TÜV SÜD Product Service
-- Smart Grid Communication --

IEC 61850 Interoperability and Integration
Integrity Testing as part of the FAT

TÜV SÜD Product Service
Smart Grid Services (PS-COP-MUC)

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TÜV SÜD Product Service GmbH

- Head of Smart Grid Communication Laboratory
- Technical Product Specialist IEC 61850 and Communication Protocols
- More than 20 years of experience in test development (SW, HW and Test Systems) and product test & qualification.
- Responsible for the Test Bench development and maintenance
- Member of IEC TC57 WG10
- Member of USE61400-25
- Member of UCAIug Testing Subcommittee
- Member of DKE 952.0.10 and 952.0.17
- Based in Munich, Germany
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AGENDA

The TÜV SÜD

IEC 61850 IOP-II Testing during FAT
Inspiring trust in a changing world

Solutions that ensure quality, safety and sustainability for future generations
Our heritage: 150+ years of business success

1866
On 6 January, 22 industrialists united to establish the Steam Boiler Inspection Association Baden in Mannheim.

1906
Our first vehicle periodic technical inspection was carried out.

1938
The launch of a standardised nationwide system created 14 regional inspection associations named TÜV.

1964
Expansion beyond Europe began with a cable car accident investigation in Cape Town, South Africa.

1991
Asian subsidiaries launched in Hong Kong then Japan, Taiwan and China, with North American subsidiaries set up around the same time.

2006
Singapore’s PSB Group is acquired, with TÜVTÜRK launched the following year and our largest acquisition to date, ATISAE, in 2016.

1881
The first binding standards related to boiler safety were agreed, paving the way for uniform technical inspections.

1921
Environmental advocacy began with our publication of a report addressing dust pollution.

1951
TÜV organisations were tasked with performing regular inspections of all motorised vehicles.

1989
TÜV Product Service GmbH was launched, pioneering the concept of worldwide approvals.

1996
The TÜVs from Germany’s southern states united to form TÜV SÜD.

Today
TÜV SÜD has been inspiring trust for more than 150 years and remains committed to shaping the future of commerce and society.
TÜV SÜD at a glance

150+ YEARS OF QUALITY, SAFETY & SUSTAINABILITY

1,000 LOCATIONS WORLDWIDE

€2.3 BILLION IN ANNUAL REVENUE

24,000 EMPLOYEES

43% OF REVENUE OUTSIDE GERMANY

574,000 CERTIFICATES

100% INDEPENDENT & IMPARTIAL

1-STOP SOLUTIONS PROVIDER

Note: Figures have been rounded off.
Technical expertise & broad industry knowledge

Testing & product certification
Beyond testing for compliance with directives, we issue TÜV SÜD certifications based on standards set according to internationally recognised benchmarks.

Inspection
We independently verify that at every stage your systems, processes and procedures comply with the relevant codes, requirements, regulations and standards.

Auditing & system certification
We audit and certify management systems for virtually all industries, ensuring your value chain complies with requirements for quality, performance and IT security according to international, national and other relevant standards.

Knowledge services
We provide knowledge services on diverse topics ranging from quality, safety and risk to environmental protection, regulatory requirements and process optimisation.

Training
We support people and organisations to enhance performance through a wide range of work safety, technical, management systems, executive training programmes and certified qualifications.
End-to-end solutions for the entire business lifecycle
The sure sign of trust

574,000 product certificates
54,000 system certificates
20,000 personnel certificates
Key services for the Chemical, Oil & Gas, Conventional Power, Renewable Energy and Nuclear industries

ENERGY AND PROCESSING SECTOR
- Engineering and knowledge services
- Life testing and maintenance services
- Product certification
- Project development and design review
- Risk-based inspection and maintenance
Services for Communication Protocols

Make your devices and systems ready to communicate in the Smart Grid

**IEC 61850 Conformance Testing and Certification**
- Testing and certification of
  - Server IEDs, Client IEDs
  - Merging Units
  - IED Configuration Tools
  - System Configuration Tools

**IEC 61850 Interoperability Testing**
- Testing of devices for their interoperability with other components and ensuring an exchange of data between systems of different manufacturers
- UCA IOP Event in Munich 2013 hosted by TÜV SÜD

**IEC 61850 Interoperability & Integration Integrity Testing**
- Testing the configuration and implementation of the IEC 61850 communication for a substation/power station within the FAT

**Redundancy PRP/HSR Testing**
- IEC 62439-3 PRP/HSR Conformance Testing
- HSR & PRP Interoperability Testing
- PRP and HSR network performance
Services for Smart Grid Architectures and Integration

Smart Grid: Power from an array of intelligently linked sources

**IEC 61400-25 Conformance Testing**
- Testing according to selected parts of IEC 61400-25, the standard on Communications for monitoring and control of wind power plants

**IEC 61850 & IEC 61400-25 Training**
- Standard Trainings: Basic / Utility / Developer
- Customized trainings according to the needs of the client

**IEC 61850/IEC 61400-25 profiling for Utilities**
- Component analysis to guarantee the interoperability of all systems involved

**Type Testing VDE-AR-N 4105, CEI 0-16, CEI 0-21**
- Testing of acceptable grid impact
- Testing of circuit breakers (grid protection device)

**IEC 62351 & IEC 62443 Security Testing**
- IEC 62351 & 62443 consultancy and auditing with preparation of test report

**IEC 61850-3 Testing**
- Electromagnetic Compatibility (EMC), shock and vibration testing (Environmental)
IEC 61850 Testing accredited by UCAIug (Level A) and DAkkS (ISO 17025)

TÜV SÜD’s unique Communication Protocols Test Laboratory
The TÜV SÜD

IEC 61850 IOP-II Testing during FAT
• The IOP-II Testing is an enhancement of the already known testings:
  
  – IEC 61850 Conformance Testing (with certificate)
  
  – IEC 61850 Interoperability Testing (White-List)
  
  – IEC 61850 Interoperability and Integration Integrity Testing (Project Specific) during the Factory Acceptance Test
How to get IEC 61850 communication into your substation

The Product Live Cycle

Specification and Tender

Development with FAT/SAT

Ramping and Life Cycle
The Test Strategy for IEC 61850 communication

- **IOP Tests**
  - Proof of basic communication

- **FAT**
  - Proof of configuration, integration integrity, network stability,
  - Check of simulated Functionality

- **SAT**
  - Proof of the real Functionality

- **Maintenance Tests**
  - System Checks, finding root cause of problems, stability checks
IOP and Integration Integrity Testing during FAT

Areas of testing

- Certificates & Documents Check
- Configuration Check
- Association, Server
- Control, Report, GOOSE
- Network Tests
- Function and Domain Tests
Issues found during IOP-II Testing

**Missing Conformance Testing**

- **Missing Certificates**
  - Missing certificates result into missing or incorrect documentation, up to problems in the communication.

- **Wrong or missing LN configuration**
  - Edition 2 devices with GGOI LN’s instead of the standardized LN’s.

- **Under-tested implementation**
  - IEDs tested and certified with less communication functionality but used with more features and services as certified.
Issues found during IOP-II Testing (continued)

Network and Configuration Tools Issues

**Network problems**
- Network setup and architecture
- Network configuration
- Switches

**IED Configuration Tools**
- ICT’s often not conform to the IEC 61850 standard (e.g. limited in import/export)
- Bug generators

**System Configuration Tools**
- SCT’s often also introduces bugs (e.g. half Edition 1, half Edition 2)
- SCT’s also often not conform to the IEC 61850 standard
Recommendation on how to consider Testing for IEC 61850

- Establish trust for Data & Information exchange over a digital medium.
  ➔ Check for actual, valid conformance certificates

- Pay attention to your technical requirements.
  ➔ Specify your communication requirements and proof correct implementation.

- Avoid unexpected costs during development and life cycle.
  ➔ Earlier you find problems and issues less expensive is the fix

- The communication is the base of information exchange in the substation.
  ➔ Test it with a good strategy to get it save
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