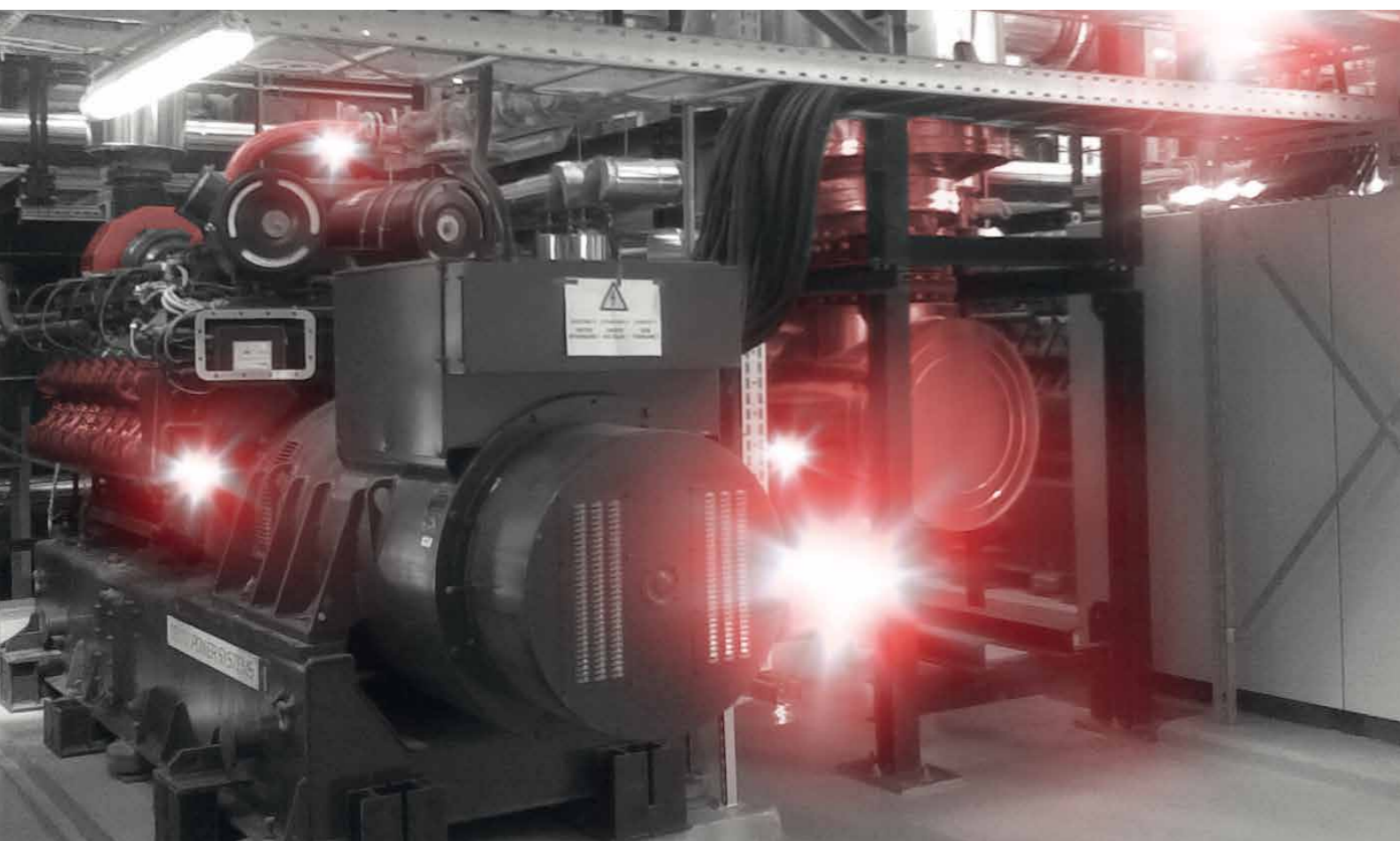# E²CON-TE ENGINE CONTROLLER

Retrofit system based on openECS for TEM-Evo controllers
to modernize MWM gas engines

PLUG & RUN: RISK-FREE CONVERSION, SIMPLE AND FAST WITH LONG-TERM ADAPTABILITY BUILT-IN

New plant concepts and operating modes demand a flexible engine control system that on the one hand can manage operation at the engine's mechanical limits and on the other hand enables an engine to be quickly and simply adapted to new requirements.

PLUG & RUN RETROFIT

Fast and simple system update by means of a pre-configured control cabinet for direct installation on site. Generator-set cabling can be retained and only renewed when "natural" degradation dictates.

PARAMETER CONVERSION

The risk-free update is achieved via a unique parameter converter. The system's major control functions, such as start / stop, emissions control and control of peripherals behave the same after the retrofit as they did before. In this way AVAT optimally minimizes the risk that the modernization of a competitor's system could lead to a deterioration in control functions.

SMART COMMUNICATION

The connection to the E²PILOT workstation and to E²SERVICE service tool no longer involves serial interfaces but are completely ethernet-based. This enables simultaneous operation.

EXTENDED ACCESSIBILITY

More scope for individual system adaptation and expansion to specific operating conditions. The familiar control functions of TEM-Evo have been further optimised and are available in their accustomed quality.

OPTIMISED OPERATION

The familiar operating concept as well as the parameter views are retained. With the new operator interface of E²PILOT, anyone who knows the earlier system will soon be at ease and confident enough to start work. In addition, with E²SERVICE service technicians have available a comprehensive service and diagnostic tool.

FLEXIBILTY OPTIONS

E²CON-TE is already prepared for the future requirements of the network connection standard VDE 4110 and for the more flexible operation of plants according to BDEW specifications.

STATE-OF-THE-ART RETROFIT SOLUTION FOR MWM ENGINES FROM THE DEVELOPER AND MANUFACTURER OF TEM-Evo

With the experience we gained on well over 10,000 engine controllers for DEUTZ and MWM gas engines, we are confident we have designed the optimum solution for their modernisation. Taking current needs into account and anticipating future challenges. This new engine management system is based on openECS, and is conceived as a risk-free conversion for replacing the TEM-Evo controllers that were delivered as standard equipment on DEUTZ and MWM engines.

HIGH PERFORMANCE PARTNER

We have been a trusted partner to the gas-engine industry for 25 years and also the manufacture of TEM-Evo engine controllers – deployed in thousands of cogeneration plants.

- Technology leader in control systems for large gas engines and cogeneration plants
- Extensive experience gained from projects with a total exceeding 12,500 MW installed electric power
- Smart solutions featuring process and control automation for multiple commodities – for sustainable energy generation and distribution

Our experienced team of engineers and technicians are constantly at your disposal to support your projects:

- Electrical engineering, production of switch cabinets
- Tuition for users and developers
- Qualified Service Hotline
- Fast spare parts shipping

FURTHER NEW FEATURES AND FUNCTIONS

NEW FEATURES

- Simple commissioning – TEM-Evo-trained service technicians can exchange the system themselves, commission it and adapt it the plant
- Delivery of a complete scope-of-supply including circuit diagram, installation instructions, functional description, list of limit values and parameter descriptions
- Web interface to the E²PILOT workstation for direct insight onto the controller from any web-capable client
- Optional connection to the AVAT VIRTUAL SERVICE CENTER for an overview of all connected plants and to an alarm management system with live status
- VHPready for straightforward integration of the plant into a virtual power plant, without the need for an overriding control system to cover this function

FUNCTIONS

- Closed-loop control of engine speed, power and air / gas mixture via a single, robust and fast multi-variable controller
- Faster engine run-up for flexible operation
- Start / Stop sequences for island and grid-parallel operation
- Wastegate control and ignition management
- High selectivity knock control of individual cylinders
- Misfire detection with automatic power reduction down to engine shutdown
- Cogeneration plant control (peripherals)
- Closed-loop control and monitoring of all cooling and heating circuits
- Fan control for dry and hybrid coolers
- Control of flow-side temperature even in part load operation

E²CON-TE
FAMILIAR TECHNOLOGY BROUGHT RIGHT UP-TO-DATE

Based on the open and flexible openECS hardware and software components and the robust M1 industrial controller from Bachmann, E²CON-TE offers significantly more scope for individual system adaptation and expansion. Likewise, E²CON-TE enables the control of complete peripheral systems to be readily implemented, or connections into SCADA systems and virtual power plants to be easily realised.

E²PILOT
One Window to the Engine – with 15" capacitive touchscreen.

- Rapid overview of engine and peripherals
- Interactive operating log, long term data storage and configurable trends
- Snapshot function – a single operation saves all control data into a single file

E²CORE
Highly dynamic multi-variable controller with direct actuator drive in one module.

- Controls directly throttle valves and wastegate actuators
- Stepper motor driver for gas mixer control

E²KNOCKCON-c
Reliably detects combustion knock and misfires on the basis of structure-borne noise signals.

- Knock control of individual cylinders
- Additional misfire detection

E²SERVICE (optional)
The software for ambitious service technicians. Task orientated graphical user interface for:

- Commissioning
- Optimisation of controller settings
- Diagnostics
- Maintenance
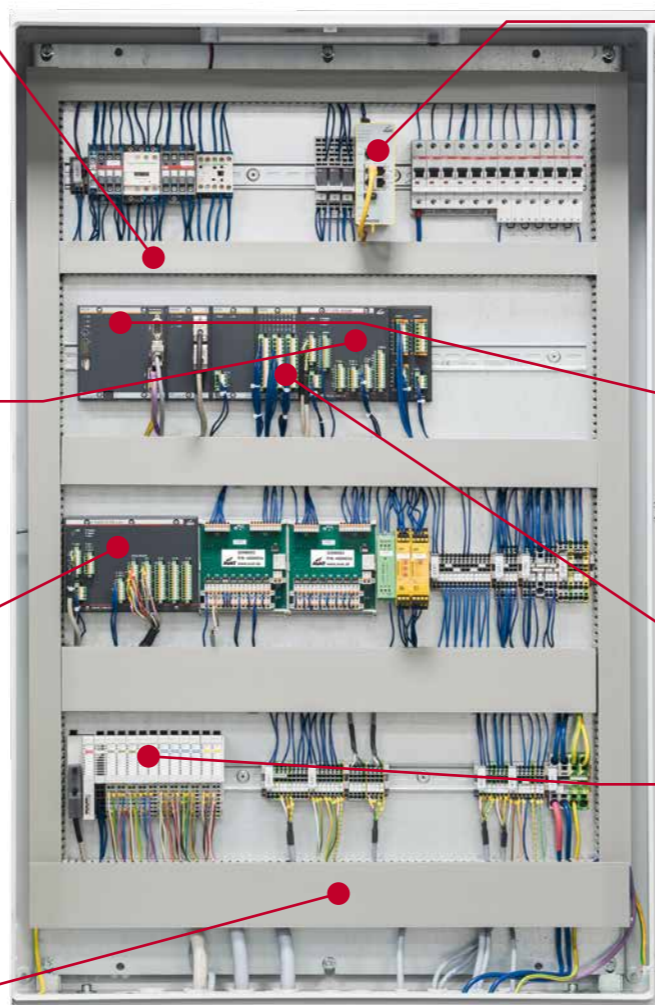
AVAT VPN-ROUTER
Our VPN industrial router for safe remote access via Internet is serially integrated.

- Internet access via broadband connection or direct via the mobile network (LTE)
- For remote access and maintenance as well as Cloud and virtual service tasks
- Optional access to sub-systems, such as easYgen

Bachmann CPU
Robust industrial controller as the control system's basis. Programmable according to industry-wide PLC Standard IEC 61131-3.

- CPU for engine management and control of peripherals
- Ethernet interface for visualization and SCADA system

Engine relevant I/O
Flexibly expandable with analog and digital inputs and outputs.

- Sensors, engine and peripherals
- Signals to and from the management system

Auxiliary system I/O
Flexibly adaptable to the individual plant configuration.

- Ancillary systems control for pumps, valves and fans etc.
- CAN connection
- Installation in the auxiliary drives cabinet

APPLICATION AREA

ENGINES

- MWM gas engines types TBG 616, 620 and 632 such as TCG 2016, 2020 and 2032
- Biogas, natural gas or special gases
- 500 to 4500 kW output range
- 8 to 20 cylinders

PLANTS

- Containerized system or installation in permanent structures
- CHP plant with waste heat recovery
- Gen-sets as electrical power modules

E²SERVICE – THE SERVICE TOOL FOR E²CON-TE

Our software for forward-looking service engineers provides visualization functionality and enables continuous remote access to all openECS based engine controllers from any location. E²SERVICE clearly displays engine behavior and relevant data. The views it offers are optimized to support typical tasks, such as commissioning, adjustment of controller settings, troubleshooting and maintenance. The operating log provides context information, filters, and search functionality. Parameters are used to provide online help plus save, restore and compare functions. As well as the scope for self-administration of access rights, task-specific views are available to users:

- The "Classic View" shows measured values and parameters.
- The "Advanced View" makes available many new, far more task-oriented views. The separation of Setup and Tuning crates a significantly clearer overview. In addition, there are special views which can be combined with each other for special application cases like parameter setting, measured values or trends, thus significantly simplifying service on the engine.
- The "Authoring View" is likewise new. It allows users to create their own views so that they can work according to their own preferences.

Depending on the application and authorization, E²SERVICE enables the following operations:

- Parameterization
- Starting and stopping the engine in manual mode
- Switching between manual and automatic mode
- Acknowledging alarms and faults when the cause of the alarm / fault has been eliminated
- Testing of signals and actuators
- Import and offline diagnoses from snapshots created on E²PILOT

THE openECS PRINCIPLE

Based on openECS, our open, flexible hardware and software components, controllers can be created for virtually all engines, gas types, fields of application, and plant types. Functions, modules, sub-systems and user interfaces form a single unit.

COMPLETE.
With openECS you create a solution that integrates all devices at and around your engine.

FLEXIBLE.
The modular design makes your Engine Control System future-proof to meet new requirements.

RELIABLE.
Long-term availability and competent support ensure safe operation in the engine's life cycle.

WHAT A CLASSIC PLC NEEDS TO BECOME AN ENGINE CONTROLLER

Why choose between special Engine Control Components and a modular industrial PLC? Exactly this combination gives you a future-proof and highly flexible engine controller.

To control gas engines in cogeneration plants, sensors and actuators are needed that cannot be connected to a classic PLC. This is where the AVAT technology modules come into use. They are fully integrated into the system via the software building blocks.

Our modules of the c-Series are an exact mechanical fit to the Bachmann M1-System and are connected via standardized CAN interfaces. Further devices, such as the ignition system, are connected via specific AVAT communication drivers.

As a matter of AVAT policy, all the modules and devices operate according to the principle "smart sensor" and "smart actuator". They deliver pre-processed information and are controlled and configured by the PLC. All functions access the same data and thus all data are usable in the total system and are displayed on the user interface.