



ME-Automation Projects

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TURBISET

The Turbine Control and Protection System

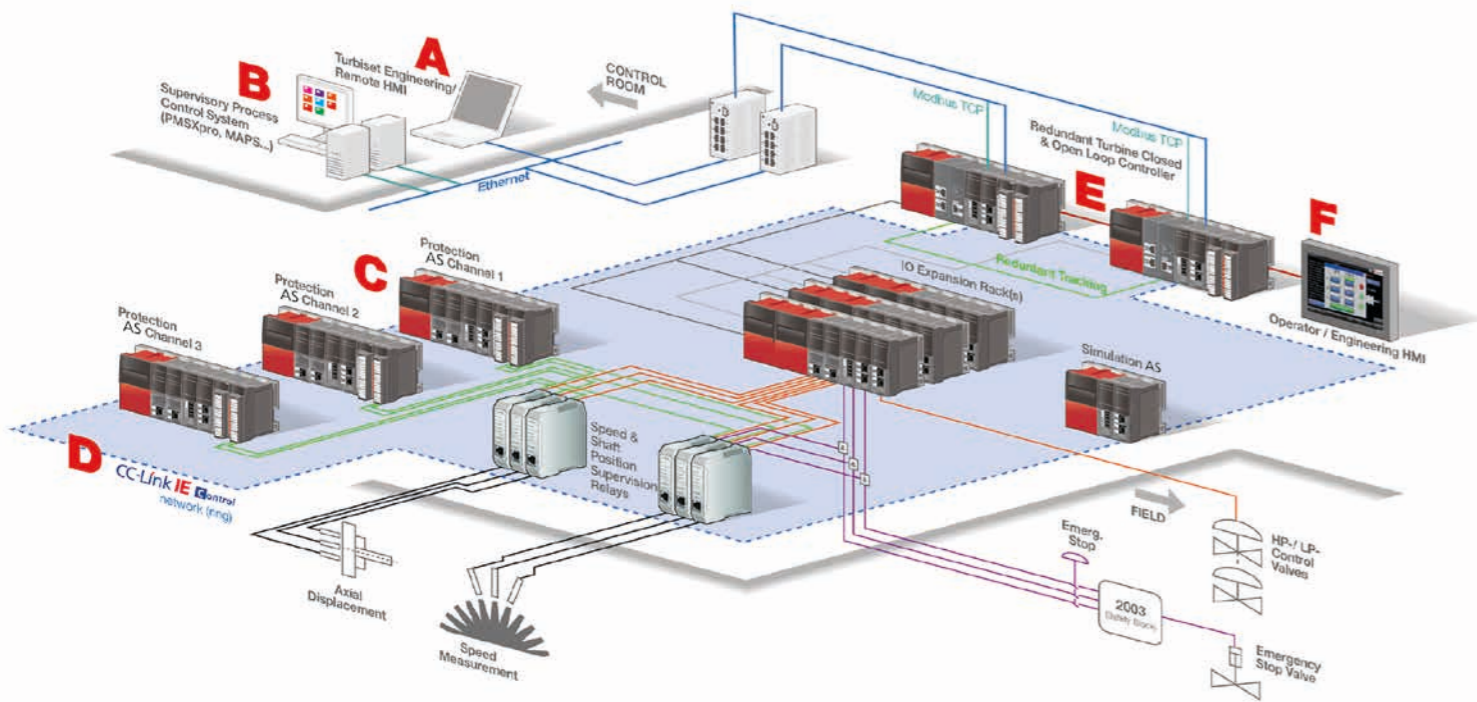
Reliable steam turbine control and protection

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TURBISET STEAM TURBINE CONTROL & PROTECTION



Why Turbiset

Steam Turbine Control and Protection solutions represent a comprehensive suite for both utility and industrial turbine applications. With many decades of experience in control and protection systems for steam turbines, Turbiset represents the culmination of this depth of experience relating to all aspects of turbine operation, fail-safe protection and maximised efficiency – saving energy, CO₂ and costs.

Turbiset Outline

Turbiset is a solution for enhanced control, protection and surveillance of steam turbines. Its built-in control features and in-depth reporting functions simplify plant operations, add flexibility to improve overall plant productivity, reduce maintenance cost, and increase your revenue and profitability.



TURBISET SOLUTION HIGHLIGHTS:

- Reliable next-level solution with comprehensive automation functions using packaged, pre-validated turbine control and protection libraries
- Control hardware with or without redundancy to ensure fully automatic and optimum control and protection resulting in minimized system downtime and productivity losses
- Service portfolio: upgrade feasibility study, detailed engineering, full simulation testing, installation and commissioning, plus complete documentation
- First-principles turbine simulator for safe, offline checkout and pre-tuning of the controls
- Monitoring, diagnostics and lifecycle optimization
- Ideal for steam turbine upgrades and retrofits

Turbiset Applications

Turbiset is equally deployable in industrial plant applications, including cogeneration or motive power turbines for compressors and pumps, as it is at home running medium and large power plant turbines. Integrated controls provide seamless steam header and extraction control and machinery protection. Therefore, the risk of critical inefficiencies, poor performance and catastrophic failures is substantially reduced.



Turbiset Scope

Turbiset includes all the elements necessary for essential steam turbine operations, and the automation and control of your plant. Additional packages such as monitoring, diagnostics and lifecycle optimization services are available to increase plant availability and lifetime with significant reliability improvement.



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IDEAL FOR STEAM TURBINE UPGRADES AND RETROFITS

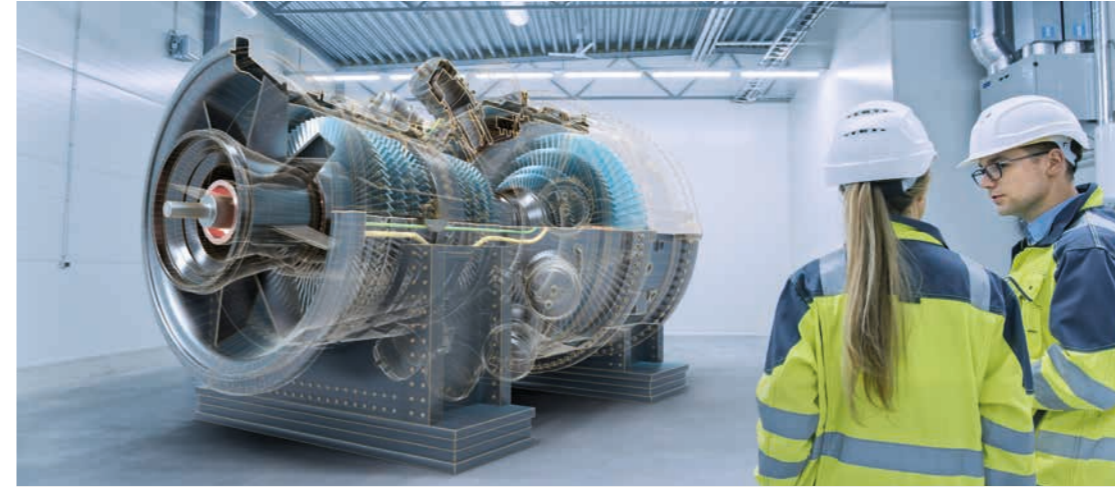
Turbiset offers its clients a control system for industrial steam turbines that is based on proven standard components to provide high operating safety and reliability capabilities via online monitoring, visualization and continuous diagnostics, flexibility via fault-tolerant trip block assemblies and user friendliness. The system is implemented on industrial-grade MELSEC iQ-R-Series automation platform, allowing flexible use for industrial steam turbines including extraction turbines and irrespective of whether these are used as generator, compressor or pump drives. We ensure you that all the components of the system are designed, installed and validated to meet your operational requirements precisely.

The advanced **Turbiset control** module implements standard controllers for generator load, live steam pressure, extraction pressure and back pressure. Limit controllers can be applied for defined process variables like generator load, live steam

and back pressure. Linearization curves can be parameterized for all final control elements. The system also permits automatic and operator-assistance run-up of the turbine to nominal speed, taking into account the specific requirements of cold, warm and hot starts.

In addition, the integrated **Turbiset protect** electronic protection module allows rapid adaptation to match turbine protection requirements as defined by the turbine manufacturer. This module includes predefined software blocks which are combined to create or extend turbine protection applications with no single point of failure and by which the existing protection logic can easily be replicated in Turbiset.

Turbiset's turbine island auxiliary controls manage the high pressure hydraulic system, lubrication oil system, jacking oil system, gland steam system, etc.



SIMULATION FOR PEACE OF MIND

The **Turbiset simulate** environment is a standard part of the system, allowing detailed mathematical modelling and simulation for planning, designing and safe testing of turbine control loops – offline and before commissioning. The blocks for configuring the turbine simulator are included in the package. The structure of the mathematical model is so modular that building a simulator to replicate the target turbine process can be compared to building of new closed loop controls in the controller.

EASY TO USE

Parameterization menus are used to adapt the solution to the turbine via a graphical operator terminal, which also permits comfortable system operation during turbine operations. Customer designations and tags from standard identification systems can be stored and displayed in the system. No additional software or hardware is required here for parameterisation.

ROBUST HARDWARE

Turbiset is deployed on the industry-hardened and highly reliable Mitsubishi Electric MELSEC iQ-R Series control platform in the combinations required by the application, with and without redundancy – guaranteeing you the highest level of control and protection resilience for your most critical power generation asset.



TURBISET SPECIFICATIONS

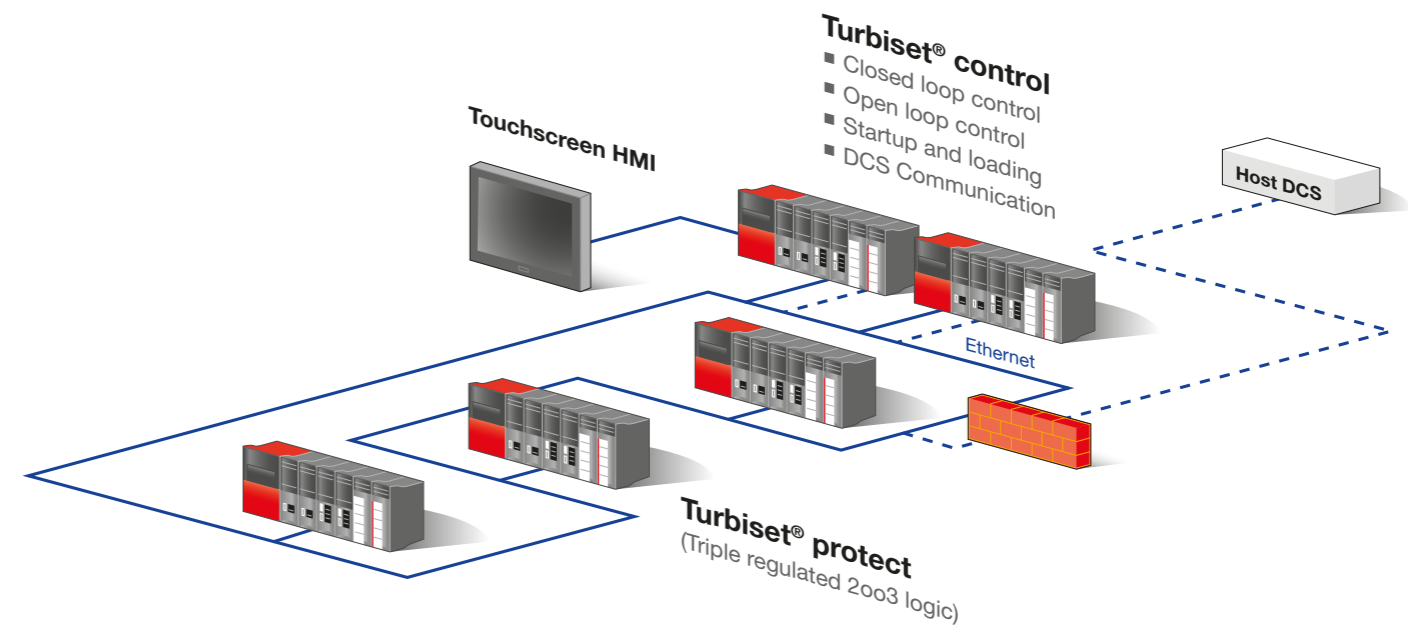
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Turbiset control – closed-loop control of:

- Turbine Speed (speed control, measurement, calculation and indication)
- Live steam pressure- seamless steam header control and machinery protection
- Back pressure
- Extraction pressure including via cross-over over valves
- Bleeding pressure via throttle valve
- Limit controls for generator load, live steam and back pressure
- Turbine run-up and loading
- Others according to requirements

Turbiset protect – triple redundancy with 2-out-of-3 voting for:

- Overspeed
- Generator protection
- Boiler protection
- Lubrication oil pressure
- Turbine and generator bearing temperature
- Bearing vibration
- Shaft displacement, etc. according to requirements
- Others according to requirements



PROTECTION THAT NEVER STOPS

Turbine protection is implemented using three identical and independent protection controllers, each of which typically controls a separate solenoid on the 2-out-of-3 hydraulic block. The hydraulic high-pressure control system – with continuous, reliable supply of oil to all control, stop and

extraction steam valves – is designed for all types of steam turbines. High control quality and position accuracy gives a maximum protection of the turbine assuring the highest turbine availability – maximising your profits.



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ME-Automation Projects GmbH
A Mitsubishi Electric Group Company

Kasseler Straße 62
D-34277 Fuldabrück

Telephone: +49 (0) 561 / 58 54 – 0
info@me-ap.de
www.me-ap.de



Visit us on LinkedIn