

## DATA SHEET: LOW VOLTAGE CURRENT TRANSFORMER

GENERAL SPECIFICATIONS FOR AAR TRANSMISSION CURRENT TRANSFORMERS



### TAPE WOUND CURRENT TRANSFORMER RESIN CAST CURRENT TRANSFORMER

#### Characteristic Parameters:-

*Current transformers convert an alternating current into a lower current, usually of higher magnitude, depending on their usage. Measurement type CTs are required to convert the primary current into different classes of accuracy.as specified by the class designation, over a current range from 1 to 120 percent of its rated primary ratio. The design of this type of transformer requires the inclusion of a core and winding which will when connected to its rated burden; perform within the limits of error as indicated by the standard's specification. It is an advantage for a measurement type transformer to saturate above this range, which provides a protection against damage to instruments by limiting the secondary current when surge currents or faults appear in the primary circuit.* 

**Current transformer:** An instruments transformer in which the secondary current, in normal condition of use, is substantially proportional to the primary current and differs in phase it by an angle which is approximately zero for an appropriate direction of connections.

**Measuring transformer:** A current transformer intended to supply indicating instruments, integrated meter, relay and similar apparatus.

Protective Current Transformer: A current transformer intended to supply protective relays.

Rated transformation ratio: The ratio of the rated primary current to the rated secondary current.

**Rated primary current:** The value of primary current which appears in the designation of the transformer and on which, the performance of the currant transformer is based.

**Rated secondary current:** The value of secondary current which appears in the designation of the transformer and on which the performance of the currant transformer is based.

**Current error (ratio error):** The error with a transformer introduces into the measurement of a current and which arises from the fact that actual transformation ratio is not equal to the rated transformer ratio. The current error expressed in percentage is given by the formula: Current error, percent = (Ka.Is-Ip) x 100 / Ip Where.Ka= rated transformation ratio ,Ip= actual primary current Is= actual secondary current when Ip is flowing under the conditions of measurement.







Accuracy Limit Factor (ALF): The ratio of the rated accuracy limit primary current to the rated primary current.

**Phase displacement:** The difference in phase between the primary and secondary current vectors, the direction of the vectors being so chosen that the angle is zero for the perfect transformer. The phase displacement is said to be positive when the secondary current vector leads the primary current vector. It is usually express in minutes.

**Composite Error:** Composite error is the resulting limitation of the harmonic content of the secondary current which is necessary for the correct operation of certain types of relays.

**Accuracy class:** A designation assigned to a current transformer the errors of which remain within specified limit under prescribed conditions of use.

Burden: The impedance of the secondary circuit in ohms and power factor.

**Rated burden:** The impedance of the secondary circuit on which the accuracy requirements are based. It is usually expressed as apparent power (in VA), at the rated secondary current and at a specified power factor.

**Rated output:** The value of the apparent power (in volt-amperes at a specified power factor) which the current transformer is intended to supply to the secondary circuit at the rated secondary current and with rated burden connected to it.

**Highest system voltage:** The highest rms line to line voltage which can be sustained under normal operating conditions at any time and at any point on the system. It excludes temporary voltage variations due to fault condition and the sudden disconnection of large loads.

**Rated insulation level:** That combination of voltage values (power frequency and lightning impulse, or where applicable, lightning and switching impulse) which characterizes the insulation of a transformer with regard to its capability to withstand by dielectric stresses. For low voltage transformer the test voltage 3kV, at power-frequency, applied during 1 minute.

**Rated short-time thermal current (Ith):** The rms value of the primary current which the current transformer will withstand for a rated time, with their secondary winding short circuited without suffering harmful effects.

**Rated dynamic current (ldyn):** The peak value of the primary current which a current transformer will withstand, without being damaged electrically for mechanically by the resulting electromagnetic forces, the secondary winding being short-circuited.

**Rated continuous thermal current:** The value of current which can be permitted to flow continuously in the primary winding, the secondary winding being connected to the rated burdens, without the temperature rise exceeding the specified values.

**Instrument security factor (ISF):** The ratio of rated instrument limit primary current to the rated primary current. The times that the primary current must be higher than the rated value, for the composite error of a measuring current transformer to be equal to or greater than 10%, the secondary burden being equal to the rated burden. The lower this number is, the more protected the connected instrument are against.

**Routine test:** Tests carried out on each current transformer to check requirements likely to vary during production.

The following tests apply to each individual transformer

- A. Verification of terminal marking (polarity)
- B. Power-frequency withstands test on primary winding.
- C. Power-frequency withstand test on secondary winding.
- D. Power-frequency withstand test, between sections.
- E. Inter-turn over voltage test
- F. Determination of errors. (Accuracy test)







sub test: ,ISF,composite error,knee-point voltage ,excitation current and resistance at  $75^{\circ}$ C The order of the tests is not standardized, but determination of error shall be performed after the other test.

**Type test:** Tests carried out to prove the general qualities and design of a given type of current transformer in accordance with the requirements of the applicable standers Tests may be carried out on a prototype which may incorporate special arrangements for the measurements required by applicable standard.

The following tests are type test:

- A. short time current test
- B. temperature rise test
- C. Determination of errors. (Accuracy test)

sub test: ,ISF,composite error,knee-point voltage ,excitation current and resistance at  $75^\circ C$ 

All the dielectric type test should be carried out on the same transformer, unless otherwise specified.

**Special tests / optional tests:** Test which may be in the nature of type tests or routine tests, and are carried out only by agreement between manufacturer and purchaser.

**Short time current test**: For the thermal short time current lth test the transformer shall be at a temperature 10°C to 40°C. The test shall be made with the secondary winding short circuited and at the current I for a time t, so that (I<sup>2</sup>t) is not less than (I<sup>2</sup>th) and provided t has a value between 0,5 s and 5s. The dynamic test shall be made with the secondary winding (s) short-circuited, and with a primary current the peak value of which is not less than the rated dynamic current (Idyn) for at least one peak.

The dynamic test may be combined with the thermal test above, provided the first major peak current of that test is not less than the rated dynamic current (ldyn).

The transformer shall be deemed to have passed these tests if, after cooling to ambient temperature (between 10°C and 40°C), it satisfies the following requirements:-

- A. It is not visibly damaged;
- B. Its errors after demagnetization do not differ from those recorded before the tests by more than half the limits of error appropriate to its accuracy class
- C. It withstands the dielectric tests specified in the standard but is reduced to 90% of the given test voltage or current.

D. On examination, the insulation next to the surface of the conductor does not show significant deterioration (e.g. carbonization).

**Temperature-rise test:** A test shall be made to prove compliance with the requirement of standard. for the purpose of this test, current transformers shall be deemed to have attained steady temperature when the rate of temperature rise dose not exceed 1 K per hour.

The test-site ambient temperature shall be between 10°C and 30°C. For the test the transformer shall be mounted in a manner representative of the mounting in service.

The temperature rise of winding shall, when practicable, be measured by the increase in resistance method, but for winding of very low resistance, thermocouples may be employed. The temperature rise of parts other than the winding can be measured by thermometer thermocouples.

Verification of terminal markings: It shall be verified that the terminal markings are correct.

**Power-frequency test:** The power frequency withstand test shall be performed in accordance with IEC 60060-1.

The test voltage should be the correct value given in the standard.

depending on the highest voltage for equipment. The duration shall be one minute.

The test voltage shall be applied between the short-circuited primary winding and earth. The short-circuited secondary winding (s), the frame (if any) and core shall be connected to earth.







**Inter-turn over voltage test:** The inter-turn over voltage test shall be performed in accordance with one of the following procedures.

With the primary winding open-circuited, the prescribed test voltage (at same suitable frequency) shall be applied for 60 seconds to the terminals of each secondary winding, providing that the rms value of the secondary current, dose not exceed the rated secondary current.

The value of the test frequency shall be not greater than 400 Hz.

At this frequency if the voltage value achieved at the rated secondary current is lower than 4.5 kV peak the obtained voltage is to be regarded as the best voltage.

When the testing frequency exceeds twice the rated frequency, then the duration of the test may be reduced from 60 seconds.

(Note: - The tests which are applicable to circular type/ window type, low tension, LTCT are given here. For remaining test procedure, please refer applicable standard.

# AAR Transmission offers the best quality current transformers with comprehensive measurement class accuracy.

The range system offers a wide selection of current ratings, bus bar sizes, holes and mounting options for every application.

Quality, accuracy, reliability are the main virtues of using AAR transmission current transformers. CT are being used by switch gear manufacturers as well as power distribution companies.

### Features:-

- compact with electrically stable quality product.
- available a wide range of products systems with various current rating.
- high precision and mounting arrangement available.
- various mounting options e.g. wall mounting, cable mounting, bus bar mounting .
- · cost effective quality product.
- CT production as per latest IS&IEC or older.

### 1. Applicable standard: - IS-2705,16227 & IEC-60044-1&61869

- 2. Connection: Two connections on each side of M6 screws with self-tapping screws.&pin type Cu.lug.
- 3. Insulation class: E (120°C max)
- 4. System voltage: 660V maximum
- 5. Test voltage: 3KV 50 Hz for 1 min
- 6. Operating frequency: 50/60Hz
- 7. Rated primary rating: 1A to 6300A
- 8. Rated secondary output: 5A standard (1A will be optional)
- 9. Rated burden: 1, 1.25, 1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30, 45, 60 VA
- 10. Thermal short circuit current (Ith): 40xln for Wound type CT and 50xln for Window(bus bar) type CT.
- 11. Dynamic short circuit current (Idyn): 2.5xlth
- 12. Instrument security factor (FS): 2.5, 5, 10





Limits of current error and phase displacements error for Standard Accuracy Classes														
Measuring Class Current Transformers (Class from 0.1 to Class 5)														
Accuracy Classes	±% Current Ratio Error at % of Rated Current							± Phase Displacement error in Min.at % Rated Current						
	1%	5%	20%	50%	100%	120%	150%	1%	5%	20%	50%	100%	120%	150%
0.1	-	0.40	0.20	-	0.10	0.10	-	-	15	8	-	5	5	-
0.2	-	0.75	0.35	-	0.20	0.20	-	-	30	15	-	10	10	-
0.2S	0.75	0.35	0.20	-	0.20	0.20	-	30	15	10	-	10	10	-
0.5	-	1.50	0.75	-	0.50	0.50	-	-	90	45	-	30	30	-
0.5S	1.50	0.75	0.50	-	0.50	0.50	-	90	45	30	-	30	30	-
1	-	3.00	1.50	-	1.00	1.00	-	-	180	90	-	60	60	-
3	-	-	-	3	-	-	3	-	-	-	-	-	-	-
5	-	-	-	5	-	-	5	-	-	-	-	-	-	-
	Note: Limits of phase displacement error are not specified for class 3.0 & 5.0													
Limits of current ratio error and phase displacement error for - Protection Class Current Transformers (Class:- 5P,10P&15P)														
Accuracy Class	Curro of	ent (Ra Ratec Curre	atio) Err I Prima nt (%)	ror at ry	Phase Displacement er in minutes at percentage Rated Current			ror e of Composite error at Rated Accuracy Limit Primary Current (%)						
	100%				Minutes				%					
5P	± 1.0			± 60				5						
10P	± 3.0							10						
15P	± 5.0			_				15						
Where P is the designation for protection. The number before P indicates the composite error percentage.														
Limits of turns ratio error for - PX Class Current Transformers														
Accuracy	± Percentage Turns Ratio Error at % of Rated Current													
Class	100%													
PX		The turns ratio shall be determined and shall not differ from the specified ratio by more than $\pm$ 0.25 percent.												
For <b>PX class CTs</b> , the burden is <b>not normally mentioned</b> . <b>There</b> the <b>CT</b> is defiened <b>based</b> on the <b>CT kneepoint voltage</b> , magnetising current <b>etc</b> .								e CT						





VA (Burden) Guide :				
SR.NO	Instrument	Burden (VA)		
1	Bimetal instruments (5 A)	3.0		
2	Bimetal and Moving iron instruments (5 A)	3.5		
3	Moving Iron Instruments	1.0		
4	Watt Meter	3.5, 5.0, 5.5		
5	Power Factor meter	4.0		
6	Current Transducers	0.5		
7	Power Transducers	0.5		
8	kWh-meter	2.5		
9	Trivector Meter, Power Analyzer, Load Manager	5.0		

Temperature rise limit of winding					
Insulation Class	Maximum Temperature Rise ( <sup>°</sup> C)				
Class Y	45				
Bituminous compound immersed classes	50				
Oil Immersed Classes	60				
Class A	60				
Oil immersed and sealed Hermetically	65				
Class B	85				
Class E	75				
Class F	110				
Class H	135				

We also manufacture CTs as per customer specifications .

