



#### On site repair

Because the Motracs modules can be partly dismounted, they have standardised access for rapid repair on site, both inside and out.

#### Full module replacement

More complex maintenance work can be carried out by replacing complete modules, transporting the module to be repaired to the factory if extensive repair work or complete renovation is needed.

Motracs cuts the cost of major repair work since the module affected can be sent to the factory eliminating the need for qualified staff to travel remote sites for long periods of time.

The possibility of replacing modules with other identical ones on site minimises down-time due to maintenance.

#### Power supply flexibility

Motracs offers a maximum traction power voltage of up to 55 kV, two-phase AC current.

Motracs also offers an ancillary power supply of 230 V single phase AC current and of 400 V three-phase AC current.

#### Traction sizing

Motracs permits complete interchangeability between the modules of similar types of

installations, making resizing operations according to railway traffic possible; something that is completely unimaginable with conventional substations.

It is thus possible to consider gradual or progressive resizing according to the actual traffic volume on a given line, as well as in order to satisfy a variable demand during periods of unusually high traffic volumes (World's Fairs, Olympic games, etc.)

#### Vibration resistance

Motracs reduces vibration inside the installation through its buffer components fitted to the supports. This allows Motracs substations to be installed without complication in problematic environments such as on sites immediately adjacent to the railway line or close to heavy industrial plants.

#### Adaptable to all weather conditions

Motracs is designed to be deployed in a wide range of climatic conditions thanks to its external container design, including hot and cold climates, humid conditions or high rainfall locations.

#### Centralised production

Since the Motracs modules are manufactured at a central plant, any waste is gener-

ated at the centre of production rather than at the client's premises, thus contributing towards the conservation of the natural environment.

#### Visual impact

The smaller footprint produced by the Motracs system reduces the visual impact of its installations. It is also possible to adapt the system to integrate the facilities harmoniously into the landscape.

#### Reduced material and energy consumption

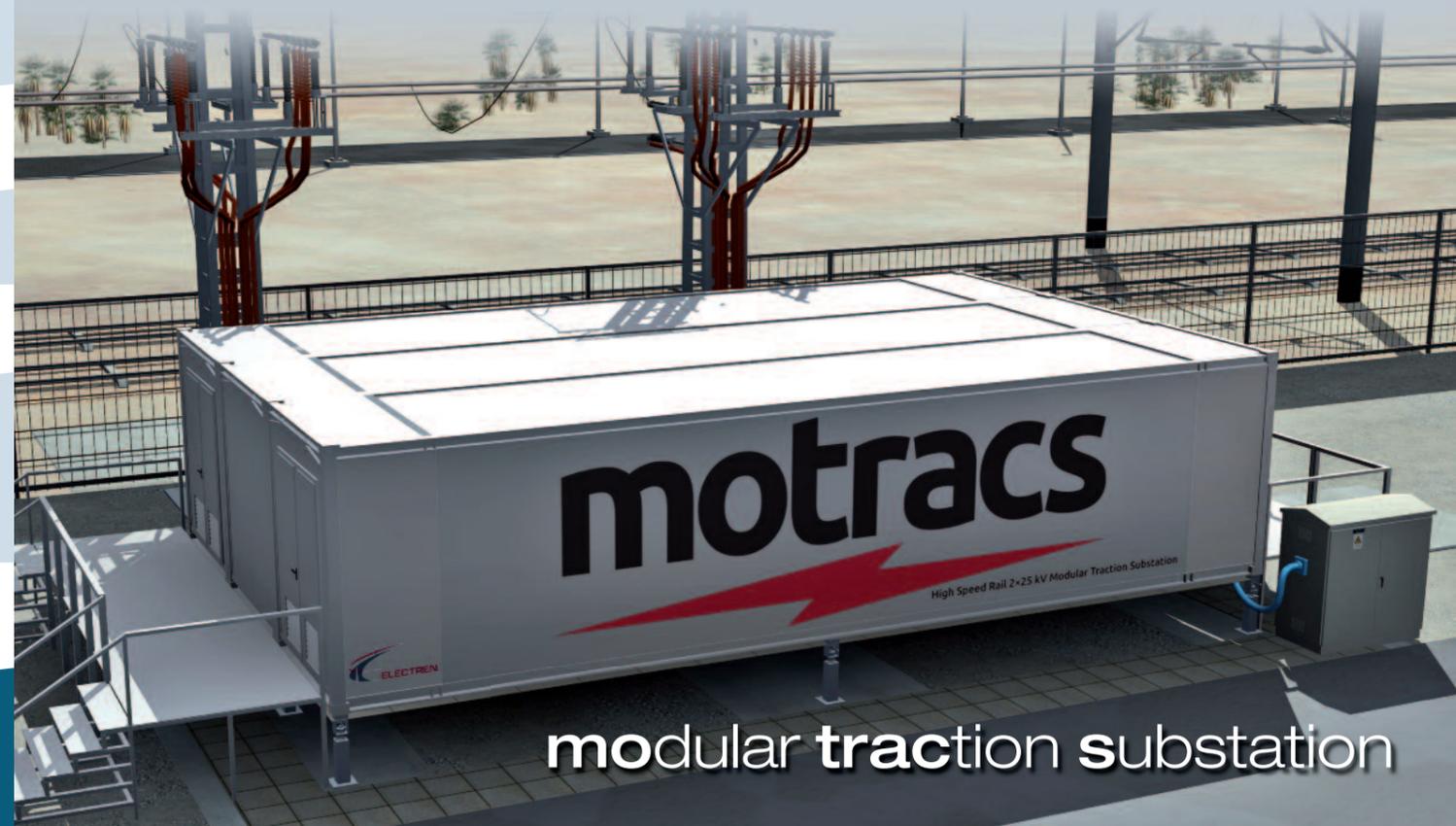
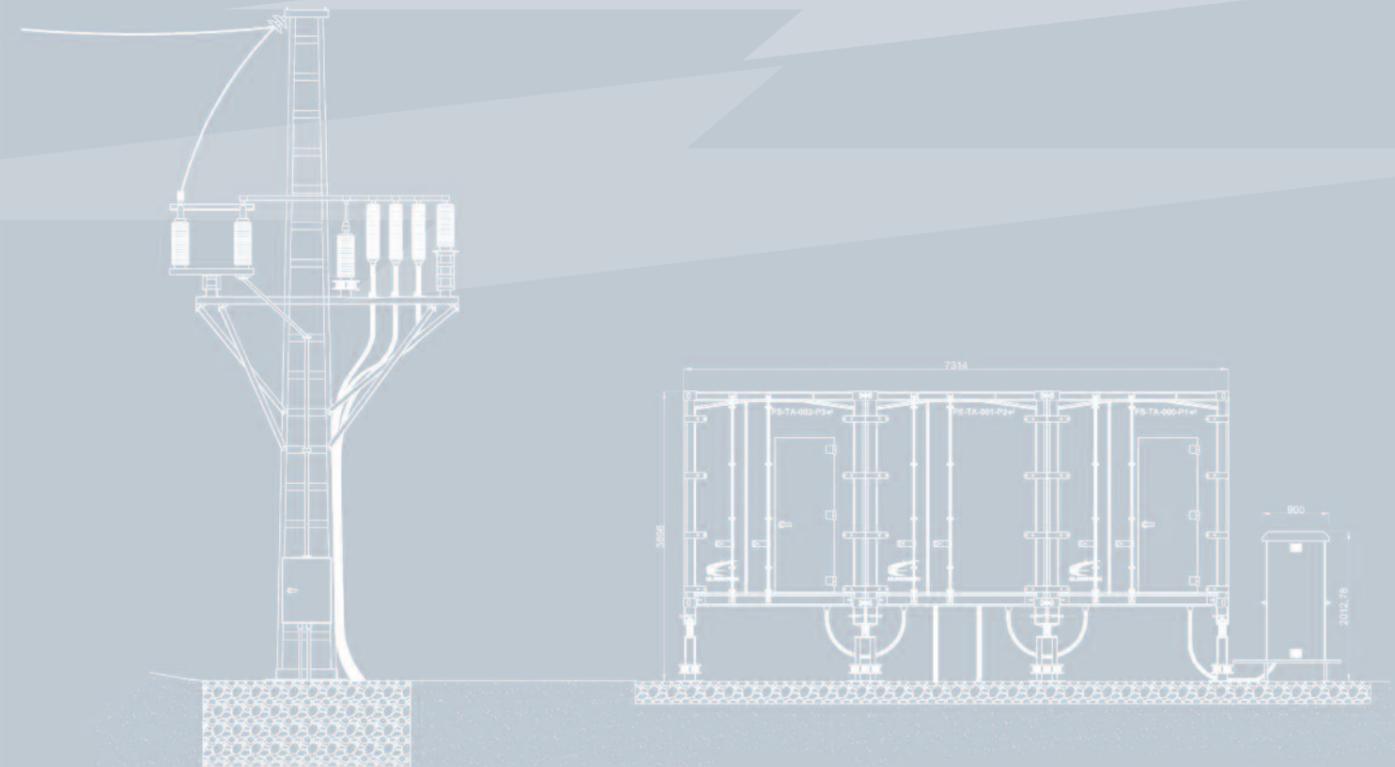
With Motracs it is possible to significantly reduce material consumption, including plastic, metal, electronic equipment, spares, etc.

The reduced assembly time also leads to lower energy needs and fuel costs related to its transport and construction —now assembly.

Greenhouse gas emissions caused by the transport of equipment and materials are considerably curtailed as they are now grouped together in one container.

#### Safety

The Motracs system significantly reduces the risk of accidents amongst on-site staff due to the standardised and simplified deployment and assembly operations.



## About us

**E**LECTRÉN, S.A. is a corporation wholly owned by VÍAS Y CONSTRUCCIONES, S.A., which in turn, is part of GRUPO ACS, market leader in the development of infrastructure for the civil and industrial engineering industries. For ELECTRÉN, a niche market player, the structural support provided by a large group provides us with access to the best resources, allowing us to offer our clients the very best quality standards with minimum risks and maximum performance.

In 2013 ELECTRÉN will have been in business for 25 years. Its very first project was a contract to build transformer substations for the first high-speed line in Spain: the Madrid-Seville High Speed Rail line. Over the years, ELECTRÉN has been involved in many of the railway developments throughout Spain, including further high speed lines, conventional railway lines, underground subway lines and urban tramlines, making it a major rail operator supplier.

Within its strategy of international expansion, ELECTRÉN also operates in France, USA, Portugal, Poland and Morocco. Some of our flagship projects outside Spain include the work carried out for SNCF in France to replace the overhead contact wire for the Paris-Lyon TGV line, with a zero incidence rate.

### The Railway Specialists

ELECTRÉN specialises in railway power supply systems: overhead lines, traction substations and electrical current transformer and distribution infrastructure. Our involvement covers everything from the initial project design, through to the infrastructure operation and maintenance. With our expert engineers and our own specialised range of equipment we are able to offer engineering, construction and maintenance solutions for any railway traction project.

### Supplier of integrated solutions for railway power supply

High speed, conventional line, tram and underground structure projects are developed and executed by our traction substations department.

With our highly qualified staff and our own specialised range of equipment, we are able to offer engineering, construction and maintenance solutions for any railway traction project.

The overhead line department carries out the work for the electrification of railways and is able to offer reliable solutions to the most challenging projects offering excellence even under hostile working conditions.

With the support of our technical office, we can adapt the principles of any system (high-speed, conventional, tramway or rigid catenary) to the specific requirements of any given situation, covering every aspect of both the design and the resources.

Following its participation in high speed, conventional and underground traction substation projects in Spain, ELECTRÉN expanded its operations in Northern Africa, France and other European countries.

### 10 years experience in mobile substations for conventional railway lines

Always alert to the specific needs of each railway traction sector, ten years ago ELECTRÉN designed and launched a system designed specifically for direct current railway lines: mobile substations.

Mobile substations are unrivalled in their speed of deployment. They can be transported on a conventional platform wagon and installed on any sideline where they can be connected to electrical power lines and catenaries.

### Opportunities for improvement in railway traction

Today, the processes of design and development of large infrastructure projects demand more than meeting the traditional timescale, cost and quality targets. Engineers must also comply with stringent environmental requirements as well as passenger safety norms during the overall life cycle of the projects.

## Motracs

**W**orking to amply fulfil all these targets and stemming from our experience gained over 25 years in the industry, ELECTRÉN has designed a new concept in electrical substations for railway traction: Motracs (MODular TRACtion Substation).

### Modular equipment for railway traction

The Motracs system is built using modules, all identical on the outside, whose roofs and side walls can be interchanged, assembled and disassembled to create large open areas in which to install the substation equipment. They have also been especially designed to be easily transported.

### Containerised modules

Motracs has been designed and is constructed in accordance with the requirements of the ISO 668:1995 standard and other standards defined by the 104 Technical Committee for shipping containers (TC 104), making them totally compatible with current multimodal loading, carriage and transport by road, rail and sea.

### Standard size

The Motracs modules on the outside are standard 40 foot High Cube type containers with the following measurements:

- Length: 12.19 m (40'00")
- Width: 2.44 m (8'00")
- Height: 2.90 m (9'6")

### Designed for ease of transport

The Motracs modules are designed to be completely compatible with current multimodal loading in terms of their external size, anchor points, dynamic behaviour and their response to various mechanical forces and vibrations during their logistical handling.

Motracs modules are made from S355 J2 steel, a high quality and extremely weldable structural material.

### Modular specialisation

The Motracs modules are customised on the inside to adapt them to the various operational areas within a substation. There are three types of modules:

- Control, protection and telecommunication equipment modules.
- Traction power distribution modules
- Modules for power distribution of ancillary services.

The modules may be fitted together along either the sides or the front of the container. It is also possible to stack modules on top of each other to create structures of up to four stories high. This building flexibility means that the Motracs system can be adapted to any space requirement.

### Different assembly options

The Motracs system allows the following structures to be built:

- AC current traction substations with three modules.
- End autotransformers with three modules.
- Intermediate autotransformers with two modules.
- DC current traction substations made from four modules, including integrated feeder gantries.

### Customised structures

It is possible to build any kind of space or specialised structure:

- Additional modules.
- Warehouses.
- Offices.
- Special structures.
- Stacked modules.

The Motracs modules can be stacked up to a height of four modules, and be assembled into structures of any length horizontally after preparing the ground surface accordingly.

### Improvements gained

In addition to the initial reasons for its development, Motracs already offers many immediate benefits to locomotive traction systems.

### Manufacture

In terms of its manufacture, the Motracs concept offers a number of advantages as described below.



### Uniform processes and results

Current traction facilities, each designed individually, make it difficult to predict their performance over the long term. In contrast, the Motracs system produces a series of identical modules whose performance has been tested and reproduced, which are manufactured and deployed following uniform procedures.

### Trials

The trials the Motracs modules are subjected to, as well as their assembly procedures, meet the standards clearly defined by the railway administrator.

### Deployment

Motracs brings with it radical changes in the planning and design of railway traction installations. A railway traction facility built using the Motracs system is not built on site. It is manufactured and then deployed.

### Reduced timescales

With Motracs the installation period is reduced because the building work is separated from the actual manufacture of the modules.

Typically, a Motracs system can take around 2 weeks to assemble compared with 5 months for a traditional structure.

### Standardised tasks

Motracs benefits from the complete standardisation of the building tasks, leading to greater uniformity and reliability in the final results.

### Simpler tasks

The simplification of the on-site tasks (assembly and commissioning) means they can be carried out by less specialised staff. This leads to greater cost savings and makes the planning task more straightforward.

### More flexible planning

Motracs completely eliminates possible negative interactions between the civil engineering tasks and the electromechanical work.

### Cost savings

Motracs reduces the investment in civil engineering works and in land expropriations as the modules' footprint is smaller than that of a traditional installation.

### Procurement savings

Compared with the individual construction processes currently undertaken for each railway traction facility, Motracs offers a single product from a single supplier, making the procurement process, traceability and warranty administration much simpler.

### Ease of transport

Motracs reduces the cost and time needed for the transport of the materials because the system is entirely built following intermodal logistics standardised processes.

### Training

The ability to assemble Motracs system modules on the client's facilities connected to a simulator of on-site conditions leads to significant improvements in the training of operations personnel of the railway operator.

### Reliability

Because the Motracs system has been put through exhaustive tests at the factory, it is more reliable, offering a greater guarantee of a continuous power supply.

# motracs