Voltage and current sensor kits for medium voltage distribution automation applications
Moving together
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1. Introduction

Nowadays, the operational management of electricity distribution networks is evolving due to the increase of distributed generation resources, more demanding quality of service / grid code requirements and the injection of new loads like electrical vehicles. High performance monitoring, automation and remote control are required closer to the grid edge, reaching new nodes and introducing new challenges for system operators.

In distribution feeders, those critical functions hinge on medium voltage sensors, as key components to obtain reliable measurements of voltage and current RMS values. With the use of sensors, utilities are getting actionable data to improve planning, enhance incidence response, integrate distributed generation and optimize system maintenance.

Taking advantage of more than 70 years of experience in manufacturing high and medium voltage instrument transformers up to 800kV, we have developed a wide range of low power instrument transformers and sensors to enable Distribution System Operators (DSO) and Medium Voltage (MV) power equipment manufacturers to deploy modern distribution automation functionalities over power grids. Nowadays, more than 40,000 Arteche’s sensors and couplers are installed worldwide helping utilities to take advantage of Information technology and Operational technology convergence.

Arteche offers comprehensive sensor solutions for varied topologies, both for underground and overhead power networks. Arteche low power instrument transformers and sensors, combined with modern intelligent electronic devices, improve system visibility and enhance grid operation management. This document shows some application examples based on our experience for inspirational purposes. We develop custom sensing solutions and tailor made sensors to meet the requirements of existing and new applications.

Advantages

› Standardization: A single reference covers a wide range of voltage levels and applications.
› Interchangeability: Sensors and low power instrument transformers do not require on site calibration.
› Safety and security: User has not access to dangerous voltage levels, secondary outputs has low power.
› Maintenance: The standardization of sensors ease stock and replace.
› Compact and lightweight: New installation options.
› Ideally suited for large deployment: Sensors are cost effective than instrument transformers and guarantees an excellent performance, with up to 0.5 accuracy class.

Distribution automation applications

› Measurement of current and voltage
› Fault location, isolation and service restoration
› Integration of distributed generation
› Power quality analysis
› Technical and non-technical losses analysis
› Multilevel feeder reconfiguration
› Distribution operation model analysis
2. Voltage and current sensors for gas insulated switchgears (GIS)

Arteche sensors are ideally suited for sensing voltage and current in gas insulated new ring main units (a.k.a. secondary substation or transformer substation) or retrofit existing ones with a single reference, in heterogeneous cubicles with different designs and environments where space is constrained.

- **PLUGSENS:** With an accuracy class 0.5, PLUGSENS is a voltage sensor based on resistive divider technology. It is designed to be plugged into DIN-C symmetric connectors. Optionally, PLUGCOM is a voltage sensor combined with a BPL-PLC coupler, can be used to measure voltage and inject PLC/BPL signal over the power cable in case of use of BPL-PLC technology for communication purposes or communicatin network deployment.
- Voltage and current RMS values are provided over a single ethernet cable, easing wiring to IED and avoiding mistakes.
- According to IEC 61869-11 standard.
- Without onsite calibration.

**Current measurement based on rogowski coils**

- **Accuracy class:** <1%
- IEC 61869-10
- Sensors based on rogowski coils offer linearity and excellent performance over a wide dynamic range. With a split core design, sensART RWG offers an excellent combination of performance and lightweight installation.

**Current measurement based on toroidal sensor or low power current transformer**

- **Accuracy class:** <0.2%
- IEC61869-10
- Sensors based on toroidal current or Low Power Current Transformers (LPCT) offers a wide dynamic range using the same current sensor for measuring and protection purposes.

**Current measurement based on split core toroidal sensor**

- **Accuracy class:** <3%
- IEC61869-10
- Split-core toroidal current transformers ease installation over existing MV Shielded Cable, matching retrofitting applications when current accuracy is not a must.
3. Voltage and current sensors for air insulated switchgears (AIS) and air insulated installations

For Air insulated applications, Arteche sensors offer a simple and cost effective option for measuring voltage and current in all kind of environments, for indoor and outdoor applications. Our comprehensive range of sensors allow their installation in almost every location.

› UNDERSENS: With an accuracy class better than 0.5%, UNDERSENS is a lightweight voltage sensor based on resistive divider technology specially designed for air insulated installations. Only requires a contact with live wire. When PLC/BPL coupling is required a UNDERCAP (BPL capacitive coupler) can be installed in the same phase for communication purposes or communication network deployment.
› Voltage and current RMS values are provided over a single ethernet cable, easing wiring to IED and avoiding mistakes.
› According to IEC IEC 61869-11 standard.
› Without onsite calibration.

Current measurement based on rogowski coils

› Accuracy class: <1%
› IEC61869-10
› Sensors based on rogowski coils offer linearity and excellent performance over a wide dynamic range. With a split core design, sensART RWG offers an excellent combination of performance and lightweight installation.

Current measurement based on toroidal sensor or low power current transformer

› Accuracy class: <0,5%
› IEC61869-10
› Sensors based on toroidal current or Low Power Current Transformers (LPCT) offers a wide dinamic range using the same current sensor for measuring and protection purposes.

Current measurement based on split core toroidal sensor

› Accuracy class: <3%
› IEC61869-10
› Split-core toroidal current transformers ease installation over existing MV Shielded Cable, matching retrofitting applications when current accuracy is not a must.
4. Voltage and current sensors for outdoor applications

› **Metering unit**: Lightweight sensor kits and structures to ease deployments in overhead lines. Our sensors feed to electronics key data to enhance power grid operation management at existing and new grid nodes, like active, reactive and apparent power measures, directional fault location, or oscillography recording.

› **OVERSENS**: Ultra compact and lightweight voltage sensor for overhead lines. Due to its design, can be installed virtually everywhere, in pole mount or fixed to any kind of structure or equipment. Physically is like a lightning arrester.

5. Block type combined sensors for indoor applications

Arteche manufacture combined sensors (voltage, current) for their application in metal-clad type switchgear and other indoor medium voltage applications. Our deep experience in instrument transformers allow us to offer a wide range of solutions according the requirements of each manufacturer.

6. Customized medium voltage sensors

Nowadays the evolution of IT technology offers new options to improve system operation and equipment lifecycle management. Our wide experience in measuring voltage and current, a deep knowledge in power grids and our manufacturing capabilities enable us to design and supply voltage and current sensors to be installed in new locations or with special characteristics to meet new applications.

7. PLC/BPL Couplers

The PLC / BPL couplers allow to carry data on a conductor that is also used simultaneously for medium voltage AC distribution. They enables an IP broadband network over existing power lines, an inexpensive way to deploy advanced services over power cables for last mile nodes without broadband access.