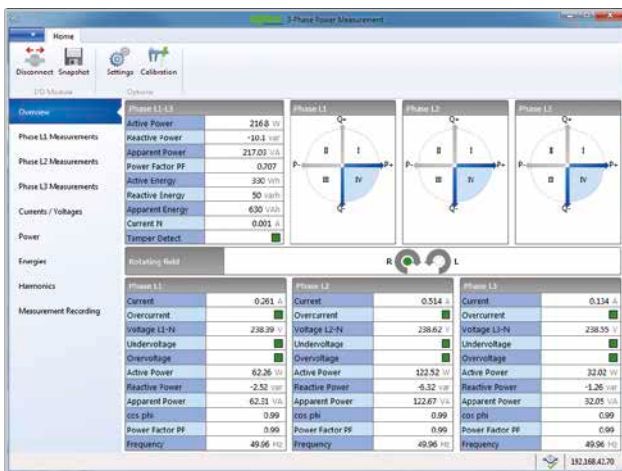per IEC 60870-5-101 /-103 /-104, 61400-25, 61850, MODBUS



**Easy parameterization**
via Web visualization



**Additional programming options that adhere to**
IEC 61131



- **Expansion** via 440+ I/O modules for many applications
- **Integration** of specialty functions, e.g., reactive power/
  undervoltage protection via I/O modules



**3-Phase Power Measurement Module**
for network analysis (current, voltage, reactive power,
effective power, frequency and energy flow direction),
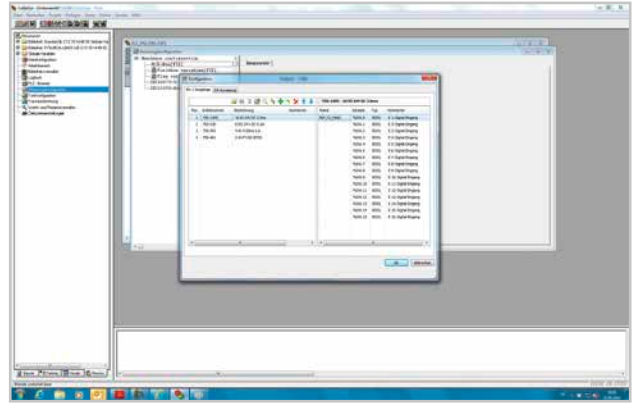as well as comparative cos φ measurement



**Connection**
is possible via DSL, GSM, ISDN, fiber optic, analog or radio

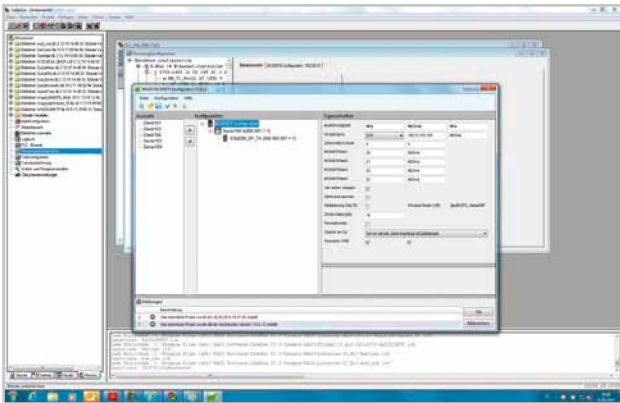# CONNECTING TO A TELECONTROL SYSTEM

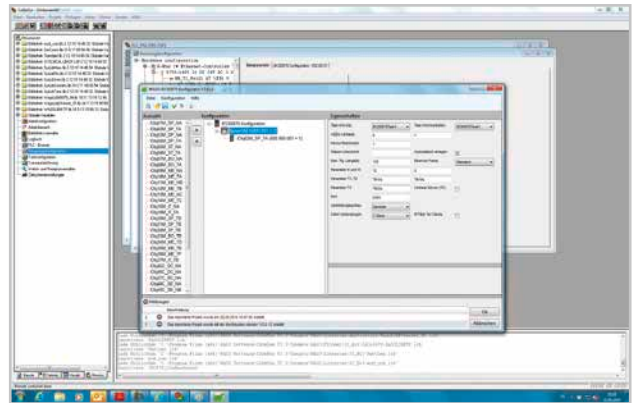## Fast Commissioning via IEC Configurator
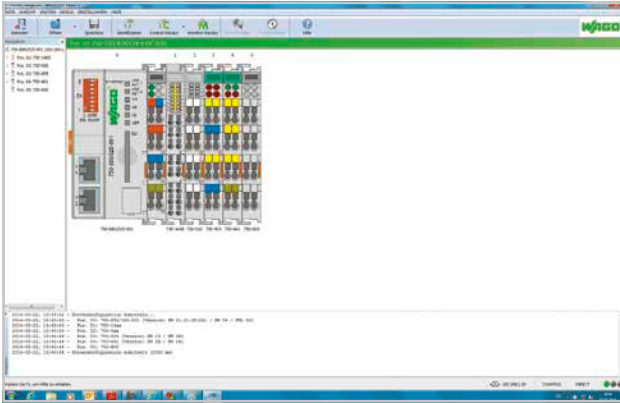


Reading the hardware setup via WAGO-I/O-*CHECK*
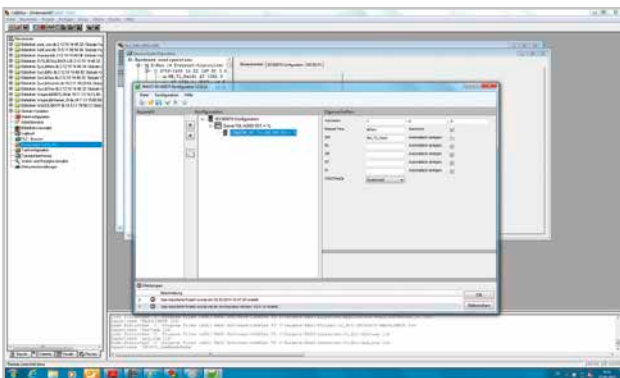


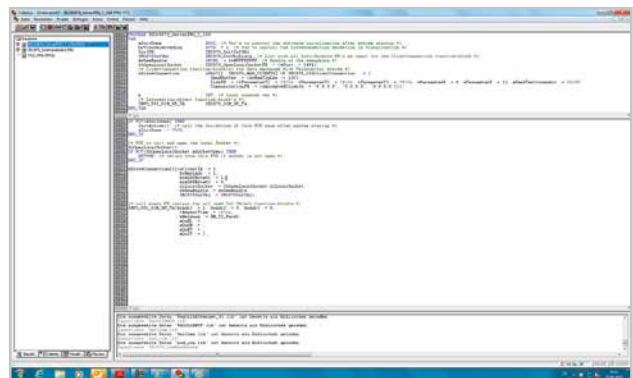Optional: Assigning plain text variables



Setting parameters for a telecontrol substation
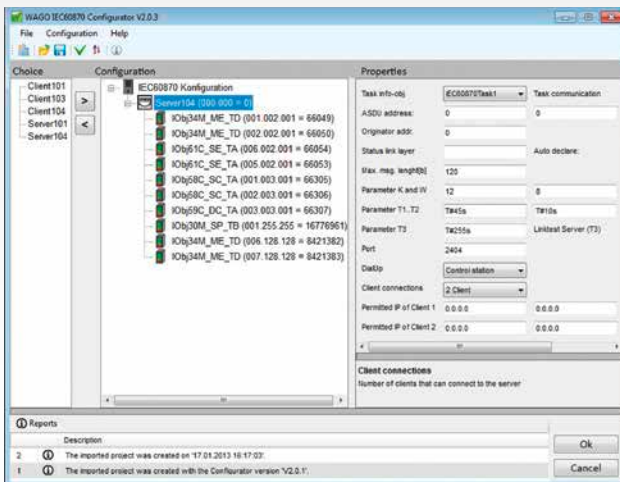


Defining the type message



Linking the plain text variables to the type message



Creating the CODESYS source code automatically

# CONFIGURING

## WAGO-I/O-SYSTEM 750 Configuration



### IEC 60870 Configurator

- Part of WAGO-I/O-*PRO* v2.3 software
- Supports IEC 60870-5-101 (Client/Server/-103 (Client)/-104(Client/Server) specific functions
- Configures and parameterizes both IEC 60870 objects and data exchange to the PLC application or I/O modules
- Import and export functions in CSV and XML formats permit transmission to engineering tools
- Sets protocol gateways
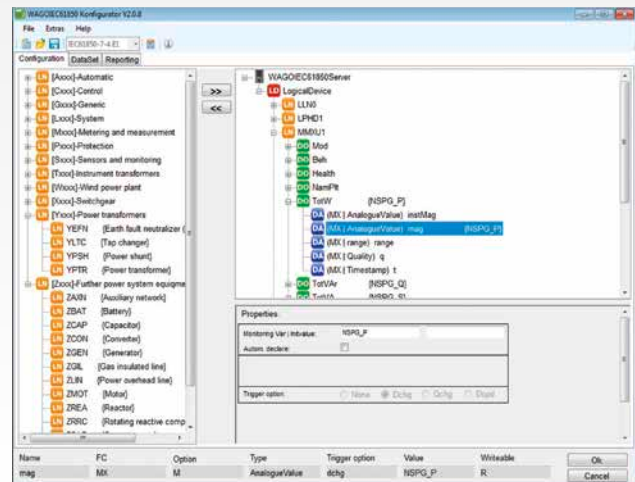
### IEC 61850 Configurator

- Part of WAGO-I/O-*PRO* v2.3 software
- Supports IEC 61850 (Client/Server) specific functions
- MMS communication
- GOOSE publisher and subscriber
- Configures and parameterizes both IEC 61850 objects and data exchange to the PLC application or I/O modules
- Sets protocol gateways (e.g., IEC 60870)
- Import and export functions in the IEC 61850 SCL exchange format enable transmission to engineering tools

### Your advantages:

- Configuration instead of programming
- Signal-oriented IEC 60870
- Object-oriented IEC 61850
- Modbus TCP/RTU

# PARAMETER SETTING

## Parameter Setting Instead of Programming



## Your advantages:

- Expedited commissioning
- Parameterization via Web browser
- CODESYS 2 WebVisu can be accessed on mobile devices

# PROGRAMMING

## Controllers: Open – Flexible – Compact



## Your advantages:

- Programmable via CODESYS per IEC 61131-3
- Can be combined with C/C++ high-level languages
- Linux® 3.6 real-time operating system
- Robust and maintenance-free
- SSH and SSL provide high levels of security

## WAGO-I/O-*PRO* Software

- Programming and visualization tool based on CODESYS that adheres to IEC 61131-3
- Supports the following standard programming languages: IL, SFC, LD, FBD and ST
- Open interfaces (OPC, DDE) enable data exchange with other programs
- Highly efficient translation between programming languages
- Automatic declaration of variables
- Library management
- Online status indication in the program code
- Offline simulation and integrated process visualization
- Recording and graphical display of project variables

# COMMUNICATING

## WAGO-I/O-SYSTEM 750 – Versatile and Flexible

CC-Link

sercos
the automation bus

INTERBUS

PROFI BUS®

PROFI NET®

Modbus

LONWORKS®

KNX®

EtherNet/IP

DeviceNet

EtherCAT®

ASHRAE BACnet

IEC 60870-5-101-/-103-/-104 Client/Server
IEC 61850 Client/Server
IEC 61400-25

CANopen
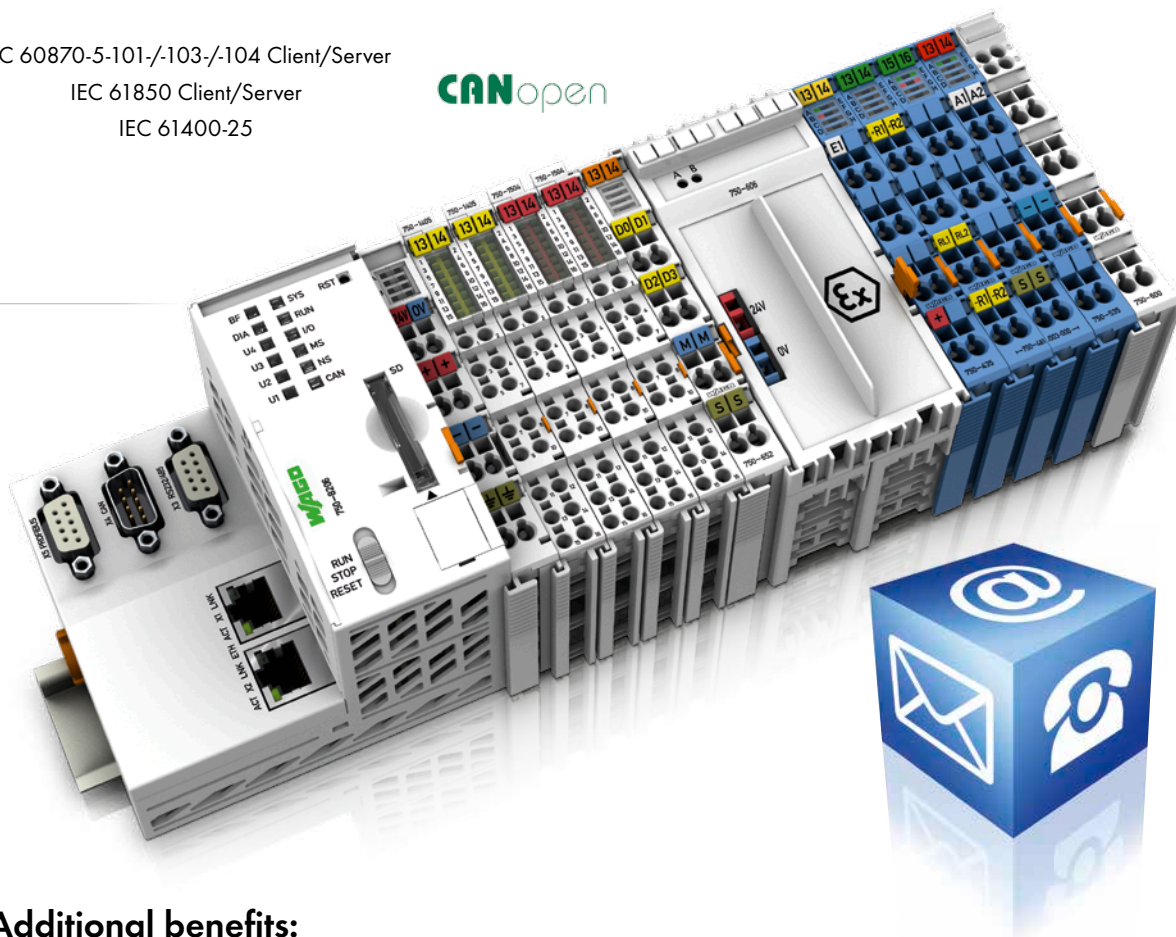
## Additional benefits:

- IT Security: Encryption that follows Europe's most stringent energy and security guidelines per BDEW and BSI
- Transmission: GSM, TETRA, dedicated line, UMTS, LTE, ISDN, fiber optic and more

WAGO®

# TO-PASS® TELECONTROL SOLUTIONS

## Scalable Telecontrol Solutions
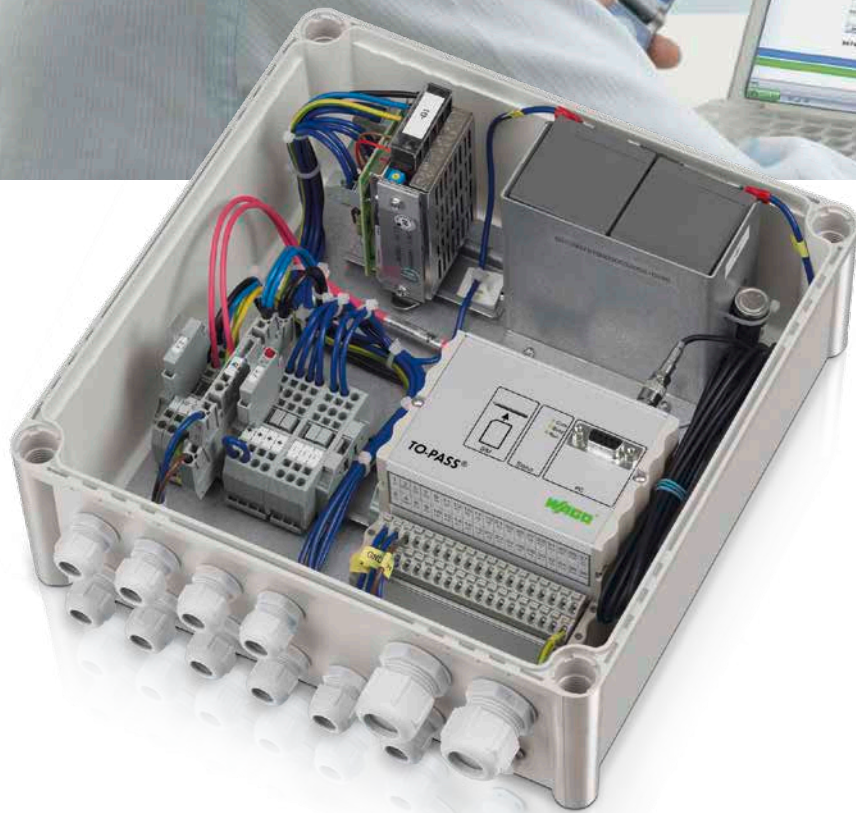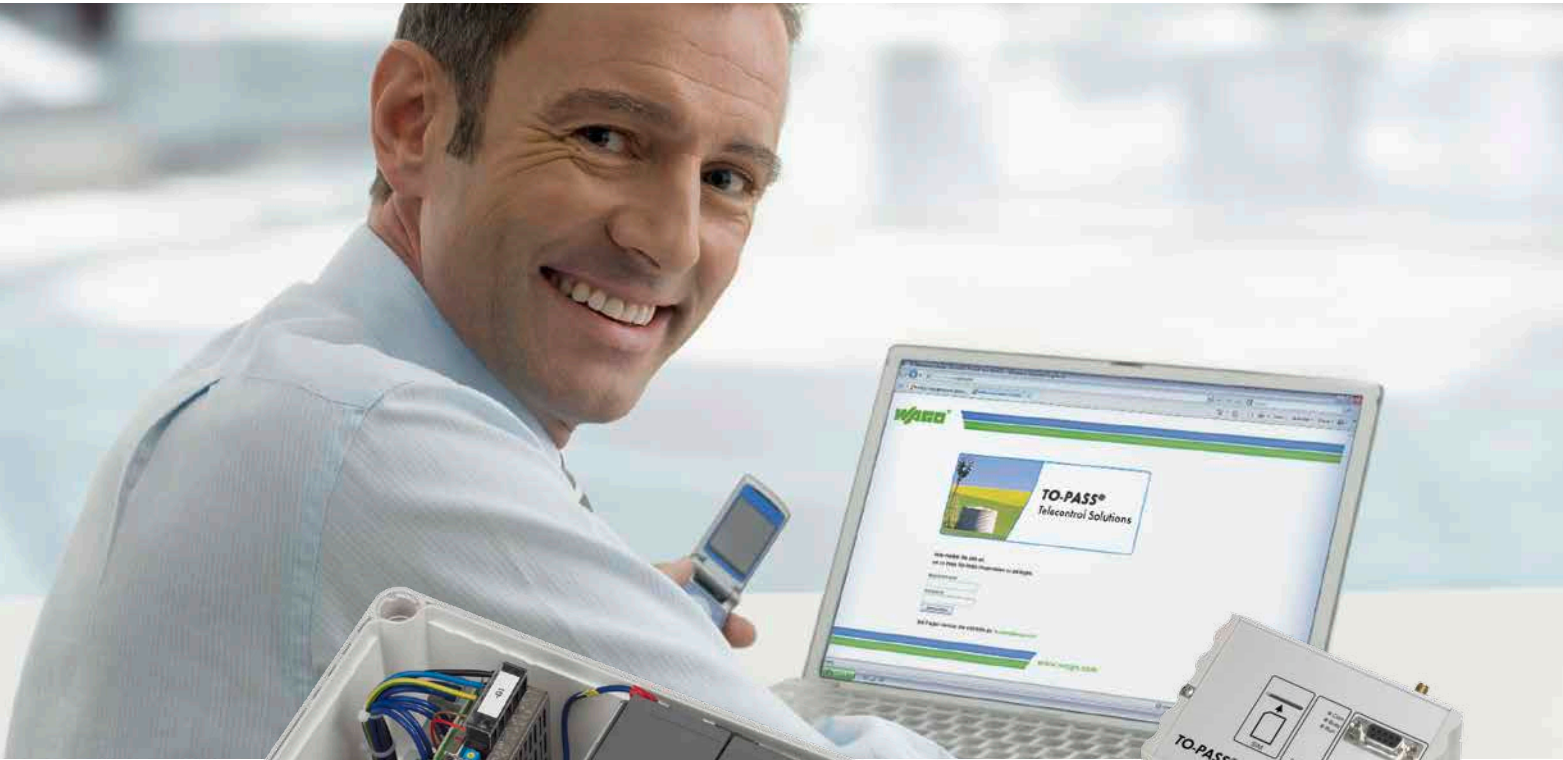


TO-PASS® Compact

TO-PASS® Outdoor

TO-PASS® Mobile

# Fault Detection and Monitoring

## TO-PASS® Compact

- Convenient, compact solution with integrated GSM modem and inputs/outputs
- Message dispatch via SMS, email, fax or over the phone
- Up to eight analog and digital inputs
- Four digital and analog outputs
- Acknowledgment: Any fault message
- Stand-by: Automatic remote switching of stand-by service
- Remote parameterization: Conveniently perform programming and process visualization from the office
- GPRS-dedicated line: Permanent online connection to the process from a Web server or PC with a fixed IP address (e.g., DSL connection)
- Event logger: Saves all occurring status changes
- Data logger: Saves all process values with an adjustable cycle
- MODBUS: Reading from 64 MODBUS 2-byte registers via serial interface
- Counter function: Maximum of four digital inputs can be used as an up or down counter; the maximum operating frequency is 1250 Hz

## TO-PASS® Web Portal

### Base module

With the base module, users receive a dedicated space on the TO-PASS® Web portal. Access is protected with a user-name and password. The data recorder function allows digital, analog and MODBUS data from connected devices to be recorded and displayed in segments ranging from 90 minutes to 512 days. Data can also be exported in the CSV format.

### Admin

This option is an addition to the base module. It allows the user to administrate additional usernames with passwords, as well as customers and devices with different access authorizations.

### Alarm

This is an optional function for the base module. It allows the module to display and administer alarms. Using analog values, up to four limit values can be configured for each measurement. An alarm list allows all alarms to be displayed and acknowledged. This option also allows the user to designate the recipients and the times when they will receive an alarm via SMS or email.

## TO-PASS® Mobile

- Compact module with an integrated GPS receiver, GSM modem and inputs/outputs for direct mounting
- Acquisition of measured values and position data
- Email, SMS (bidirectional), fax (depending on provider) and dial-up connection (CSD)
- Internal memory for GPS and process data
- GPS receiver
- GPS raw data
- Map view via Google Maps and Open Street Map
- Waypoints and distance

## TO-PASS® Outdoor All-In-One Solution

- Compact, IP66 enclosure for installing TO-PASS® telecontrol modules. The unit is equipped with an integrated GSM antenna and a 115–230 VAC to 24 VDC power supply.
- Two backup batteries protect against power failure and supply additional sensors
- All-in-one solution eliminates wiring costs
- Antenna is hidden inside the enclosure
- Fast outdoor installation
- Battery provides power failure protection
- Built-in heating system for operation in temperatures < -20 °C
- Also available with self-sustaining solar operation

# *TO-PASS*® WEB CONNECTOR

## Integrating Fault Detectors into I&C Systems



HTTP Request

GPRS

HTTP Response

or
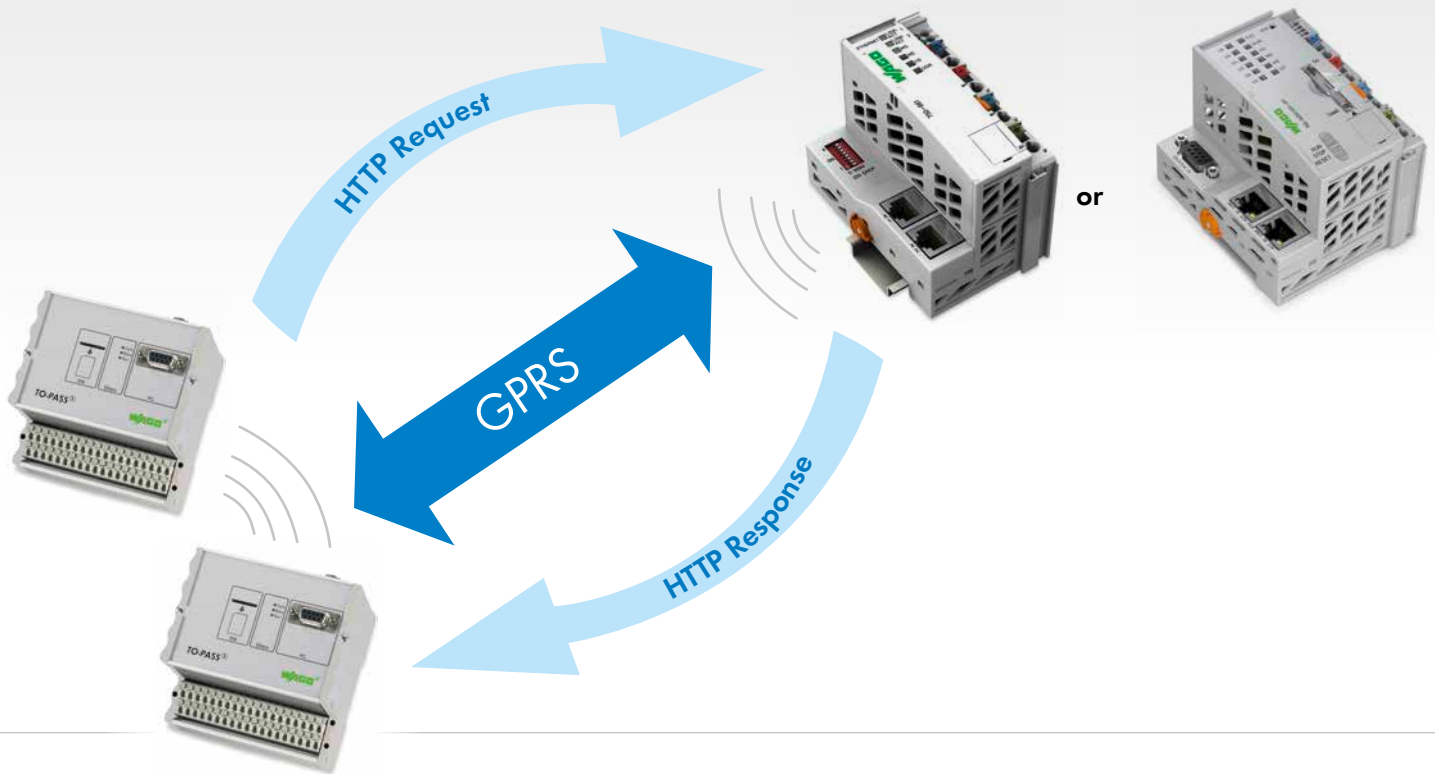
## Fieldbus-Independent Connection of *TO-PASS*® Compact to the Control System

- Send fault and event messages via GPRS data string (<1 KB) to a WAGO I/O controller with a fixed IP address
- Transmit data (e.g., via TCP/RTU, PROFIBUS, BACnet, IEC telecontrol protocols per 60870, 61850, 61400) to a central control system

## *TO-PASS*® Compact

- Rugged, compact device rated for -20 °C to +70 °C operation
- Three *TO-PASS*® GPRS modules are available with up to 8 DI, 8 AI, 4 DO, 2 AO and MODBUS
- Cyclic and/or event-controlled transmission
- Parameter setting — not programming
- Optional outdoor version in an IP66 housing with battery, charging controller and heater

## Your advantages:

- Fieldbus-independent connection to the WAGO-I/O-SYSTEM
- Free, comprehensive user application
- Individual expansions and/or program modifications
- Scalable solutions from controllers to IPCs (depending on the number of remote stations)

# SYSTEM MACROS

## Heating, Ventilation and Air Conditioning

| Enable | Start | Supply Temp* | Antifreeze protection | Dampers |
|---|---|---|---|---|



**Enable**

FbCollectiveMalfunction

Error
Quit

**Start** — Switching ventilation system on/off

FbStartStop

Manual | Off | Auto

**Supply Temp*** — Determining the setpoint supply temperature for the boiler system based on the outside temperature

FbHeatingCharacteristics

**Antifreeze protection** — Air-side antifreeze protection via antifreeze monitor installed in the system

FbAntifreezeWater

**Dampers** — Controlling the outside air dampers (one function block per damper)

FbContinuousDamper

X | 30 %

| Pump | HR* | PID controller | Fan |
|---|---|---|---|

**Pump**

FbValveAndPump

**HR*** 

FbPlateHeatExchanger

X | 0 %
X | 0 %

**PID controller**

FbPIDController

**Fan**

FbFan_FC

Y = 100 %
S

*HR = Heat recovery
*Supply Temp = Supply temperature

## Parameter Setting — Not Programming

- Suitable for a wide range of HVAC applications (e.g., heat transfer station)
- No time-consuming programming
- Individual adjustment via parameter settings



Manual | Off | Auto

Overriding sensor values

X | 18.0°C
X | 100 %
X | 100 %
Y = 100.0 %
S
P | P
X | 18.0°C
W | 22.0°C
X | 1800 mBar
W | 2000 mBar
p
X | 31.0°C
X | 15.0°C
Y = 100.0 %
S
P | P
X | 18.0°C
W | 28.0°C
X | 100 %
X | 0 %
X | 12.0°C

Error
Quit

| Status messages | | | |
|---|---|---|---|
| Collective malfunction: | OK | Supply air (HE) | ON |
| Pre-flush: | Preflushing completed | Exhaust air (HE) | ON |
| Air damper: | Open | Incoming air fan: | OK |
| Exhaust air damper: | Open | Exhaust air fan: | OK |

Home page | Configuration

WAGO®

# QUALITY AND RELIABILITY

Innovation – Quality – Safety



## Quality Through Experience and Attention to Detail

- Integrated quality assurance measures play a vital role during the manufacturing process
- 100 % testing for proper operation
- In-house, accredited laboratory for internal electrical and mechanical testing on terminal blocks and connectors, as well as for environmental simulation per DIN EN ISO/IEC 17025
- In-house accredited EMC laboratory
- Worldwide approvals

## Proven Quality Thanks to Certified Processes and Products

- DIN ISO 140001:2004 certificate
- DIN EN ISO 50001 energy management certification
- DIN ISO 9001:2008 certificate
- IRIS certificate
- KTA approval for select products

# WAGO CATALOGS/BROCHURES

## WAGO-I/O-SYSTEM 750 – Versatile and Flexible

**Rail-Mounted Terminal Block Systems**

Full Line Catalog, Volume 1
Edition: 2015

WE INNOVATE!

### Volume 1, Rail-Mounted Terminal Block Systems

- Rail-Mounted Terminal Blocks
- Modular Connectors (X-COM®-SYSTEM and X-COM®S-SYSTEM)
- Patchboard Systems
- Terminal Strips
- PUSH WIRE® Connectors for Junction Boxes
- Lighting Connectors
- Shield Connecting System

**PCB Terminal Blocks and Connectors**

Full Line Catalog, Volume 2
Edition: 2015

WE INNOVATE!

### Volume 2, PCB Terminal Blocks and Connectors

- PCB Terminal Blocks
- Feedthrough Terminal Blocks
- *MULTI CONNECTION SYSTEM (MCS)*
- Pluggable PCB Terminal Blocks
- Specialty Connectors

**Automation Technology**

Full Line Catalog, Volume 3
Edition: 2015

WE INNOVATE!

### Volume 3, AUTOMATION

- IP20 Modular I/O-SYSTEM
- Radio Technology, *TO-PASS®* Telecontrol Technology
- Industrial Switches, *PERSPECTO®*
- IP67 Modular I/O-SYSTEM, IP67 Block I/O-SYSTEM
- IP67 Sensor/Actuator Boxes, IP67 Cables and Connectors
- Power Supplies

**Interface Electronic**

Full Line Catalog, Volume 4
Edition: 2015

WE INNOVATE!
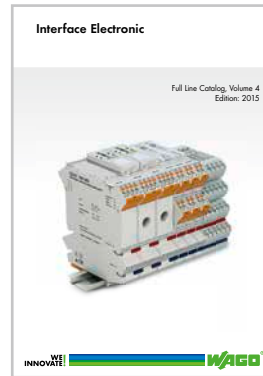
### Volume 4, INTERFACE ELECTRONIC

- Relays – Optocouplers – Specialty Functions
- Interface Modules
- Signal Conditioners
- Power Supplies
- Overvoltage Protection
- Radio Technology
- Empty Housings and DIN-Rail Mount Carriers

**WINSTA®
The Pluggable Connection System**

Full Line Catalog, Volume 5
Edition: 2015

WE INNOVATE!

### Volume 5, *WINSTA®* – The Pluggable Connection System

- *WINSTA®* MINI – Pluggable Connectors
- *WINSTA®* MINI special – Pluggable Connectors
- *WINSTA®* MIDI – Pluggable Connectors
- *WINSTA®* MIDI special – Pluggable Connectors
- *WINSTA®* MAXI – Pluggable Connectors
- *WINSTA®* RD – Cable Assemblies
- *WINSTA®* KNX – Pluggable Connectors
- *WINSTA®* IDC – Flat Cable Systems

**THE WAGO-I/O-SYSTEM 750**
One System for Every Application

WE INNOVATE!

**WAGO-I/O-SYSTEM 750**

**WAGO-I/O-SYSTEM 750**
750 XTR Series

TAKING IT TO THE EXTREME –
THE STANDARD FOR 750 XTR

XTR

WE INNOVATE!

**WAGO-I/O-SYSTEM 750, 750 XTR Series**

**CURRENT AND ENERGY MEASUREMENT TECHNOLOGY**

WE INNOVATE!

**Current and Energy Measurement Technology**

WE! INNOVATE!

WAGO®