SYNAPTEC

Megger.

Preventive cable monitoring:

Avoid failures and performance losses.

Distributed Electrical Sensing

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ENGLISH

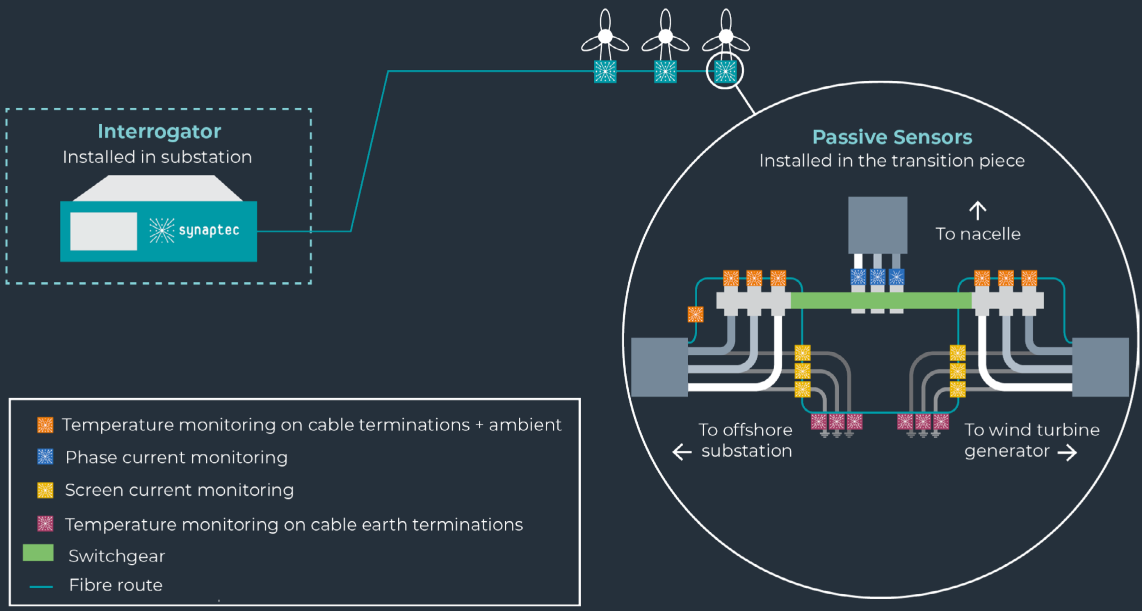
Cable condition monitoring in offshore wind

69%* of all cable failures occur in joints and terminations, locations which are remote and inaccessible in offshore wind farms. As Synaptec sensors require no data networks or control power, it is now feasible to instrument these remote locations to provide early warning of more cable failure modes than with conventional technology. This dramatically improves availability and safety, while reducing OpEx and outage cost over the life of the array.

Cable failures remain the single largest operational cost in offshore wind. Most power cable faults can be traced back to issues with terminations, where jointing and earthing can be vulnerable to degradation over time. Monitoring sheath currents and temperatures in these terminations and their screen connections provides early and economical failure warnings across every cable in one retrofittable, online monitoring system.

*Source http://www.jicable.org/TOUT_JICABLE/2015_slides/2015-D9-2_slides.pdf

Synaptec's Cable Condition Monitoring (CCM) platform is a simple and powerful solution to enable health monitoring of cable junctions and terminations. Using Synaptec's Distributed Electrical Sensing (DES) technology, CCM delivers real-time, high-quality data on the cable screen earthing points and ambient temperature. Integrated and customisable threshold alarms and live measurement data are easily integrated with existing SCADA systems, giving wind farm operators awareness and actionable information on the health and status of terminations.



Synaptec's unique Distributed Electrical Sensing (DES) technology leverages existing optical fibres to instrument up to 21 mechanical or up to 30 electrical sensors over a 60 km range. The sensors do not require data networks, control power, expensive civil works, or time sources at any measurement location, taking as little as 30 minutes per sensor to install.

Current measurements are IEC 60044/IEC 61869 compliant. Temperature measurements are accurate to +/-0.5 °C, allowing the temperature of individual components, such as terminations, to be precisely and discretely monitored. All data – electrical and thermal – are precisely timestamped centrally by the Interrogator module for analysis of fault precursors and trends.

CCM is focused on providing early warning of premature termination failure. CCM is compatible with complementary mid-span optical monitoring technologies such as DTS and DAS and can share the same optical fibre core as those technologies.

Key benefits

Permanently and synchronously monitors the relationship phase current, sheath current and temperature with passive sensors

Provides earlier warning of more cable failure modes over longer distances compared to conventional monitoring techniques

Optimises scheduled maintenance

Easy retrofit and integrated with DTS and DAS for holistic lifetime monitoring

Distributed Electrical Sensing (DES)

Distributed Electrical Sensing (DES) is a precision measurement technology that allows power system operators to protect and monitor their networks with unprecedented flexibility. Using the optical fibre within power networks, DES makes high-fidelity measurements of voltage and current at many locations over distances of up to 60 km from a substation.

The entire sensor array is completely passive, meaning no control power or auxiliary equipment is needed at sensing locations. Synchronised waveform data from all sensing locations is available at the speed of light, enabling a wide range of protection, control, and monitoring functions to improve reliability and security, reduce unplanned maintenance, and significantly reduce operational cost.

Why choose DES?

Quick to install. Commissioned from a single location. No maintenance requirements

DES deployments are simple and elegant, avoiding complex wiring and telecoms. Full sensor networks supporting protection or monitoring are typically installed and commissioned in days rather than over weeks.

Measurements synchronised to within one microsecond, and processed in under 200 microseconds

DES delivers the world's fastest protection and monitoring systems. Make instant and informed decisions on your network with synchronised waveform data.

Easily compare multiple remote measurements across hard-to-reach locations

Monitor your networks at scale with multiple sensors deployed over 60 km of optical fibre, with no requirement for power or data networks at the sensor location.

Ultra-stable year-round in the most challenging environments

Simple and resilient sensors that automatically adjust to environmental conditions, ensuring accuracy in all conditions.

Cyber-secure sensor networks with no data exposure

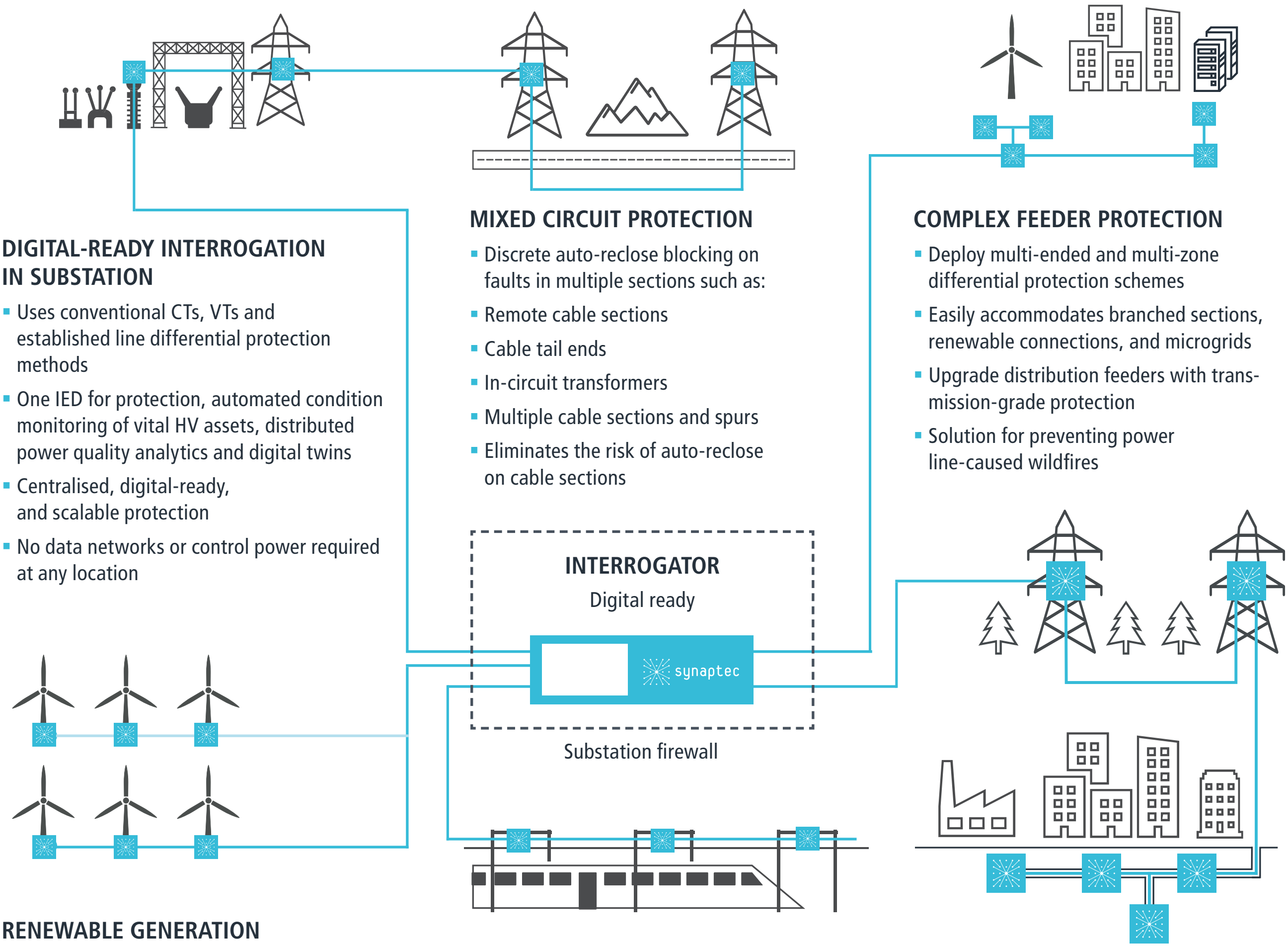
Our hardened sensor networks transmit no data. Data is only produced within the safety of the substation environment, ensuring your vital insights are never exposed.

Fully passive sensing networks of voltage and current

Using optical fibre within power networks, Distributed Electrical Sensing enables high-fidelity measurements of voltage and current at many locations over distances of up to 60 km from a substation.

One technology, multiple applications

Our DES technology is the ideal solution for a range of applications on power grids, offshore and industrial networks.



DIGITAL-READY INTERROGATION IN SUBSTATION

- Uses conventional CTs, VTs and established line differential protection methods
- One IED for protection, automated condition monitoring of vital HV assets, distributed power quality analytics and digital twins
- Centralised, digital-ready, and scalable protection
- No data networks or control power required at any location

MIXED CIRCUIT PROTECTION

- Discrete auto-reclose blocking on faults in multiple sections such as:
- Remote cable sections
- Cable tail ends
- In-circuit transformers
- Multiple cable sections and spurs
- Eliminates the risk of auto-reclose on cable sections

COMPLEX FEEDER PROTECTION

- Deploy multi-ended and multi-zone differential protection schemes
- Easily accommodates branched sections, renewable connections, and microgrids
- Upgrade distribution feeders with transmission-grade protection
- Solution for preventing power line-caused wildfires

RENEWABLE GENERATION

- Early warning of power cable and termination failures at multiple locations
- Retrofittable for array, export, dynamic cables
- More accurate Real Time Thermal Rating
- Permanent and synchronous harmonics from every turbine
- Scalable, flexible protection of array cables
- Simplified substation and grid connection instrumentation

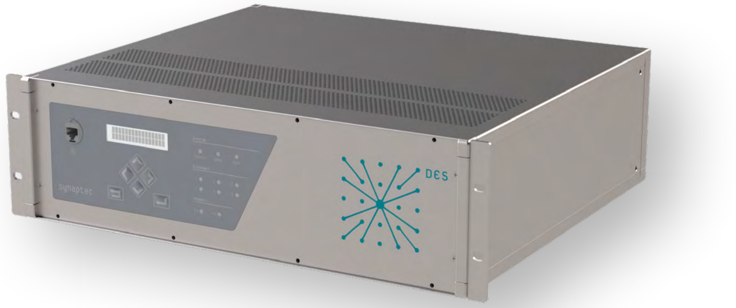
INDUSTRIAL/PRIVATE POWER SYSTEMS

- Distributed protection, control, condition monitoring in one system
- Earlier warning and more accurate location and characterisation of faults

REMOTE-ASSET MONITORING

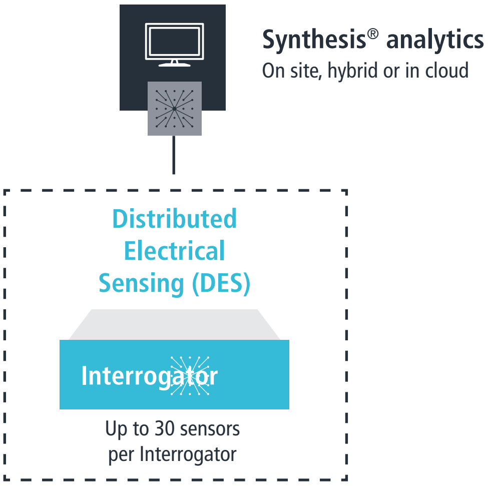
- Truly automated condition monitoring of assets beyond the substation fence
- Works where no control power or telecommunications are available
- Ideal for underground and subsea cable system monitoring
- Live ampacity for remote spans
- Tower and line damage from intrusion or weather event

Interrogator



Synaptec Interrogators are the core component in all our monitoring systems, centrally gathering, time-stamping and publishing synchronous data from passive Synaptec sensors. The data can be streamed to existing protection relays and SCADA systems, with Synthesis® providing visualisation and analytics to enable actionable alarms and insights.

Modular and scalable, they fully support any mix of Synaptec's electrical and mechanical sensors and perform real-time analysis of the performance and condition of power networks.

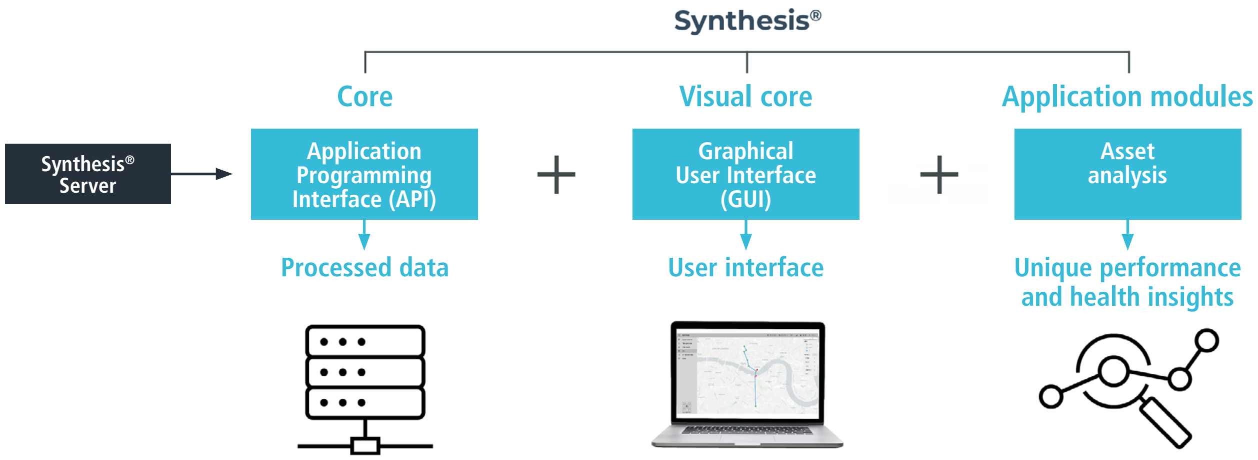


The DES Interrogator is Synaptec's core, high-performance Interrogator, designed primarily for Distributed Electrical Sensing (DES). The DES Interrogator streams live data in industry standard formats including IEC 61850 Sampled Values or custom data formats, and alarms in GOOSE format. All measurements are time-synchronised, accurately time-stamped to within a microsecond, and published at up to 14.4 kHz, enabling the system to support a combination of protection, metering, and condition monitoring applications. The DES Interrogator synchronously monitors up to 30 sensors over a 60 km range, processing and streaming waveform data in real time with industry-leading latency and detail.

Synthesis® server

Synthesis® Server provides convenient and secure local hosting of the Synthesis® Core and Visual Core software. It provides a one-box, turn-key solution for collecting and interpreting high-resolution data from many Interrogators, and other data sources. It is designed to be simple to deploy and maintain, while unlocking advanced visualisation and analysis features for asset condition monitoring. Extensive processing and analysis is performed on all measurement streams in real time.

Synthesis® Server is ruggedised for deployment in harsh, safety-critical environments, such as electrical substations. It offers reliable, high-performance computation in a robust, fanless, and low-maintenance form-factor. All processing is performed locally to deliver a self-contained platform for delivering data aggregation, visualisation, and analysis. The hardware is also future-proofed for updating with new analytics features and applications.



Key features

Designed for electrical substation deployments – high reliability and stability	Certified with IEC 61850-3 and IEEE 1613 compliance for operation in challenging EMC and environmental conditions
Guarantees at least 12-months of local data storage	Fanless design
Dual redundant power supplies	No user-configuration required

Talk to an expert.
Looking forward to your requests.

synaptec@megger.com

The Synaptec system is built and owned by Synaptec Ltd.
Megger is the authorised distribution partner.

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