



ETOS[®] – the central control and monitoring system for transformers

Individual. Independent. Reliable.

Who can help me control and evaluate the transformer?

Why ETOS®?

ETOS® is the **central control and monitoring system** for the transformer, which bundles all necessary functions in one system. In addition, the complete secondary technology can be integrated in ETOS®, eliminating the cost of a separate cabinet. ETOS® uses proven components from the TAPMOTION® ED for the on-load tap-changer drive functionality. In combination with the actuator technology for cooling, ETOS® performs the basic control functions on the transformer.

Dynamic load and operation control or automatic voltage regulation can be integrated for efficient control. The integration of important monitoring functions (bushings, DGA, cooling, tap changers) show the full range of functions that can be **individually combined** in ETOS® as required. The more intelligent sensors - e.g. from the MR MSENSE® product series - are integrated into ETOS®, the more powerful and precise the system becomes. ETOS® is compatible with sensors from any manufacturer, which gives the user full flexibility in designing the automation solution.

With ETOS® you realize your **manufacturer-independent standard** for the networked, digitally connected transformer without having to sacrifice reliability and durability. ETOS® demonstrably meets the highest quality and safety requirements, e.g. by covering the specifications from **VDE SPEC 90011 V1.0** or standards such as IEC60214/ IEC61439, IEEE 1686 and the BDEW Whitepaper 2.0. This high standard is evident, among other things, in the hardware used in ETOS® - the ISM® technology (Integrated Smart Module) - with an expected service life of approx. 20 years. Later replacement is uncomplicated and cost-effective because the Linux-based software has been abstracted from the hardware.

How does ETOS® work?

The unique feature of ETOS® is the modular combination of **monitoring, control and actuator technology** for on-load tap-changers and cooling in one system. The core of ETOS® is the ISM® technology, consisting of a CPU with the software developed by MR. Further hardware components are analog and digital input and output modules, current and voltage measurement modules or additional modules for functions such as tap changer- or bushing-monitoring. In the robust, durable control cabinet made of aluminum sheet

(protection class IP66), the ISM® is ideally equipped for the tough requirements at the transformer. On request, ETOS® is also available without control cabinet for assembly on mounting rail.

ETOS® acquires the required sensor data where they are generated: at the transformer. This **saves wiring and installation effort**. An integrated sensor bus via Modbus RTU ensures communication between sensors and ETOS®; alternatively, communication can take place via analog channels. For communication to the control system or to a higher-level asset performance management system, all common protocols - e.g. IEC61850 or IEC 60870-5-104 - can be used in ETOS®. In addition, browser-based remote visualization is possible.

ETOS® evaluates and analyzes the collected data, providing the user with **concrete interpretations and recommendations** for action. The more sensors are connected to ETOS®, the more meaningful the evaluations and recommendations for action. This is made possible by the „Asset Intelligence“ function, which is supplied as standard. The Asset Intelligence function is used to diagnose possible faulty conditions of the transformer from the data of the sensors that are connected to the device. This greatly facilitates the interpretation of the acquired measured values and the event messages that have occurred, because the system simultaneously evaluates the probability & criticality of the fault as well as possible consequences for the transformer and what options are available for troubleshooting.

It is in functions such as „Dynamic Transformer Rating (DTR)“ that ETOS® **unfolds its added value compared to the use of disconnected individual systems**. DTR enables dynamic, optimized operation of the transformer by checking the expected load and calculating the specific temperature limit and aging. This requires a wide range of input variables such as currents and temperatures (environment, oil, winding, hot spot). The result is a load control based on dynamic limits for temperatures and load including predictive cooling. The advantages are, for example, a longer service life and efficient utilization of the transformer.

Your advantages

- ETOS® is the central control and monitoring system for actuators, control and monitoring on the transformer. The bundling of all required functions in one system and the possibility of integrating previously separate transformer control cabinets in ETOS® significantly reduces corresponding costs and simplifies handling through a uniform, central visualization.
- The bundled functions in ETOS® are superior to various individual systems in terms of informative value and derivation of concrete measures.
- ETOS® has a modular structure and can therefore be individually designed; functions can be retrofitted at any time.
- **Asset Intelligence:** With the help of intelligent algorithms - based on our many years of expertise in on-load tap-changers and transformers ETOS® evaluates collected data and generates concrete analyses and recommendations for action for the user.
- With ETOS®, data is bundled where it originates: at the transformer. The resulting minimal wiring effort leads to savings during installation and commissioning.
- **Data sovereignty** in ETOS® remains with the operator at all times - no external access by third parties or MR. If interested, service solutions can be created based on a digital twin.
- The robust housing made of aluminum sheet in double-walled design with passive cooling for optimized temperature management protects the inner workings from external influences (protection class IP66) while minimizing the CO₂ footprint.
- ETOS® fully complies with the requirements of VDE SPEC 90011 V1.0 for functionally integrated modular transformer control.
- ETOS® meets **full coverage** to the applicable regulation **BDEW Whitepaper 2.0**, including the use of a hardened and robust operating system, an integrated firewall, encrypted communication, role-based access control, external auditing and product security management by an in-house CERT team.
- Various international norms and standards are taken into account in the development of security functions and with regard to securing the devices: IEC62443, IEC 62351, BDEW Whitepaper, IEEE 1686, OWASP, BSI TR 02102, FIPS-PUB 180-4, and many more.
- ETOS® is the manufacturer-independent solution for digitalization and networking at the transformer.
- ETOS® is open in 2 dimensions. Compatible with sensors of any manufacturer and open for co-creation and cooperation with external partners
- Based on cooperation (co-creation), MR offers the possibility to develop own software modules on the ISM® platform and to scale them via the ISM® hardware to enable differentiating, individual automation and digitization solutions. In this way, new business models can be developed according to demand and further potentials can be used.
- Intensive, personal training at one of our training centers or at your site.
- Together with TESSA® APM, you can manage the entire data chain with MR, from data generation (sensor technology), to the utilization of data in ETOS® (Edge), to the structured, qualitative status assessment of the entire transformation fleet (online and offline data) in TESSA® APM.
- We are there when you need us - global service network MR with 24/7 availability.
- Personal support from your local MR Sales contact.
- Holistic consulting through MR's expert knowledge of OLTC and transformer: One partner for everything!



→ [More Information](#)

Contact us at: ETOS@reinhausen.com



Maschinenfabrik Reinhausen GmbH

Falkensteinstraße 8
93059 Regensburg
Germany
+49 941 4090-0
info@reinhausen.com
[reinhausen.com](https://www.reinhausen.com)

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