A Calibration System for Current Transducers up to 100 kHz

Erik Kroon Yokogawa Europe Solutions B.V.

INTRODUCTION

Power meters of Yokogawa have a wide bandwidth. However, the current input of these power meters are limited to 30 or 50 A. To extend the current, Current Transducers (CT) are used. A DT100ID, DS600ID, MACC 2 Plus, CT 500 and a CT 1000 were calibrated on the Current Transducer Calibration System, developed by the Yokogawa European Standards Laboratory to offer traceability up to 100 kHz and 100 A.

CURRENT TRANSDUCER CALIBRATION SYSTEM

The Yokogawa Current Transducer Calibration System uses a transconductance amplifier to generate a current, the current is applied to a coaxial chamber which contains the CT under test. From the coaxial chamber, the current will flow through a high current coaxial shunt which is used as reference to determine the primary current. The secondary current from the CT is connected to a wideband shunt to convert the current to a voltage. The voltage of the high current coaxial shunt and the voltage of the wideband shunt are measured by a Fluke 5790B AC Measurement Standard to determine the ratio of the current transducer. The AC Measurement Standard is then replaced by a Yokogawa WT5000 Precision Power Analyzer to measure the phase deviation of the current transducer. The coaxial chamber provides a well-defined and uniform electric field distribution.

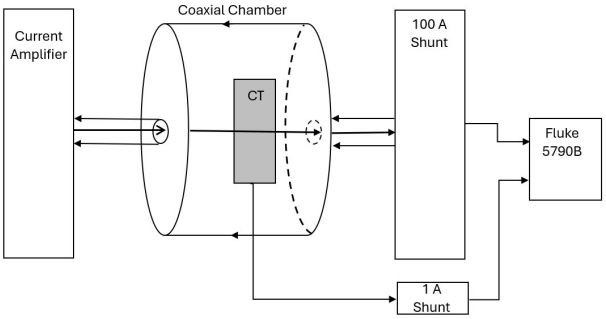


Fig. 1

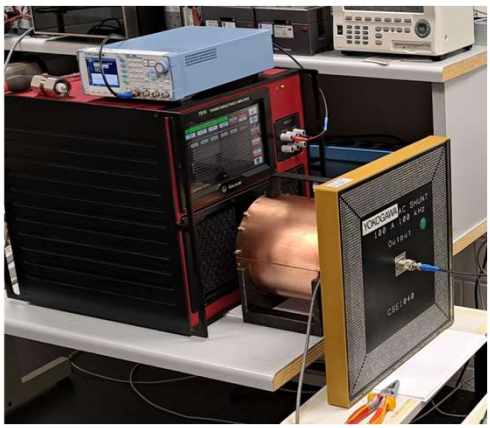


Fig. 2

CALIBRATION OF TRANSDUCERS

Separated calibrations are done on Danisense, Signaltec and PMSMS transducers. First the results for ratio. As frequency has no significant effect on the ratio of the CT below 1 kHz, the calibration and evaluation in Fig. 3 starts at 1 kHz. Its shows that frequency effects on the ratio starts from 3 kHz. The relative uncertainty for calibration of the ratio is from 0.007 % at 40 Hz and increases to 0.035 % at 100 kHz at 100 A.

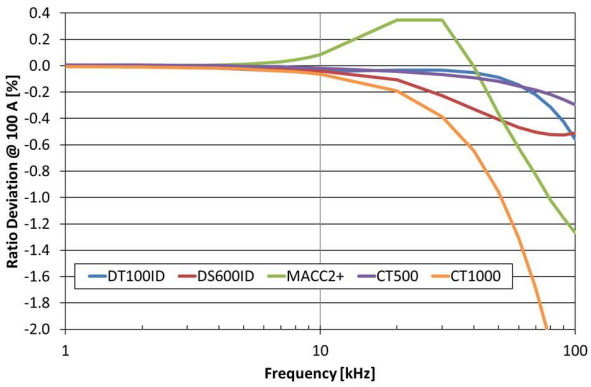


Fig. 3

The Yokogawa WT5000 Precision Power Analyzer is used to measure the phase deviation. The current transducers were measured at a current of 60 A, starting from 1 kHz in Fig. 4. Above the 10 kHz, the frequency starts to influence the phase deviation of the current transducers. The uncertainty starts form 87 μrad at 40 Hz to 8.7 mrad at 100 kHz

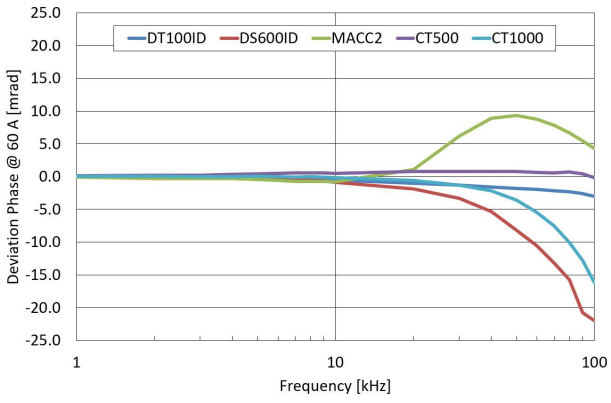


Fig. 4

CONCLUSION

By using the newly developed Calibration System for Current Transducers, it is possible to characterize the ratio and phase performance of Current Transducers up to 100 kHz and 100 A. By using two turns, 200 A up to 40 kHz can be achieved, with increased uncertainty. This new calibration system demonstrates the performance of Current transducers, when using them to measure distorted waveforms i.e. beyond the limited bandwidth of 50, 60 Hz from traditional calibration systems.