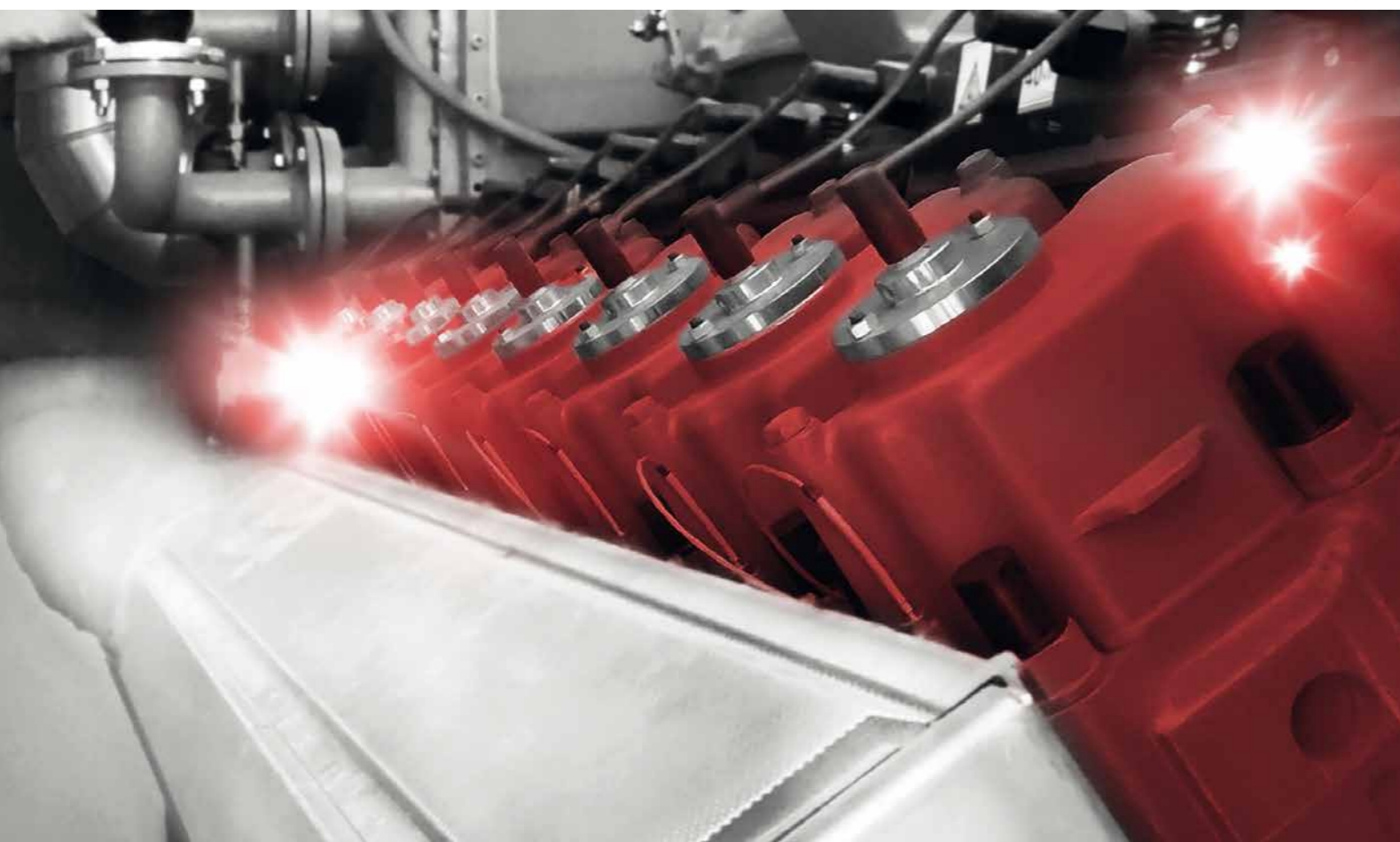# E²CON-GE ENGINE CONTROLLER

Retrofit system based on openECS
for modernizing GE Jenbacher gas engines

COMPLETE CONTROL SYSTEM FOR GE Jenbacher GAS ENGINES: CONSTANTLY FLEXIBLE, ALWAYS EXPANDABLE

Increasing the efficiency of gas engines in the context of modernization and new cogeneration plant operating concepts demand stable and performance-enhancing components as well as a more open and flexible gas engine control system. One that can keep the engine operating safely at the limit of its mechanical repowered parts while at the same time integrating it seamlessly into the cogeneration plant or into a whole network of plants. With our GE Jenbacher engine specialized control system – available for repowered gas engines Types 3, 4 and 6, system upgrades are straightforward while providing more options for your individual specifications.

EXTENDED ACCESSIBILITY

Our GE Jenbacher engine application covers all your known requirements and further more scope for individual system adaptation and expansion to specific operating conditions. The familiar control functions of are available in their accustomed quality.

FLEXIBILTY OPTIONS

As well as synchronisation and generator protection functions, grid code functions are already integrated into the system. The Bachmann GSP274 Grid and Generator Measurement Modules feature approved Component Certificates, simplifying the mandatory gen-set certifications. We will also support you during the certification process or in obtaining extensions to existing certificates.

EASY RETROFIT

Fast and simple system update by means direct installation on site. Generator-set cabling and actors can be retained and only renewed when "natural" degradation dictates.

COMPREHENSIVE SCOPE-OF-SUPPLY

Your new engine control system is delivered with all circuit diagrams, installation instructions and descriptions of functional characteristics. EPLAN libraries and complete circuit diagrams are available for all the components applied.

RETROFIT FOR GE Jenbacher GAS ENGINES FROM THE DEVELOPER AND MANUFACTURER OF TEM-Evo

The development of new engine controllers is our daily business. In doing so, we support our clients with practical experience in all the phases of the project for as long as it takes to reach a plant's design goals. Using our experience with over 8,500 customer-specific engine control systems we are confident we will also find the optimum solution for your project. This experience is also reflected in the GE Jenbacher retrofit application E²CON-GE. Aligned to the current requirements, also thought for future challenges.

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

ADVANTAGES AND FUNCTIONS

ADVANTAGES

- A more flexible control system for performance-enhanced GE Jenbacher gas engines in the context of plant modernization
- Reliable knocking and misfire detection included
- Powerful built-in diagnostic and service tools
- One controller for both the engine and the plant (CHP)
- Update availability over many years
- 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
- Start / Stop sequences for island and grid-parallel operation
- Compressor bypass control and ignition management
- High selectivity knock control of individual cylinders
- Misfire detection with automatic power reduction down to engine shutdown
- Monitoring of all sensors and measured values
- CAN connection to the ignition system
- 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-GE: OPEN UP YOUR GE Jenbacher GAS ENGINE FOR MORE FLEXIBILITY

Our tailor-made engine controller for GE Jenbacher gas engines is a specialized control system which is open for all types of expansion. Functions, modules and subsystems harmonize with a high performance user interface to form a single unit. E²CON-GE is based on classic PLC components. A wide range of interfaces make them an ideal control center for integrating all types of components.

E²PILOT
User terminal with 15" capacitive touch-screen, adapted to the plant operator's needs. Rapid overview of engine and peripherals. Interactive operating log and configurable trending function.

Remote Services
AVAT VPN-ROUTERS guaranties fast and secure remote access via Internet for remote assistance, reportings and smartphone based alarm management on request.

Grid Protection
Grid and generator monitoring, synchronizing and generator protection. Measurement of U, I, f, P and phase angle. Integral grid protection functions fulfill active and reactive power demands and synchronization criteria.

Bachmann CPU
Robust industrial controller as the control system's basis. Ethernet interface for visualization, SCADA system and virtual power plants technology.

Control Cabinet
All control system modules will be integrated in the existing control cabinet in short time. In most cases, I/O modules and engine cabling can be reused.

E²KNOCKCON-c
Reliably detects combustion knock of any individual cylinder from the signals of established piezo knock sensors.
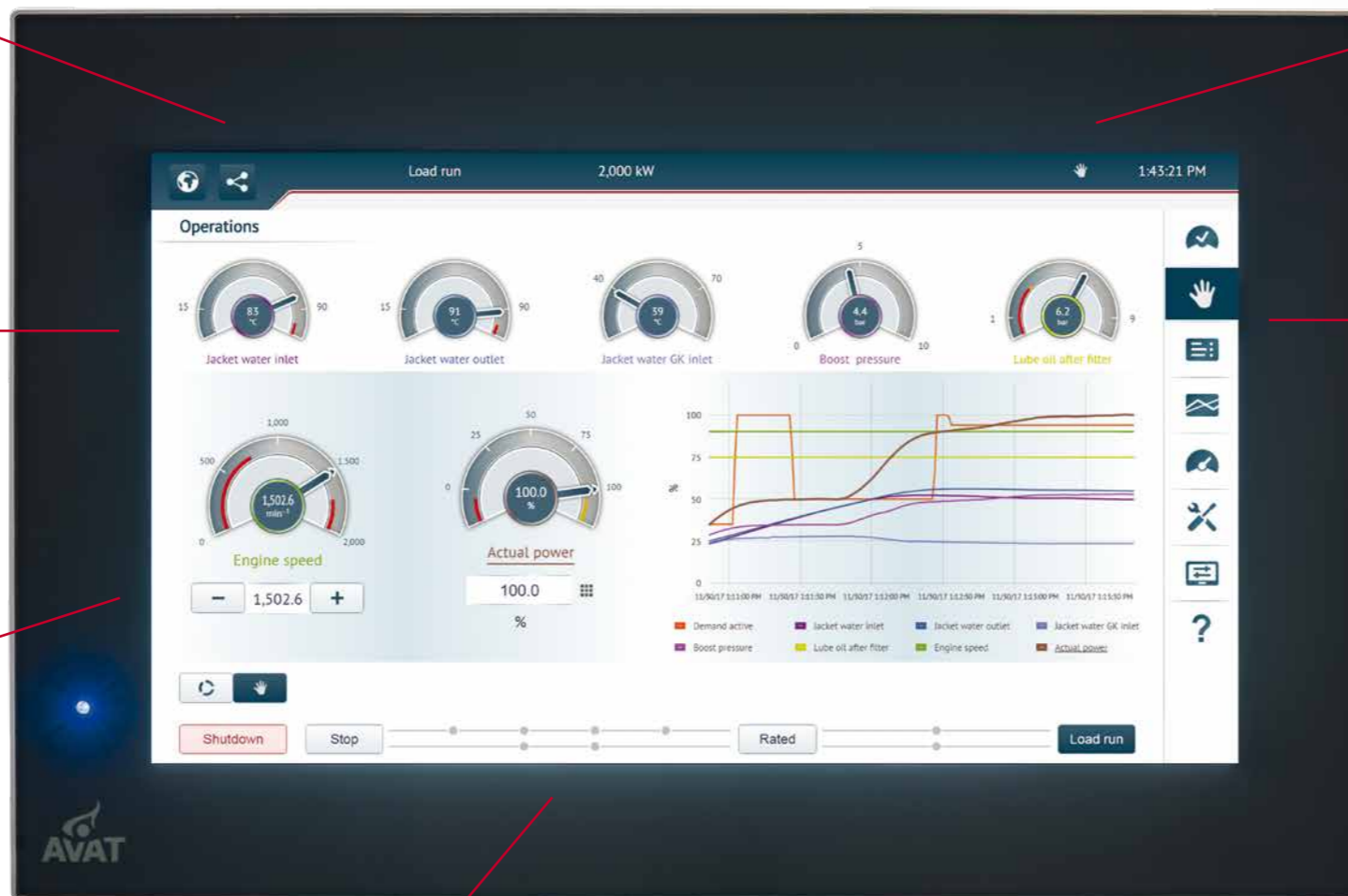
E²SERVICE (optional)
The software for ambitious service technicians. Task orientated graphical user interface for:

• Commissioning
• Optimization of controller settings
• Diagnostics
• Maintenance

AVAT VIRTUAL SERVICES (optional)
Central management of the complete engine pool and all service staff.

• Overview of all supervised plants
• E-Mail alerts in case of malfunctions, changes of status and control maintenance events
• List of alarm signals and reset statuses

APPLICATION AREA

ENGINES AND ACTUATORS

- GE Jenbacher Type 3, 4, 6 gas engines
- 400 to 3,500 kW output range
- 12 to 20 cylinders
- Biogas, natural gas or special gases
- Exhaust gas turbocharger with compressor bypass
- Original throttle, bypass and mixer actuators
- High voltage capacitor ignition system
- Two-stage intercooler

PLANTS

- Stationary cogeneration plants
- Containerized system or installation in permanent structures
- Synchronous AC generator, low or medium voltage
- Island mode and grid-parallel operation
- Grid code compliance
- Auxiliary control covers GE Jenbacher scope of supply

E²SERVICE – THE SERVICE TOOL FOR E²CON-GE

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 "Advanced View" makes available many new, far more task-oriented views. The separation of setup and tuning creates 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.