



Current transformers

Overview standardization

CIGRE B5 – Workshop Stroomtransformatoren

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(KEMA TIC en lid NEC38)

Question?

- How thinks to be up to date with (inter)national standardization of instrument (current) transformers?
 - Yes = Green
 - No = Red

Current transformer standardization

Content of the presentation

- Standardization instrument transformers
- Standardization current transformers
- Standardization protection relays
- Liaisons within standardization

Standardization Instrument Transformers

- IEC TC38 / CENELEC CLC TC38 / NEN NEC38
 - IEC : International standardization
 - CENELEC : European standardization
 - NEN : Dutch standardization
 - Scope
 - “Standardization in the field of AC and/or DC current and/or voltage instrument transformers, including their subparts like (but not limited to) sensing devices, signal treatment, data conversion and analogue or digital interfacing.”

Standardization Instrument Transformers

- Transition from IEC 60044 into IEC 61869
- Initiated by standardization work of non conventional and digital instrument transformers
- New structure more in line with general IEC look

Standardization Instrument Transformers

Product family standards		Product standard	Products	Old standard
IEC 61869-1 General requirements for instrument transformers		IEC 61869-2	Additional requirements for current transformers	IEC 60044-1 IEC 60044-6
		IEC 61869-3	Additional requirements for inductive voltage transformers	IEC 60044-2
		IEC 61869-4	Additional requirements for combined transformers	IEC 60044-3
		IEC 61869-5	Additional requirements for capacitive voltage transformers	IEC 60044-5
	IEC 61869-6	IEC 61869-7	Additional requirements for electronic voltage transformers	IEC 60044-7
	Additional general requirements for electronic instrument transformers and low power stand alone sensors	IEC 61869-8	Additional requirements for electronic current transformers	IEC 60044-8
		IEC 61869-9	Digital interface for instrument transformers	
		IEC 61869-10	Additional requirements for low power and stand alone current sensors	
		IEC 61869-11	Additional requirements for low power and stand alone voltage sensors	IEC 60044-7
		IEC 61869-12	Additional requirements for combined electronic instrument transformers or combined stand alone sensors	
		IEC 61869-13	Stand alone merging unit	

Standardization Instrument Transformers

- Actual status November 2011

Standard	Publication	Forecast	Standard	Puplication	Forecast
IEC 60044-1 Ed. 1.2	2003-02-13		IEC 61869-1 Ed. 1.0	2007-10-09	
IEC 60044-3 Ed. 2.0	2002-12-16		IEC 61869-2 Ed 1.0		2012-02
IED 60044-6 Ed. 1.0	1992-03-30		IEC 61869-3 Ed 1.0	2011-07-13	
IED 60044-7 Ed. 1.0	1999-12-17		IEC 61869-4 Ed 1.0		2013-04
IED 60044-8 Ed. 1.0	2002-07-19		IEC 61869-5 Ed 1.0	2011-07-13	
			IEC 61869-6 Ed 1.0		2013-07
			IEC 61869-9 Ed 1.0		2012-12
			IEC 61869-10 Ed 1.0		2011-10
			IEC 61869-11 Ed 1.0		2012-06
			IEC 61869-13 Ed 1.0		2012-12

Standardization Instrument Transformers

- Technical reports

Standard	Title	Publication	Forecast
IEC/TR 61869-103 Ed. 1.0	The use of instrument transformers for power quality measurement		2012-03

Standardization Current Transformers

- IEC 60044-1 Instrument transformers – Part 1: Current transformers
- IEC 60044-6 Instrument transformers – Part 1: Requirements for protective current transformers for transient performance

Standardization Current Transformers

- IEC 60044-1 Instrument transformers –
Part 1: Current transformers
 - Definitions
 - Normal and special service conditions
 - Ratings
 - Design requirements
 - Classification of tests

Standardization Current Transformers

- Classification of tests
 - Type test
 - Short time current test
 - Temperature rise test
 - Lightning impulse test
 - Switching impulse test
 - Wet test for outdoor type transformers
 - Determination of errors
 - Radio interference voltage test

Standardization Current Transformers

- Routine test
 - Verification of terminal markings
 - PF withstand test on primary winding
 - Partial discharge measurement
 - PF withstand test on secondary windings
 - PF withstand test, between sections
 - Inter-turn overvoltage test
 - Determination of errors

Standardization Current Transformers

- Special tests
 - Chopped lightning impulse test
 - Measurement of capacitance and dielectric dissipation factor
 - Multiple chopped impulse test on primary winding
 - Mechanical test
 - Measurement of transmitted overvoltages

Standardization Current Transformers

- Determination of errors
 - Measuring current transformers
 - Current error and phase displacement (1), 5, 20, 100 and 120% I_{p_r} at 25% and 100% S_r
 - Instrument security factor I_{exc} measured at U_{emf}

Standardization Current Transformers

- Determination of errors
 - Protective current transformers Class P
 - Current error and phase displacement
100% I_{p_r} at 100% S_r and pf of 0,8 ind.

Standardization Current Transformers

- Determination of errors
 - Protective current transformers Class P
 - Composite error
 - Direct method
 - $I_{p_{ALF}}$ at 100% S_r and $pf = 0,8$ ind.
 - Indirect method
 - I_{exc} measured at U_{emf}

Standardization Current Transformers

- Determination of errors
 - Protective current transformers Class PR – limited remanence factor
 - Determination of remanence factor K_r
 - Determination of secondary loop time constant (T_s)
 - Determination of secondary winding resistance (R_{ct})

Standardization Current Transformers

- Determination of errors
 - Protective current transformers Class PX – low leakage reactance
 - Proof of low reactance by drawing or by composite error measurement

Standardization Current Transformers

- IEC 60044-6 Instrument transformers –
Part 1: Requirements for protective current transformers for transient performance
 - Definitions (class TPS, TPX, TPY, TPZ)
 - Ratings and performance requirements
 - Methods of specification
 - Marking of rating plate
 - Tests

Standardization Current Transformers

- Tests
 - Type test
 - Turns ratio error or steady state ratio error and phase displacement
 - Determination of secondary winding resistance
 - Determination of excitation characteristic
 - Determination of remanence factor
 - Calculation of secondary loop time constant

Standardization Current Transformers

- Type test (continued)
 - Errors at limiting conditions
 - Determination of the factor of construction
- Routine test
 - Errors at limiting conditions
 - Determination of the factor of construction
- Special test
 - Verification of low leakage flux design

Standardization Current Transformers

- IEC 61869-1 Instrument transformers – Part 1: General requirements
- CDV IEC 61869-2 Instrument transformers – Part 2: Current transformers

Standardization Current Transformers

- Definitions
- Normal and special service conditions
- Ratings
- Design and construction
- Tests
- Rules for transport, storage, erection, operation and maintenance
- Safety
- Influence of products on the natural environment

Standardization Current Transformers

- Main difference between IEC 60044-1 /-6 and IEC 61869-1 and CDV IEC 61869-2
 - IEC 61869-2 will be product standard for current transformers
 - For general requirements reference is made to IEC 61869-1
 - Transient performance protective current transformers included in IEC 61869-2

Standardization Current Transformers

- New additional test items:
 - Type tests
 - Electromagnetic compatibility (EMC)
 - Degree of protection by enclosure (IP)
 - Enclosure tightness at ambient temperature
 - Pressure test for the enclosure

Standardization Current Transformers

- Routine tests
 - Enclosure tightness at ambient temperature
 - Pressure test for the enclosure
- Special tests
 - Internal arc fault test
 - Enclosure tightness at low and high temperatures
 - Gas Dew point test
 - Corrosion test
 - Fire hazard test

Standardization Current Transformers

- Sample tests
 - Lightning impulse test recommended
 - Test program agreed between purchaser and manufacturer

Standardization Protection Relays

- IEC TC95
 - In the process of development of functional test standards for many functions, e.g.
 - IEC 60255-121 Distance protection
 - IEC 60255-151 Over/under current protection
 - IEC 60255-167 Directional current protection
 - IEC 60255-178 Power swing protection
 - IEC 60255-179 Reclosing
 - IEC 60255-187 Differential protection

Standardization Protection Relays

- CDV IEC 60255-121 ?? PWI ??
 - CT requirements shall be given by manufacturer (E_{alreq})
 - Cases considered
close-in reverse fault, close-in forward fault,
zone 1 underreach and zone 1 overreach
 - Procedure on how to dimension CT is given

Liaisons within standardization

- Liaisons between
 - TC 8X - System aspects of electrical energy supply
 - TC13 Equipment for electrical energy measurement and load control
 - TC38 Instrument transformers
 - TC85 Measuring equipment for electrical and electromagnetic quantities
 - TC95 Measuring relays and protection equipment
 - TC57 Power systems management and associated information exchange



End sheet

Thank you for your attention.

Questions?