



SERVICES FOR ELECTRIC
POWER GRID AUTOMATION

Ingeteam




INGETEAM

SERVICES FOR ELECTRIC POWER GRID AUTOMATION



Ingeteam has supplied protection, control and automation solutions for electrical substations for more than 25 years. More than 5,000 installations with our technology have been performed for the energy transmission and distribution and renewable energy generation industries.

Ingeteam makes available to our clients a network of professionals, covering 4 continents to offer both service and assistance during each phase of their projects, from the initial project definition phase to the end of the useful life of the equipment.

-  **Engineering & configuration**
-  **Operation & supervision**
-  **Maintenance & analysis**

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INGETEAM P&C SERVICES



ENGINEERING

We develop the substation protection and control project from the engineering phase to commissioning



R&D SERVICES

We place at your service a distinguished team of professionals with more than 25 years of experience and the most advanced laboratories and design tools



CONSULTANCY

We provide guidance to find the best solution to your specific needs, placing our knowledge and experience at your service



TRAINING

We help to ensure the best performance from our teams and solutions by conducting tailored operation and/or maintenance courses

INGETEAM EVOLUTION SERVICES



PREVENTIVE MAINTENANCE

We make sure that the assets of your installation perform are in line with the progress of the market and technology



CORRECTIVE MAINTENANCE

We provide prompt support to identify and solve any problems or incidents that may arise



TECHNICAL SUPPORT

You can rely on the various types and levels of support we offer across 4 continents



REPAIRS AND WASTE MANAGEMENT

Our after-sales service is flexible so it can provide faster, closer and more efficient assistance

INGETEAM P&C SERVICES

Project phases

1

PRE-SALES

We select the best technical solution



2

PLANNING

Project launch and definition of milestones



3

DOCUMENTATION

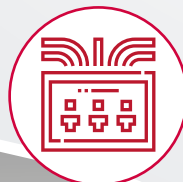
We prepare and validate the engineering



4

MANUFACTURE

Monitoring of on-time equipment manufacturing



5

PANELS

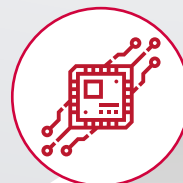
Panel engineering and manufacture



6

CONFIGURATION

We program the equipment according to the documentation



Ingeteam's team of engineers are highly specialized in technology and know how to respond to the demands of constant technological and digitalization transformation of substations, in search of a more reliable and sustainable energy system.





7
FAT
Validation testing
alongside the customer



8
LOGISTICS
The material is
documented and
shipped



9
PREVENTION
We prepare all the
requirements to comply
with legal regulations



10
SAT
Commissioning
of the system



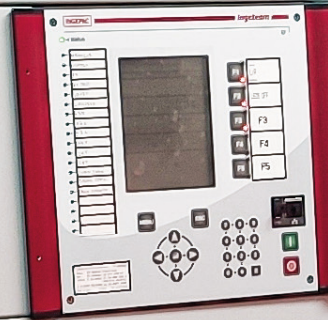
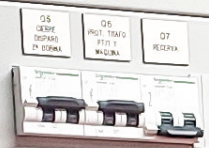
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TRAINING
We train operations
and maintenance staff



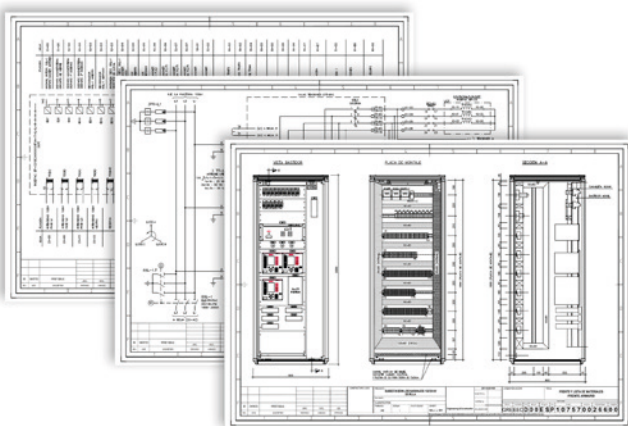
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DOCUMENTATION
We provide drawings,
backups and all the files
pertaining to the project



INGETEAM P&C SERVICES



ENGINEERING SERVICES



Project

- Protection and control system development engineering
- Interconnection engineering and diagrams
- Studies on the selection and coordination of protections
- Preparation of substation programming logic and blocking
- Definition and programming of automation devices
- Preparation of the remote control database
- E-House solutions
- Documentation



Panel construction and tests

- Design and construction of protection and control panels
- Construction of distribution boxes
- Functional cabinet tests



Office services

- Control and protection equipment programming
- Integration of third-party equipment in the system
- Protection regulation and logic programming
- Programming of monitoring screens, alarms, events, metering and reports
- Automation device programming
- Programming of remote control databases with the required protocol
- Programming of redundant schemes
- Configuration of the system communications network
- Validation testing alongside the customer



Commissioning

- Functional tests of the equipment
- Protection and control system commissioning
- Point-to-point testing with remote control dispatching
- Energizing assistance

INGETEAM P&C SERVICES

R&D SERVICES

Development of adaptation of our equipment, systems and software tools to solve the specific needs of our customers

Ad-hoc developments

Ingeteam places all the knowledge and experience of our R&D team at the service of our customers, a hallmark of the Ingeteam Group.

All the ad-hoc solutions that we develop are subjected to the strictest testing and validation processes in the advanced installations and laboratories that Ingeteam places at the disposal of our customers.

Validation tests are also conducted with customers.



Validation tests

Our control components are used to measure the results of our work and guarantee that the performance of our equipment will be as required throughout its useful life cycle.

We also perform an in-depth analysis of the data generated at each stage of our developments, by which we obtain precise information that ensures that each modification that is carried out complies with our quality goals.





System modelling with RTDS

The RTDS (Real Time Digital Simulator) analyses both direct and alternate current high-voltage systems, combining the precision of digital models and real time response of analogue simulators.

All the information collected during simulations is stored for subsequent study and analysis of the behavior of the modelling system.



INGETEAM P&C SERVICES



CONSULTANCY SERVICES

Guidance throughout all the project phases, including preliminary preparation and implementation and complete after-sales service



Pre-sales

- Consultancy for control and protection specifications
- Guidance on system communications architecture
- Protection schema proposals
- Validation of system protection performance via RTDS

After-sales

- Analysis of system performance and detection of needs
- Analysis of technological upgrading needs
- Analysis of events
- Retrofit study

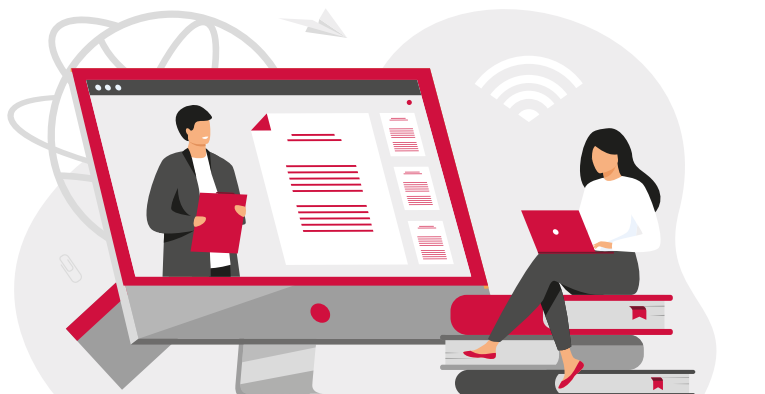
TRAINING



Practical courses and seminars intended to provide operation and maintenance staff with the knowledge required to handle the equipment

Knowledge base

- Control system operation and maintenance
- Courses of protection principles
- Management of software tools: INGESYS™ IT, INGESYS™ eFS, pacFactory
- Operation and adjustment of INGEPAC™ protections
- Training courses for integrators
- Online or in person training



INGETEAM EVOLUTION SERVICES

What do we offer after the system is installed?

1



SYSTEM EVALUATION

Evaluation of the initial situation and the performance and condition of the installed equipment and systems

2



TASK PLANNING

The work to perform is planned with the least possible equipment downtimes

**P+C ASSET
GOALS**

**INCREASING
AVAILABILITY**

**P
AN**



3



WORK EXECUTION

The improvement, upgrading, expansion or corrective tasks are carried out, whether remotely or on-site

4



REPORTS AND DOCUMENTATION

Customers are provided with accurate and updated information on the final status of the system

PROTECTION
AND CONTROL

O&M COST
REDUCTION

EXTENSION OF
USEFUL LIFE

INGETEAM EVOLUTION SERVICES



PREVENTIVE MAINTENANCE

Periodic upgrades to ensure that the system is constantly renewed and that performance remains optimal over time

Periodic system revisions

- Revision of the status of P+C equipment HW
- Revision of the status of P+C equipment FW and SW
- OS security patches in PC platforms
- Performance of backups of system information

System upgrading

- Generation of new screens, reports
- Integration of new elements in the system
- Alarms, remote control points, etc.
- Parameter changes
- Upgrading of operating systems
- Upgrading of SCADA protection firmware and software





Preservation of equipment and installations by carrying out adjustments and revisions to guarantee proper operation and reliability

Software maintenance and cybersecurity

- System inventory support
- Support for migration to active operating systems (not discontinued)
- Support and guidance for network segmentation
- Hardening of Windows-based PC platforms:
 - Hardware and software hardening
 - Installation of anti-malware programs and whitelisting
 - Patching and upgrading of the operating system and applications
- Management of backups (performed and hosted in CPD Ingeteam)
- Integration in corporate systems (Active Directory, etc.).
 - Management of users and passwords
 - Integration with CERTs, Siems

Software tools associated with Operations & Maintenance

Tools that facilitate plant control by O&M staff, thereby reducing the need for travel and providing knowledge of plant status in real time.

- Reports module
- Alarm notification module
- Expansion of the number of viewing clients in the plant
- Remote viewing via website access:
 - From central offices
 - Control stations
 - Base substations of O&M staff in the area
 - Mobile devices

INGETEAM EVOLUTION SERVICES



CORRECTIVE MAINTENANCE

Prompt assistance, identification and resolution, when necessary, of problems that arise in the plant, with various SLA arrangements



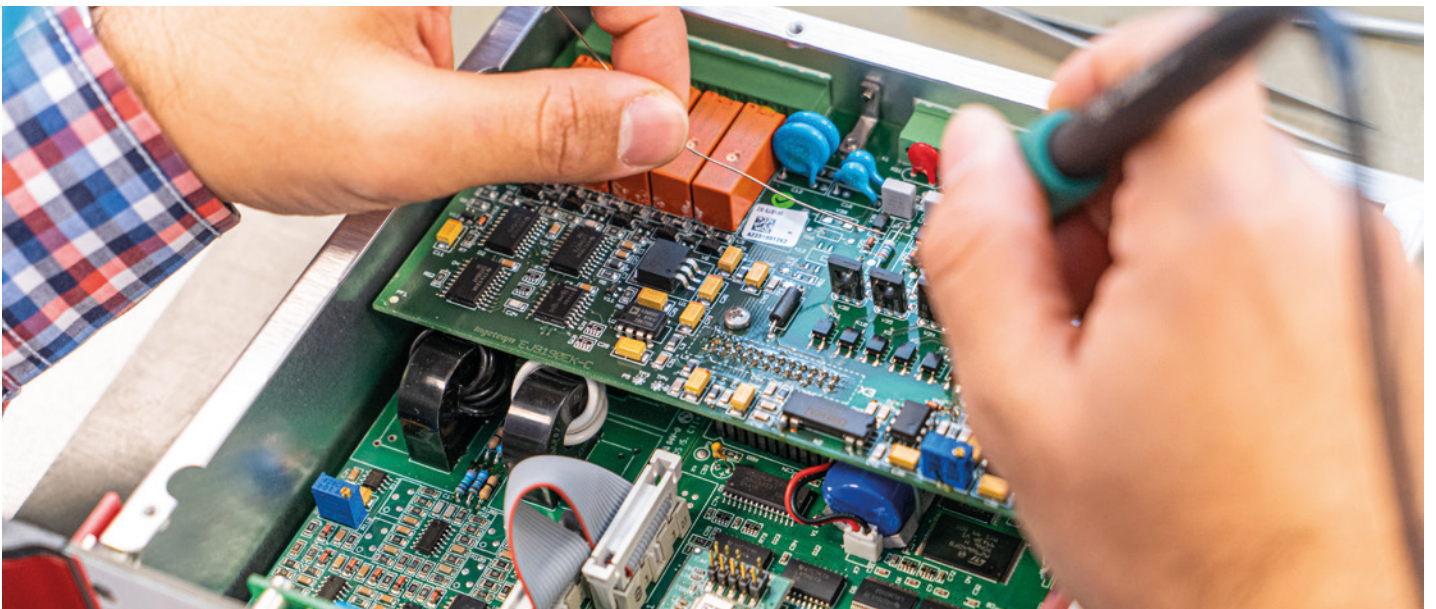
TECHNICAL SUPPORT

Remote assistance 8/5 and 24/7 with call support, remote electronic support and access to the customer area



SYSTEM PERFORMANCE

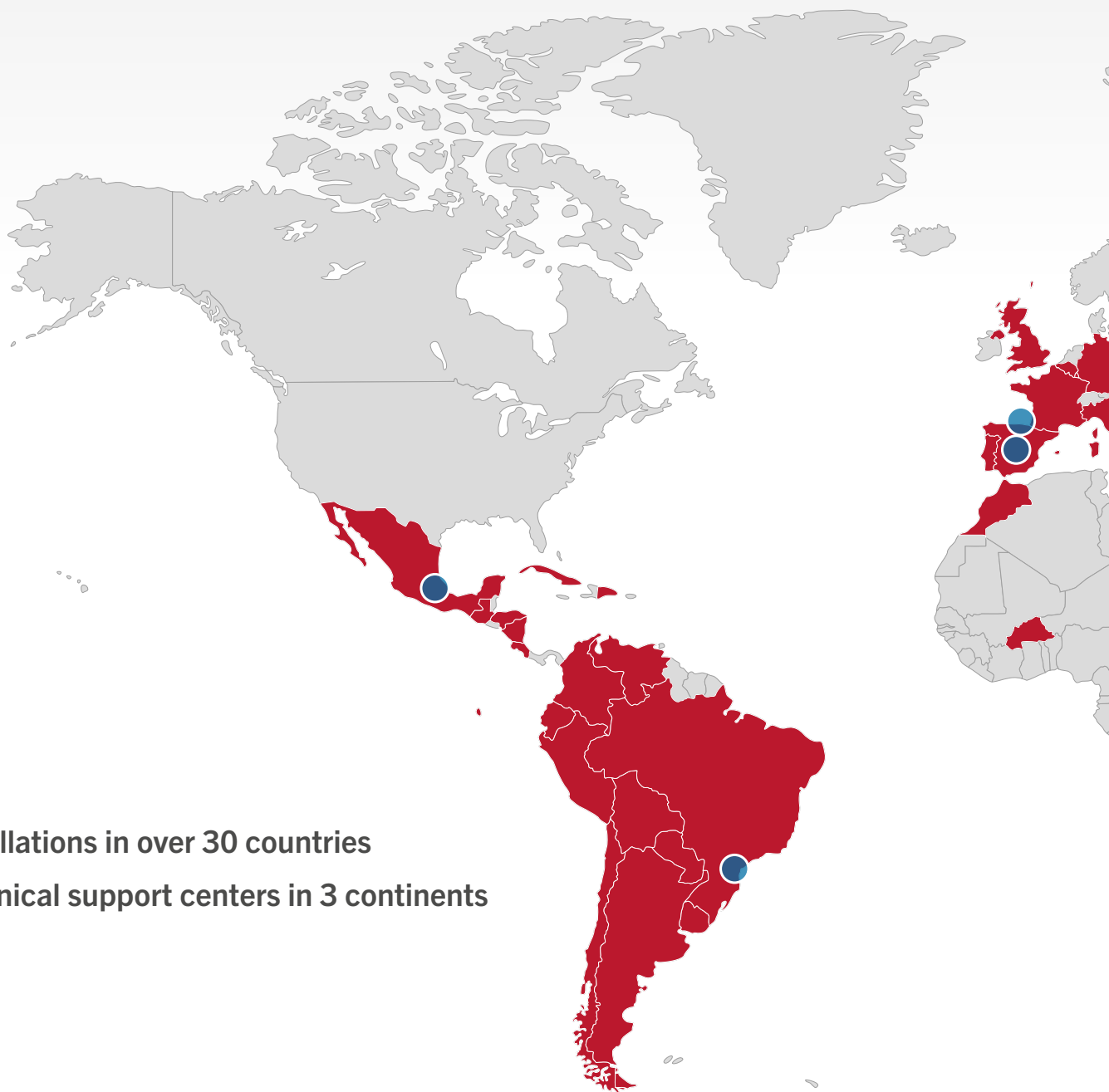
Customer support throughout the life cycle of the protection and control system



REPAIRS AND WASTE MANAGEMENT

Agile repairs provided by the various support centers, with warranty extensions and equipment replacement

INTERNATIONAL PRESENCE



- Installations in over 30 countries
- Technical support centers in 3 continents

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Ingeteam contributes to a safer, more reliable and sustainable electrical network





Ingeteam

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