

# CT Sense

Revolutionary technology for fast screening of metrology characteristics of **current transformers** on live-line in real operating conditions

# A Revolution in live-line CT metrology testing

CT Sense testing system and methodology provides a unique opportunity for Transmission and Distribution System Operators, Power Generation and Industrial companies to efficiently improve the metrological condition of CT's on all voltage levels easy and without power interruptions, allowing for an entirely new and effective implementation of CT maintenance strategies.

The system is using **automated measurements**, data collection, analysis and reporting to enable **condition based** approach in maintenance of metrological characteristics of installed CT's.



## **CT** Sense use cases

**Metrological properties** (the ratio and phase displacement error) of current transformers in medium voltage (MV) or high voltage (HV) electric power systems, which have been in operation for decades, are unknown or **insufficiently tested**. This is mainly due to the **lack of an adequate measurement systems and methodologies** for getting this data in real time and on live line. Existing measurement devices and methodologies require a current transformer to be **disconnected** from the power network, which results in the **interruption of the power** supply. This is, in most cases, unacceptable and in some cases not feasible for the power network operators. Finally, even in cases where disconnecting of a current transformer is acceptable, existing technologies **do not allow testing in real operating conditions**, with real currents and secondary burdens.

**Knowledge of the exact conditions of current transformers** in real operating conditions is **crucial for vital functions** in the electrical power system, such as billing, calculation of power and energy flows, calculation of losses, monitoring of the static and dynamic stability of the electric power system and proper functionality of various protection equipment.

**CT Sense technology** from Netico **solves** the aforementioned **problems** in a **fast**, **simple** and **cost-effective** way. It provides a quick overview of the state of current transformers and their accuracy in MV and HV power systems, in real operating conditions and without the need to switch the power off.



## CT Sense Measuring head – Key Components





### **Conductor holder**

Correct central positioning of conductors of different shapes and sizes, providing the best measurement accuracy.

#### **GPS** Antenna

Precise time stamping of measured current data using GPS absolute time.

### **Mounting Tool**

Allows mounting of the Measuring Head onto the energized (live line) primary conductor.

#### **Electronics module**

Cutting edge IoT technology, designed by Netico, for precise, high speed and high accuracy measurement collection.

## Current sensor

High accuracy U-shape split core current transformer for rated primary currents from 20A to 6000A and secondary currents of 5A and 1A.



## **Measurement process**

The primary subsystem is a hot stick mounted on a conductor that supplies the primary end of the measured CT. The secondary subsystem is mounted on a conductor that is connected to the secondary end of the CT. Installation of the primary and secondary subsystems is carried out in real operating conditions, under voltage and on live line.

The CT Sense system is suitable for measuring **rated primary currents** ranging from **20A to 6000A** and **rated secondary currents** of **5A and 1A**. The system supports all voltage levels (**LV, MV, HV and EHV**) and both power frequencies of 50 and 60Hz. **The measurement uncertainty** in measuring ratio and phase displacement errors is not exceeding **+/- 0.1% and +/- 3 min**, respectively.

The system is **completely safe for use** and **has no detrimental effect** on the functionality of the measured installation. It is non-invasive and safe for the environment, equipment and personnel.

The CT Sense system is specially designed to be fully **compliant with international standards** IEC 61869-1, IEC 61869-2, IEC 61869-6, IEEE C57.13.



Figure 1 Block diagram of the CT Sense measuring system.

## **Measurement process**

Following is the description of elements, systems and physical variables indicated on Figure 1:

CTx-current transformer under test,

P1, P2- primary connectors of CTx ,

S1, S2- secondary connectors of CTx ,

SSS- secondary subsystem,

B- secondary burden of CTx ,

LV- low voltage

Is- secondary current of CTx ,

Ip- primary current of CTx ,

LV, MV, HV, EHV- low voltage, medium voltage, high voltage, extra

high voltage,

PSS- primary subsystem,

GPS- Global Positionig System (used for time synhronization),

NTWSS- network subsystem (radio, wi-fi),

ITSS- information technology subsystem.

The Ct Sense measuring system uses a **direct testing method** to determine ratio and phase displacement errors of the current transformer under test.





# Automatition of measurements and data analysis

The CT Sense system provides the possibility to collect **automated measurements using a tablet and the corresponding CT Sense mobile application**, enabling users to manage the measurements and collect the test information for measured CT's in the field. When the measurements are completed, the measurement data, test information, photos and notes pertaining to the measured CT's are **encrypted** and sent from the mobile application to the CT Sense cloud platform where they are stored, decrypted, analyzed, processed and available in real time to the user from any location in the world.

This approach simplifies the test process and ensures that all of the necessary information is collected in a fast and reliable way.



## **CT Sense Cloud Platform**

CT Sense uses its own **cloud platform**, specially designed for efficient collection and analysis of parameters of measured CT's.

Measurements collected by the CT Sense test system are **stored safely** and can be used to compare CT parameters throughout a specific time period and between different measurement locations.

The key functions of the CT Sense cloud platform include automatic processing of measurement data, automatic assessment of the metrology condition of measured CT's (Ok/Suspicious/Bad), analysis and visualization of measured data and test information, automated reporting and the ability to visualize measurement data on a map based on the precise GPS location of each CT.

The entire CT Sense system is provided **by Netico as a service**, and the cloud platform is the main interaction point for each customer, with a dedicated portal to access **encrypted and protected** measurement data. The cloud platform provides a **transparent billing service** with most recent, up to date, cost calculation for performed measurements and data analysis.

The CT Sense cloud application can be deployed so that it complies with specific client data privacy requirements.

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## **Key Benefits**

Certified and patent pending technology, including certificates for safe and accurate operation in the presence of High Voltage.



#### Increased operational efficiency and safety due to the full transparency of the metrological state of CTs.

- Improved accuracy of energy measurements.
- Improved monitoring, localization and reduction of technical loses at all voltage levels.
- Improved functionality of the protection equipment and advanced metering infrastructure.

• Ability to detect current transformers whose cores have become magnetized due to the grid faults and transient currents.

#### Increased cost efficiency

The CT Sense system is deployed on a live line, without the need for power interruption and expensive deinstallation and installation activities.
There is no disruption of the equipment and the normal operation processes on the monitored power system.

Ability of the CT Sense to provide measurements in real operating conditions significantly increases insights into the actual operation of the monitored energy distribution system.

## **Technical specifications**





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