Islamic Republic of Iran
Vice Presidency for Strategic Planning and Supervision

General Technical Specification and Execution Procedures for Transmission and Subtransmission Networks Current Transformers

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Description **PAGE**

Technical Specification of Current Transformers

1-GENERAL REQUIREMENTS

This specification covers the requirements for the design, manufacturing, checking, factory testing, marking, packing, transportation, storage, installation and commissioning tests for current transformers in 63 to 400 kV substations.

Current transformers shall be designed, manufactured and tested according to the applicable requirements of the latest edition of the following standards and to this specification:

IEC 60044-1: Instrument transformers, part 1, current transformers

IEC 60044-6: Instrument transformers. Part 6. Requirements for protective current transformers for transient performance.

IEC 60270: Measurement of partial discharge

IEC 60296: Specification for unused mineral oils for transformers and switchgears

IEC 60947-1: Low voltage switchgear and controlgear

ISO 1461: Metallic coatings – hot dip galvanized coating on fabricated ferrous products.

All amendments, supplements and reference publications listed in the above standards shall also be applied.

The current transformers shall be completed with spare parts and all necessary accessories and suitable for operating under conditions specified in basic equipment data and normal rating shall be as indicated in schedule CT (I)

2- DESIGN AND CONSTRUCTION

Current transformers shall withstand primary rated current and rated voltage without producing additional heat and insulation break down.

Protective current transformers under occurrence of short circuit in network shall be performed current turning with an appropriate accuracy.

Under short circuit condition, measuring cores shall be saturated, in order to limit secondary current, so measurement devices are not corrupted.

The current transformers shall be oil-immersed, Self cooled type and have a appropriate insulation.
(cast-resin type current transformers may also be used in 63 kV level).

The current transformers shall be suitable for outdoor installations on supporting structures.

The output of each current transformer shall be suitable for the correct working of the related protection devices and instruments over the required range of load and fault duties as specified.
When multi-ratio transformer windings are specified, the requirements shall be met by the use of tappings in the secondary windings.
Oil – filled current transformers shall be supplied with the following facilities:

- Oil level indicator
- A filling plug
- A draining valve
- A draining cap
- Lifting facilities for lifting the completely assembled transformer filled with oil.

The lower metallic part of the current transformers shall be provided with two earthing terminals on opposite sides for connection of suitable size of earthing conductor. The earth connection shall be so arranged that can not be inadvertently removed.
For establishing primary and secondary connections an approved arrangement should be considered.
All parts exposed to corrosion shall be made by non-corrosive material, or be hot-galvanized.
Current transformers shall be equipped with a secondary terminal box with sufficient holes and cable glands for cable connection. The terminal box shall be spacious enough to allow connection of necessary connecting leads and short circuiting of the current transformer's secondary terminals. The terminal box shall be accessible when the current transformer is in operation and also be provided with rain-protected shield, Net-covered, breather holes. Terminal box shall have a protection degree of IP54 or IP55 according to IEC 60144. The terminal box shall be provided with earthing clamp for earthing of secondary windings and cable shields. All contact components and screws shall be of corrosion resistant metal.
A current transformer marshalling box in accordance with IEC 60144, category IP54 or IP55 shall be supplied for every three set of CTs to be mounted near the center phase support structure to provide the interconnection point between phases. Maximum segregation shall be considered between winding groups.
Adequate precautions shall be taken to ensure that a uniform stress distribution is achieved throughout the insulation. After processing period, the insulation shall be free of moisture and trapped air. Details of the proposed methods of processing, drying and filling the current transformer, time of drying, degree of vacuum, etc. shall be submitted.
Each current transformer shall be impregnated and filled with oil of the grade specified in IEC 60296.
Each core shall be electrically separated from the other windings.
Current transformers may be of the bar, single or multi-turn primary.
Oil-filled current transformers shall be sealed completely and equipped with an expansion chamber, this arrange is not applied for inverted – type transformer.

Inner insulation shall be satisfactorily and permanently protected against moisture. Associated equipment for sealing shall be resistive to sunlight, air, oil and water.

Porcelain to metal joints shall be such as to ensure no occurrence of oil leakage under all loading conditions imposed at high voltage terminal, particularly during transport to site.

At short duration time after fault inception, Protective cores of current transformers shall correctly transform primary current wave shape to secondary winding. They shall follow high speed three phase autoreclose faults without saturation at the maximum fault level and relevant dc offset. The voltage produced at the cores by fault current or during transients on the system shall be well below the saturation level to ensure good transient response.

The precautions taken in the design of the primary winding to prevent the thermal and mechanical stresses caused by short circuits shall be shown on the documents submitted by the manufacturer.

An electrostatic shield should be provided between primary and secondary of CT's for preventing access of high current to secondaries and relays.

Secondary terminals shall be located so that they are accessible while the equipment is alive.

Secondary winding terminals which are not used shall be earthed.

The mechanical strength of the screws of secondary terminals should be sufficient. All of the screws must have spring washer.

Where any special construction or arrangement of windings is employed to improve accuracy, Or for any other reason, details of such construction or arrangement shall be shown on the documents.

For the multi-ratio tappings, labels shall be provided indicating the connections required for all ratios clearly. These connections shall also be shown on all connection diagrams.

Current transformers shall be mechanically dimensioned for stresses arising from ice load, wind load, tensile forces and forces caused by short circuit and earthquake as specified.

The porcelain insulator shall be designed in relation to site weather conditions and be washable when CT energized. It shall be manufactured and tested in accordance with the relevant IEC standards and comply with the requirement of CT's.

If the current transformer has several primary turns or is of the tank type, the primary winding shall be protected, if necessary, by an arrester or spark-gap. Protected characteristics of arrester shall be suitably coordinated with insulation between primary sections.

3- Capacitive terminal

If specified, current transformer shall be provided with capacitive voltage terminal for metering, synchronizing and relay protection. At rated voltage and by short-circuiting between voltage terminal and earth a current of at least 8 mA should be obtained. The actual short-circuit current shall be specified.

Internal impedance in current transformers between the terminal and earth shall be purely capacitive and dimensioned so that a no-load voltage of at least 250 V is obtained. If the transformers are provided with spark gap between the terminal and earth, this must not have a lower sparkover and extinction voltage than 350 V and 250 V respectively.

Any overvoltage protection shall be accessible without necessitating drainage of insulation oil.

The capacitive terminal shall also be suitable for dissipation power factor (tangent delta) measurement.

The capacitive terminal shall be designed to withstand a one minute power frequency test voltage of 4 kV rms.

The capacitive terminal shall be connected to a box, separated from the secondary terminal box.

4- High voltage terminal

High voltage terminal shall normally be of module plate type. Pin type is accepted as an alternative.

The terminal shall be designed according to bending moment owing to wind load or earthquake force together with horizontal pull of the high voltage line conductor.

Module plate terminals shall be designed according to primary current level as following dimensions:

Terminals for maximum rated current upto 1600 A shall be designed as plate of 75×75×15 mm (L×W×T). The plate should have 4 holes of 14 mm diameter with 40±0.5 mm as distance between holes center. Also the distance between plate edge and hole center should be 17.5 mm.

Terminals for maximum rated current upto 3150 A shall be designed as plate of 125×125×35 mm (L×W×T). The plate should have 4 or 9 holes of 14 mm diameter and center to center distance of 40±0.5 mm for two holes side by side.

Pin type terminals shall be designed according to the following cases:

Terminals for maximum rated current upto 1600 A shall be designed as a pin of 125 mm length and having 30±0.15 mm diameter.

Terminals for maximum rated current upto 3150 A shall be designed as a pin of 125 mm length and having 60±0.2 mm diameter.

Terminals of copper (Cu) or a copper alloy shall be tinned to a thickness of minimum of 50 micro meters. A copper alloy which is sensitive to season cracking shall not be used.

Terminals of aluminium or an aluminium alloy shall not be treated. An alloy sensitive to season cracking, shall not be used.

A module plate terminal of aluminium or aluminium alloy shall have a hardness of minimum 750 N/mm.

5- Rating plate

Rating plate made of stainless steel or other equivalent weather proof and corrosion-proof materials, shall be fixed in a visible and appropriate position.

The inscription shall be made by etching, engraving or other approved methods.

According to IEC 60044-1 information which shall be mentioned on the rating plate are as follows:

- The manufacturer's name.
- A serial number or a type designation, preferably both.
- The rated primary and secondary current
- Rated frequency
- The rated output and the corresponding accuracy class
- The highest voltage for equipment
- The rated insulation level

In addition, the following information shall be marked whenever space is available:

- the rated short-time thermal current (I_{th}) and the rated dynamic current if it differs from 2.5 times of rated short-time thermal current
- the class of insulation, (if different from class A. If several classes of insulating material are used, the one which limits the temperature rise of the windings should be indicated).
- On transformers with two secondary windings, the use of each winding and it's corresponding terminals shall be mentioned.

For measuring CTs, the accuracy class and instrument security factor shall be indicated following the indication of corresponding rated output (for example 15 VA class 0.5 FS5)

Measuring current transformers having an extended current rating shall have this rating indicated immediately following the class designation (e.g 15 VA class 0.5 ext.150%). If an equivalent output and accuracy class exists these values shall also be mentioned (e.g. 15 VA class1- 7 VA class 0.5), obviously other output may have a value different from values specified by standard.

For protective current transformers, accuracy limit factor shall be indicated following the corresponding output and accuracy class (e.g. 30 VA class 5P10).

Rating plate of class PR current transformers in comparison to rating plate of class P current transformers, differ in the following items:

- Usage of "PR" instead of "P" for specifying of accuracy class (e.g. 30 VA 5PR20)
- If required, secondary loop time constant (T_s) shall be mentioned

For rating plate of class PX current transformers, in addition to mentioned items, following parameters shall be considered.

- Rated turns ratio
- Rated knee point e.m.f (E_k)
- Maximum exciting current (I_e) at the rated knee point or at the stated percentage thereof
- Dimensioning factor (K_x) (If required by purchaser)
- Rated resistive burden (R_b) (If required by purchaser)

In addition to information requested in IEC 60044-1, secondary winding resistance at 75°C shall also be mentioned on rating plate.

For protective current transformer designed for transient performance, according to IEC 60044-6, information specified in table (1) shall be mentioned on rating plate.

Table (1) - information to be included in the plate

CT class	TPS	TPX	TPY	TPZ	Notes
I_{pn}	×	×	×	×	1
I_{sn}	×	×	×	×	1
I_{th}	×	×	×	×	3
I_{dyn}	×	×	×	×	3
K_{ssc}	×	×	×	×	
R_b	×	×	×	×	
R_{ct}(at … °C)	×	×	×	×	
K_{td}	—	×	×	×	
K	×	—	—	—	
U_{al}	×	—	—	—	
I_{al}	×	—	—	—	
F_c	—	×	×	×	2
T_p	—	×	×	×	5
T_s	—	—	×	—	4,5
Duty cycle Single: t', t'_{al} Double: $t', t'_{al}, t_{fr}, t'', t''_{al}$	—	×	×	—	5

NOTES:

1. For multi ratio protective current transformers, I_{pn} and K_n will usually be the highest values applicable to the range of ratios.
2. Data to be given if F_c>1.1
3. Values for I_{dyn} may exceed 2.5 I_{th} depending on the values of T_p and I_{psc}
4. when T_s is greater than 10 s, it will usually be adequate to mark on the rating plate T_s>10s.
5. T_p, T_s and the duty cycles are interrelated and their indication on the rating plate could be omitted for low leakage flux CTs.

For all current transformers total weight of transformer shall also be mentioned on rating plate.

6- Spare Parts and Tools

The manufacturer's recommended spare parts for 5 years trouble free operation and any special tools necessary for erection and repair should be provided.

7- Tests

Current transformers shall be tested according to IEC 60044-1 under following type, routine and special tests.

7.1- Type test

- Short time current test
- Temperature rise test
- Lightning impulse test
- Switching surge withstand capability test
- Wet power frequency test on primary insulation
- Accuracy tests

7.2- Routine tests

- Verification of terminal markings
- Power frequency tests on primary winding
- Power frequency tests between sections of primary and secondary windings and on each secondary windings
- Measurement of partial discharge
- Over voltage inter-turn test
- Accuracy tests

7.3- Special tests

- Chopped impulse test on primary winding
- Measurement of the capacitance and dielectric dissipation factor
- Multiple chopped impulse test on primary winding
- Mechanical tests

For protective current transformers designed for transient performance, in addition to above tests, according to IEC 60044-6 tests specified in table (2) shall also be done.

Table(2)- test schedule

Test	CT class				Notes
	TPS	TPX	TPY	TPZ	
Turns ratio error	×	—	—	—	1
Steady state ratio error And phase displacement	—	×	×	×	1
R_{ct}	×	×	×	×	1
Excitation characteristic	×	×	×	×	1
K_r	—	—	×	—	1
T_s	—	—	×	×	1
Errors at limiting conditions	—	×	×	×	2
F_c		×	×	×	2
Verification of low leakage Flux design (F_c<1.1)	×	—	—	—	3

NOTES:
1. Type and routine tests.
2. Type tests.
3. Special tests performed only on agreement between manufacturer and purchaser.

8- DRAWING AND DOCUMENTS

8.1- Documents to be given by tenderer

- Filled schedule C.T (II)
- Catalogue and technical pamphlets
- Summery of type test reports
- Outline drawing
- Detailed summary of exceptions to tender specifications
- Reference list of all CT
- List of special tools
- List of spare parts

8.2- Documents to be given by contractor / supplier

The electrical and mechanical design, fabrication, factory testing, marking, packing transportation, storage, erection, site test, operation and maintenance drawings, documents and manuals of current transformer are as follow and not limited to the following shall be submitted:

- Magnetic characteristics of CT
- CT connection diagram
- CT dimensioning drawings
- Calculation sheets to establish adequacy of CT in any respect.
- Loading on foundation
- Nameplate drawings
- Detailed drawing for secondary terminal box (with indicating of polarity of primary and secondary)
- Detailed drawing and technical specification for porcelain insulator.
- Routine test certificates
- Type test documents
- Shipping, warehousing, assembly, erection, commissioning, operating and maintenance instruction manuals
- List of component
- Packing details
- Work schedules and monthly progress report
- Drawing list
- Final as built Doc/Dwg
- Dismantling reassembling and adjusting manuals

9- Transportation, Storage, Installation and commissioning

It is essential that the transport, storage, installation and commissioning of current transformer be performed in accordance with instructions given by the manufacturer.

The instructions for the transport and storage should by given before delivery.

The instructions for the installation and commissioning should be given by the time of delivery at the latest.

9.1- Transportation

If current transformer not designed for horizontal transportation it shall be transported vertically. In this case maximum allowable deviation angle shall be 60 degree.

If current transformer which shall be transported vertically, placed horizontally, it shall not be energized, because nitrogen gas exists on top of expansion chamber, may be reached active part region of transformer and in this situation, with energizing current transformer danger of explosion of CT exists.

9.2- Storage

Current transformer can be stored in a covered or open air condition according to manufacturer instructions. If current transformers are stored in open air, at least they shall be covered with plastic tissues. These plastic tissues shall not be put directly on galvanized surfaces and an air channel shall be mounted to prevent any infiltration of water.

Storage is called to a place that:

- It has a ceiling
- Its floor is firm and uniform.
- Air humidity shall be less than 50%
- Air temperature 20 ± 10 C°

To prevent water from reaching the current transformer, it shall be stored in an elevation upper than floor level. To prevent any corrosion caused by the infiltration of water, the plastic cover shall be removed (not for spare parts).

After receiving of each current transformer the following items shall be checked:

- Current transformer delivery is according to order documents.
- There is no damage or shortage in the delivered current transformer

If there is any damage, all damages shall be photographed. These shall be reported. Storage of a current transformer in moist and not well ventilated air may cause the change of color of galvanized surfaces. This change of color is generally named white corrosion and is not a reason for rejecting the goods.

All parts shall be stored in away are always accessible. The surrounding ambient of current transformer shall be clean of any dust, smoke, flammable or corrosive gasses, steam or salt. In this condition, the storage shall be cleaned before storing process.

Spare parts shall be kept in their original boxes and stored in storage. This is specially important for plastic parts (for water proofing and etc). These parts shall be kept away from sunlight to prevent them drying. Spacer washers can be stored for just a short time in the storage.

In the case of tank type transformer, Because of center of gravity is placed on bottom and transformer has a relatively high weight, additional equipments for tightening transformer to the floor is not required.

9.3- Checking and erection

Current transformers must be checked carefully after to be carried to destination. Insulators must be checked for external damages.

Transformer case must be checked for non existence of oil, specially on the insulator- to- expansion chamber connection part and on oil chamber.

During unpacking CTs, cotton string must be used. For transformers lifted horizontally this cotton string must be tied with top section of insulator. For transformers lifted vertically, this cotton string must be tied with lugs placed in the bottom of transformer.

For lifting transformer, chains must not be used.

9-3-1- Erection stages

1. Before erection, in situation which transformer placed in vertical position, oil level shall be checked.
2. After ensuring of non-oil leakage and non-damaging of transformer due to lifting, transformer placed on related structure vertically. Tightening transformer in unbalance situation could lead to oil leakage. By using some metal sheets, it could be possible to perform corrections for balancing the transformer.
3. Secondary terminal connections must be performed carefully. Every secondary winding must be earthed from one-end. Secondary windings not to be used, must be short circuited and earthed. If one tap of secondary is used, its not required to short circuit other taps.
4. Primary connection shall be performed in such a way that mechanical static load on primary terminal is minimized. It shall be possible with a flexible connector. A non-flexible connection could lead to oil leakage in primary terminals.
5. For connecting primary terminal of CT to other equipments, at first conductor shall be connected to other side and after that it could be connected to primary terminal of CT. This procedure performed for avoiding of applying a non-allowable bending moment to primary terminal.

   When it's specified for connecting conductor to primary terminal at first, firstly connecting bolts shall be tightened completely and secondly, until one end of conductor placed on the other side, conductor shall be kept from bottom by a base or from top by a rope.

   If a height difference exists between primary terminal of CT and equipments which shall be connected, it's essential for conductor having appropriate bending, this deformation shall be performed on the conductor before installation. After connecting conductor to primary terminal, applying force to deform the conductor is not allowable.

6. Ground terminal of CT shall be earthed. Capacitive terminal which come through a bushing from oil chamber If not to be used shall be connected to oil chamber case.

9.4. Commissioning

After a current transformer has been installed and all connections have been completed, commissioning tests are recommended to be performed to confirm that transportation and storage have not damaged the current transformer.

The manufacturer shall produce a program of site commissioning checks and tests. Repetition of the full program of routing tests, already performed in the factory, shall be avoided as the purpose of commissioning tests is for confirmation of

- Existence of no damage
- Compatibility of separate units
- Correct assembly
- Correct performance of the assembled current transformer.

For this purpose the commissioning tests shall include, but not limited to the following items:

- Measurement of insulating resistance with 5000 V MEGGER
- Polarity test
- Measurement of secondary winding resistance
- Measurement of secondary circuit burden
- Magnetic characteristics test
- Measurement of turn ratio

The results of the tests shall be recorded in a test report.

SCHEDULE CT (I)
RATINGS AND CHARACTERISTICS OF CURRENT TRANSFORMER

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	**245 kV**	**145 kV**	**72.5 kV**
1	**Particulars of system:**					
1.1	Highest system voltage	kV	420	245	145	72.5
1.2	Nominal system frequency	Hz	50	50	50	50
1.3	Number of phases		3	3	3	3
1.4	System neutral earthing		Solidly earthed	Solidly earthed	Solidly earthed	Solidly earthed/Non-Solidly earthed
1.5	Max. duration of short time current	sec	1	1	1	1
2	**Service conditions**					
2.1	Max. ambient temperature	°C	40/45/50/55	40/45/50/55	40/45/50/55	40/45/50/55
2.2	Min. ambient temperature	°C	-40/-35/-25	-40/-35/-25	-40/-35/-25	-40/-35/-25
2.3	Average value of daily temperature	°C	*	*	*	*
2.4	Solar radiation	W/m^2	*	*	*	*
2.5	Altitude above sea level	m	1000/1500/2000/2500	1000/1500/2000/2500	1000/1500/2000/2500	1000/1500/2000/2500
2.6	Pollution level		Low/medium/high/very high/special	Low/medium/high/very high/special	Low/medium/high/very high/special	Low/medium/high/very high/special
2.7	Max. wind velocity	m/s	30/40/45	30/40/45	30/40/45	30/40/45
2.8	Wind velocity at ice condition	m/s	20	20	20	20
2.9	Ice coating thickness	mm	5/10/20/25	5/10/20/25	5/10/20/25	5/10/20/25
2.10	Seismic acceleration	m/s^2	0.2g/0.25g/0.3g/0.35g	0.2g/0.25g/0.3g/0.35g	0.2g/0.25g/0.3g/0.35g	0.2g/0.25g/0.3g/0.35g
2.11	Relative humidity	%	90/95/more than 95	90/95/more than 95	90/95/more than 95	90/95/more than 95
3	**CT characteristics**					
3.1	Class (outdoor/indoor)		Outdoor	Outdoor	Outdoor	Outdoor
3.2	Type		Oil immersed-Tank/inverted type.	Oil immersed-Tank/inverted type.	Oil immersed-Tank/inverted type.	Oil immersed-Tank/inverted type.

SCHEDULE CT (I)
RATINGS AND CHARACTERISTICS OF CURRENT TRANSFORMER

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	**245 kV**	**145 kV**	**72.5 kV**
3.3	Highest Voltage for equipment	kV	420	245	145	72.5
3.4	Nominal service voltage	kV	400	230	132	63
3.5	Rated insulation levels at standard conditions:					
3.5.1	One min PFWL	kV	490/510/570/630	275/325/360/395/460	185/230/275	140
3.5.2	LIWL	kV_{peak}	1150/1175/1300/1425	650/750/850/950/1050	450/550/650	325
3.5.3	SIWL	kV_{peak}	1050	—	—	—
3.6	Max. R.I.V at $\frac{1.1Um}{\sqrt{3}}$ at 1 MHz	μvolt	2500	2500	2500	—
3.7	Rated Primary current (I_{pn})	A	#	#	#	#
3.8	Rated secondary current (I_{sn})	A	1-5	1-5	1-5	1-5
3.9	Rated Primary current (I_{sc})	kA_{rms}	50-63	40-50	25-31.5-40	20-25-31.5-40
3.10	Duration for short time current	Sec	1	1	1	1
3.11	Rated dynamic current		$2.5I_{SC}$	$2.5I_{SC}$	$2.5I_{SC}$	$2.5I_{SC}$
3.12	Rated continuous thermal current		$1.2I_{pn}$	$1.2I_{pn}$	$1.2I_{pn}$	$1.2I_{pn}$
3.13	Number of cores:					
3.13.1	For measuring		$0/1/2^{\#}$	$0/1/2^{\#}$	$0/1/2^{\#}$	$0/1/2^{\#}$
3.13.2	For protection		$3/4/5^{\#}$	$3/4/5^{\#}$	$3/4/5^{\#}$	$3/4/5^{\#}$

SCHEDULE CT (I)
RATINGS AND CHARACTERISTICS OF CURRENT TRANSFORMER

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	245 kV	145 kV	72.5 kV
3.14	Accuracy Class For Measuring cores		0.1/0.2/0.5/1/3/5/0.1S/0.5S#	0.1/0.2/0.5/1/3/5/0.1S/0.5S#	0.1/0.2/0.5/1/3/5/0.1S/0.5S#	0.1/0.2/0.5/1/3/5/0.1S/0.5S#
3.15	Accuracy Class For protection cores		TPS,TPX,TPY,TPZ,P, PX,PR, X#	TPS,TPX,TPY,TPZ,P, PX,PR, X#	TPS,TPX,TPY,TPZ,P, PX,PR, X#	TPS,TPX,TPY,TPZ,P, PX,PR, X#
3.16	Rated output:		*	*	*	*
3.16.1	For measuring	VA	*	*	*	*
3.16.2	For protection	VA	*	*	*	*
3.17	Max. temperature rise at rated Continuous thermal current	C	*	*	*	*
3.18	Min. external creepage distance	mm/kV	*	*	*	*
3.19	H.V Terminal static withstand forces:		*	*	*	*
3.19.1	Horizontal	N	*	*	*	*
3.19.2	Vertical	N	*	*	*	*
3.20	Capacitive terminal provided?	Yes/No	*	*	*	*

*: These will be specified by engineer.
#: Detailed requirement of each CT should be mentioned on item 3.21

3.21- Current & output data:

Item No.	Core No.	Application	CT ratio (for each tap)	Rated burden (VA)	Accuracy class

SCHEDULE CT (II)
GUARANTEED TECHNICAL INFORMATION OF CURRENT TRANSFORMER
(TO BE SUPPLIED WITH TENDER)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	245 kV	145 kV	72.5 kV
1	**GENERAL**					
1.1	Manufacturer's name and country					
1.2	Manufacturer's type designation					
1.3	Class and type (outdoor/indoor)					
1.4	Applicable standard					
1.5	Applicable site and ambient conditions:					
1.5.1	Max. design ambient temperature	°C				
1.5.2	Min. design ambient temperature	°C				
1.5.3	Average value of daily temperature	°C				
1.5.4	Solar radiation	W/m^2				
1.5.5	Design altitude above sea level	m				
1.5.6	Pollution level	m/s^2				
1.5.7	Max. permissible ice thickness	mm				
1.5.8	Design seismic acceleration					
1.5.9	Max. permissible wind velocity	m/s				
1.6	Document (test reports/outline/drawings Catalogues/ maintenance & installation Manuals /instruction manuals /references List of spare parts)					
2	**Rated values & characteristics:**					
2.1	Rated voltage	kV				
2.2	Capacitive terminal provided?	Yes /No				
2.2.1	Type	Tank type/ Inverted type				
2.2.2	Short circuit current	kA				

SCHEDULE CT (II)
GUARANTEED TECHNICAL INFORMATION OF CURRENT TRANSFORMER
(TO BE SUPPLIED WITH TENDER)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	245 kV	145 kV	72.5 kV
2.2.3	No load voltage	V				
2.3	Type of primary winding (single turn or multi turn)					
2.4	Means for compensation of oil expansion					
2.5	Insulation level (at standard condition)					
2.5.1	LIWL	kV_{Peak}				
2.5.2	SIWL	kV_{Peak}				
2.5.3	1 minute PFWL	kV				
2.6	Max. R.I.V level measured at $\frac{1.1U_m}{\sqrt{3}}$ and 1 MHz	μvolt				
2.7	Rated power frequency withstand Voltage for secondaries	kV				
2.8	Max. partial discharge level at $\frac{1.1U_m}{\sqrt{3}}$	pC				
2.9	Dielectric dissipation factor at $\frac{1.1U_m}{\sqrt{3}}$					
2.10	Rated primary current	A				
2.11	Rated secondary current	A				
2.12	Rated transformation ratio					
2.13	Rated continuous thermal current	A				
2.14	Rated short time thermal current:					
2.14.1	1 sec	kA				
2.14.2	3 sec	kA				

SCHEDULE CT (II)
GUARANTEED TECHNICAL INFORMATION OF CURRENT TRANSFORMER
(TO BE SUPPLIED WITH TENDER)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 kV	245 kV	145 kV	72.5 kV
2.15	Rated dynamic current	kA_{peak}				
2.16	Time permitted with open circuited secondary	Sec				
2.17	Voltage at secondary winding in situation of flowing of normal primary load current through terminal and Secondary open circuited	V				
2.18	Type of protective device (if any) to limit voltage in item 2.17					
2.19	No. of Cores in secondary:					
2.19.1	For metering					
2.19.2	For protection					
2.20	Max. temp. rise at rated continuous thermal current	°C				
2.21	Magnetization Curve					
2.22	Overall length	mm				
2.23	Overall width	mm				
2.24	Overall height	mm				
2.25	Max. shipping dimensions	m×m×m				
2.26	Weight of oil	kg				
2.27	Type and grade of oil used					
2.28	Total weight of a single phase current transformer	kg				

SCHEDULE CT (II)
GUARANTEED TECHNICAL INFORMATION OF CURRENT TRANSFORMER
(TO BE SUPPLIED WITH TENDER)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 KV	245 KV	145 KV	72.5 KV
2.29	Material of conducting parts					
2.30	Type of terminal connections					
2.31	Corona ring provided?	Yes/No				
2.32	Max. allowed static forces applied at outermost point of the primary terminal:					
2.32.1	Horizontal	N				
2.32.2	Vertical	N				
2.33	Max. allowed dynamic forces applied at outermost point of the primary terminal:					
2.33.1	Horizontal	N				
2.33.2	Vertical	N				
2.34	Electrostatic capacity of complete current transformer	pF				
2.35	Test method for internal discharge test					
2.36	Voltage level for internal discharge test	kV				
2.37	Method of controlling stress distribution in paper insulation					
2.38	No. of stress grading foils					
2.39	Vibratory characteristic of CT:					
2.39.1	Damping factor	%				
2.39.2	Natural frequency (ies)	Hz				

SCHEDULE CT (II)
GUARANTEED TECHNICAL INFORMATION OF CURRENT TRANSFORMER
(TO BE SUPPLIED WITH TENDER)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS			
			420 KV	245 KV	145 KV	72.5 KV
2.40	Surge arrester on primary winding rating & Protective characteristic provided?	Yes/No				
2.41	IP class of secondary terminal box					
2.42	Heater provided?	Yes/No				
3	**External insulator:**					
3.1	Type					
3.2	Manufacturer's name and country					
3.3	Dry striking distance	mm				
3.4	Detail of shed					
3.5	Creepage distance	mm				
3.6	Washable in service	Yes/No				
3.7	Ultimate strength					
3.7.1	Bending	N.m				
3.7.2	Torsion	N.m				

NOTE: Detailed characteristics of each CT should be mentioned on item 3.8

3.8- Current & output data:

Item No.	Core No.	Application	CT ratio (for each tap)	Rated Burden (VA)	Accuracy class	Rated Accuracy Limit factor for protective cores	Minimum Knee point Voltage	Maximum CT Secondary Resistance At 75°C (Ω)	Maximum Exciting Current at 1/2 kV peak (mA)