

INSTRUMENT TRANSFORMERS



Product Spectrum



Context

The transmission of energy from the generation sites to the places of use is carried out through high voltage electrical lines and substations as interconnecting points. These substations are carried out with two types of insulation: Air (Air Insulated Substation) or Gas (Gas Insulated Switchgear).

At interconnecting points on transmission lines, it is necessary to measure and control the electrical parameters of the transmitted energy. For this aim, devices called Instrument Transformers are used to reproduce primary parameters at scaled down values which are suitable for measuring instruments and protection relays.

Instrument Transformers are mainly divided into two categories: Current Transformers and Voltage Transformers.

The goal of measuring the current and voltage levels on various points of transmission lines is to quantify the amount of transferred energy, and verify the accuracy of the network parameters in order to protect the transmission lines as well as the substation equipment.

Context

energy
every



for
body

Trench Solution

The Trench Group has a full portfolio of Instrument Transformers that are capable to meet any customer's needs worldwide and can be installed in any environmental condition. Our global team of experts is working every day to ensure a high quality level under any condition as well as to enhance the portfolio with any new feature required by our Customers.

THE TRENCH GROUP PORTFOLIO INCLUDES:

- Current transformers for AIS and GIS applications
- Inductive and Capacitive Voltage Transformers for AIS and GIS applications
- Resistive-Capacitive Dividers for Voltage and Harmonic Measurements
- Capacitors for various applications (High voltage Circuit-Breakers, Line Compensation, Filters, Couplings , etc.)
- Power Voltage Transformers for measuring and providing auxiliary power

THE TRENCH GROUP PORTFOLIO IS AVAILABLE

IN ALTERNATIVE DESIGN FEATURES:

- Internal insulation: Paper-Oil , SF6 gas or alternatives (e.g. CleanAir)
- External insulation: porcelain or composite material
- Different measuring technologies for current measurement system (ferromagnetic core and copper wires) or unconventional type (optical transducer)



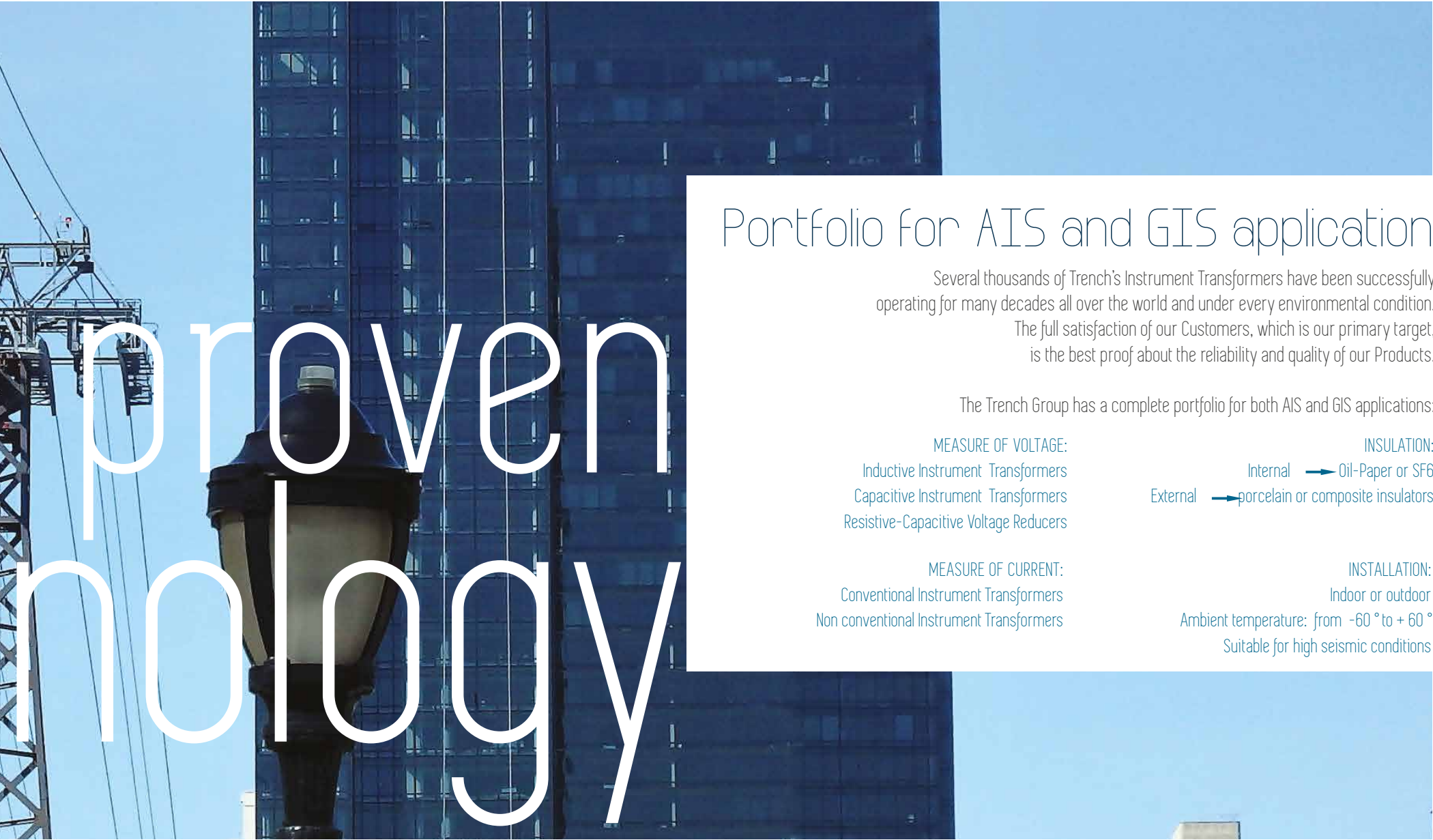
HVAC

For transmitting electrical power, High Voltage Alternate Current (HVAC) lines (50/60 Hz) are the most utilized infrastructures. The rated voltage stays in ranges from 72 to a maximum of 1200 kV and the transmitted current reaches thousands of Ampere values.

Though the above values do not allow a direct measurement for obvious technical reasons, the need to measure voltage and current at the various points of the line remains, and therefore Instrument Transformers are used with a double purpose:

1. Transform the High Voltage and Alternate Current values transmitted by the line in a way that they can be easily read by common measuring devices (about 100 Volts for the voltage and about 1-5 Amperes for the current);
2. Ensure the necessary electrical insulation between the high voltage line and the measuring systems.





Portfolio for AIS and GIS application

Several thousands of Trench's Instrument Transformers have been successfully operating for many decades all over the world and under every environmental condition. The full satisfaction of our Customers, which is our primary target, is the best proof about the reliability and quality of our Products.

The Trench Group has a complete portfolio for both AIS and GIS applications:

MEASURE OF VOLTAGE:
Inductive Instrument Transformers
Capacitive Instrument Transformers
Resistive-Capacitive Voltage Reducers

MEASURE OF CURRENT:
Conventional Instrument Transformers
Non conventional Instrument Transformers

INSULATION:
Internal → Oil-Paper or SF6
External → porcelain or composite insulators

INSTALLATION:
Indoor or outdoor
Ambient temperature: from -60 ° to + 60 °
Suitable for high seismic conditions

HVDC

In the case of very long lines or when cable connection is required, it is more and more common to transfer electrical energy through High Voltage Direct Current (HVDC) lines. As in the HVAC lines, the reference voltage reaches a maximum of 1200 kV and the transmitted current reaches thousands of Ampere values. In order to monitor and measure the transferred Energy as well as to protect the line themselves in case of abnormal service conditions, it is needed to measure the system electrical parameters (Current & Voltage) along the DC links.

Suitable Current & Voltage transducers are designed and installed in key points of the converting plants and DC lines for above purposes. Their outputs are connected to measuring, control and protection devices

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Portfolio for HVDC applications

The Trench Group has a dedicated portfolio for HVDC applications that is successfully in operation in many HVDC projects around the world:

VOLTAGE MEASUREMENT:

Resistive-Capacitive Voltage Reducers

CURRENT MEASUREMENT:

Instrument Transformers with DC sensors
Coupling capacitors for various applications

INSULATION TYPES:

Internal Insulation: SF6 gas or oil paper
External insulation: porcelain or composite material

INSTALLATION:

Indoor or outdoor
Ambient temperature: from -60° to $+60^{\circ}$

COUPLING CAPACITORS FOR VARIOUS APPLICATIONS

AVAILABLE FOR HIGH SEISMIC CONDITIONS



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Voltage monitoring

Harmonic waves presence in High Voltage Transmission is dangerous for HV equipment; phenomena like malfunctioning of protection and measuring systems as well loss in electrical motors efficiency can appear. Another common effect caused by harmonic waves is equipment overheating. Nowadays some Power Purchase Agreements contracts, are stipulated by fixing specific clauses ruling the harmonic limit contents. It means that the supplied energy shall be characterized by a low harmonics content. In case of harmonics exceeding contractual values, the seller might pay some fees to the purchaser as compensation.

Harmonic measurement solutions can assist Grid Operators in addressing Harmonic Wave Generators to reduce their own contribution. It has been proved that Conventional Instrument Transformers, which are designed to be energized at rated frequencies like 50 and 60 Hz, are not able to measure Harmonic waves beyond the frequencies and accuracy required by the Customers.

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Quality

Solutions

Usually, the harmonics content is checked by monitoring the High Voltage Wave through equipment designed for this purpose.

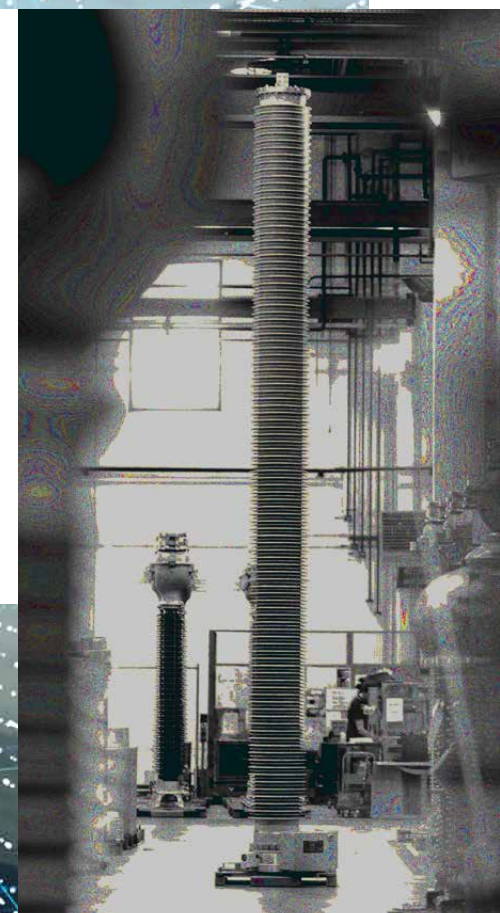
Trench Group has a complete range of products suitable to meet all possible customer requirements (Accuracy Class & Frequency Bandwidth):

Capacitor Voltage Transformer equipped with Harmonic Measurement Terminal

Capacitor Voltage Transformer equipped with PQ Sensor™

Resistive-Capacitive Voltage Dividers

Master of Wave



Special Applications

There are situations where an economic power source is required for temporary or permanent use:

AUXILIARY POWER SUPPLY FOR SUBSTATIONS

Auxiliary power for substations is commonly supplied by a tertiary winding of the power transformer. A tertiary winding can be avoided by the introduction of a Power Voltage Transformer (Power VT) that supplies the needed power directly from the transmission line to the substation operating as conventional Voltage Transformer at the same time.

ELECTRIFICATION OF REMOTE AREAS

In developing countries or isolated areas (such as villages or farms) where the distribution network is weak or non-existent but transmission lines are close by, a Power VT can serve as an economical and feasible source of power that be customized to the needs of different consumers.

POWER SUPPLY DURING SUBSTATION CONSTRUCTION WORKS

A Power VT can be used as a temporary power generator during the construction of substations, wind farms, power plants, etc. or in any other situation where immediate emergency power is required. It is also possible to equip a trailer with a Power VT to have a mobile power supply instead of using a diesel generator set.



power

Solutions

Trench Power Voltage Transformers (Power VTs) combine the attributes of an inductive voltage transformer with the application of a small power transformer. Therefore, they are the perfect solution wherever low voltage is needed and high voltage is available.

Main characteristics of Power VTs
in the Trench Group portfolio:

High Voltage up to 550 Kv

Output Power up to 125 KVA
Accuracy classes according to
IEEE/IEC standards

Oil-insulated or SF6 inner insulation

External insulation:
porcelain or composite material



Supply



Innovation and bridge to the future

Knowledge, experience and innovation are necessary components for bridging current technology to future social and environmental needs.

Electrical grids will be more digitalized in the near future.

High voltage products will be built with more environmental friendly technology.

environmental respon

sustainability

Solutions

OPTICAL CURRENT TRANSFORMER - CUSTOMER VALUE

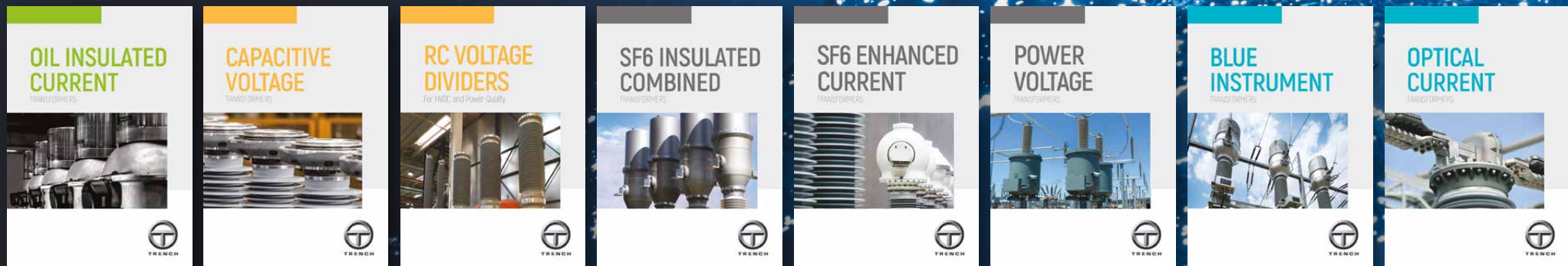
- Environmental friendly insulating system
- More compact CT design
- High-performance measurement behavior
- Improved operational safety
- Reduced losses
- Reduced cabling effort
- Passive system

BLUE PORTFOLIO - TOTALLY SF6 FREE

Products go beyond the common standards and meet strict criteria of environmental protection and sustainability



Global footprint and technologies



A high-angle, night-time aerial photograph of a city, showing a dense network of lights and streets. The lights are bright white and yellow, contrasting sharply with the dark blue and black of the night sky and the city's shadows. The perspective is from a high altitude, looking down at the city's layout.

“Our partners are utilities, contractors and power intensive industries worldwide. We support them with our technical expertise, extensive experience, competitiveness of our products and a global network of factories”

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