Specification – HV Capacitor Voltage Transformers

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** This person will have the power to grant the process owner the authority and responsibility to manage the process from end to end.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Revision Control		
Revision	**Date**	**Description**
0	26/05/2023	First issue

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Manager Engineering & Project Services	Asset Managers
Manager Systems & Network Planning	Manager Assets Services
Senior Manager Safety, Health and Wellbeing	

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1 SCOPE

This Specification sets out the technical (electrical and mechanical) requirements for the performance, testing and supply of high voltage, capacitor voltage transformers for the transmission system only.

Approval in terms of this specification shall be obtained by one or a combination of the following:

a) successful completion of the appropriate tests required by this specification by an independent and accredited test authority.

b) provision of test certificates from an independent and accredited test authority based upon an alternative specification, with test requirements at least equivalent to this specification.

NOTE: Verification of accreditation of the test authority shall be provided by NATA (National Association of Testing Authorities) accredited test house or by a test house possessing accreditation from a NATA MRA (Mutual Recognition Agreement) partner.

Tenderers must state any non-compliance with the specification in any tender submission and any alternative offers must be submitted in full and separately from any main offer.

2 NORMATIVE REFERENCES

2.1 Standards

2.1.1 Horizon Power Standards

[1]. *Horizon Power Environmental Conditions*, standard number HPC-9EJ-01-0001-2013, available at http://horizonpower.com.au/contractors-suppliers/contractors/manuals-and-standards/ under the 'Standards' heading.

2.1.2 Australian Standards

The following standards are available at http://www.saiglobal.com.

[2]. *AS 1627.0, Metal finishing – Preparation and pre-treatment of surfaces – Method selection guide*, Standards Australia, 1997 (R2017)

[3]. *AS/NZS 2312.1, Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Paint coatings*, Standards Australia, 2014

[4]. *AS/NZS 4680, Hot dip galvanised (zinc) coatings on fabricated ferrous articles*, Standards Australia, 2006

[5]. *AS/NZS 60529, Degrees of protection provided by enclosures (IP Code)*, Standards Australia, 2004

[6]. *AS 61869.1, Instrument transformers – Part 1: General rules*, Standards Australia, 2021

[7]. *AS 61869.5, Instrument transformers – Part 5: Additional requirements for capacitor voltage transformers*, Standards Australia, 2021

[8]. *AS 62271.301, High voltage switchgear and control gear – Dimensional standardisation of terminals*, Standards Australia, 2011

2.1.3 International Standards

The following standards are available at http://www.saiglobal.com.

[9]. *IEC 60060.1, High-voltage test techniques – Part 1: General definitions and test requirements*, International Electrotechnical Commission, 2010

[10]. *IEC 60812, Failure modes and effects analysis (FMEA and FMECA)*, International Electrotechnical Commission, 2018

2.1.4 Compliance with Standards

Various Standards are referenced in this Specification. The Standards have reference to the year they were published. If over the life of the Tender the Standards change, the Vendor is required to conform to the new edition of the Standard.

Unless otherwise specified herein, the *Equipment* shall be designed, manufactured and type and routine tested in accordance with the referenced Australian Standards, including all amendments. Where there is no Australian Standard equivalent, International Standards or Codes as defined in this specification shall be used. The specified documents contain provisions that, through reference in the text, constitute requirements of this Specification. At the time of publication of this Specification, the editions indicated were valid. Information on currently valid national and international standards may be obtained from the Australian Standards website. http://saiglobal.com.

2.2 Definitions and Abbreviations

For the purposes of this specification, definitions shall apply as in the relevant Australian Standards (AS 61869.1 [6] and AS 61869.5 [7]) with the addition of a few general definitions listed below in alphabetical order.

CVT: Capacitor Voltage Transformer

Equipment: High Voltage Instrument Capacitor Voltage Transformer

3 REQUIREMENTS

3.1 General

The *Equipment* specified in this instruction is to be used for electrical metering (including power quality and telemetry) and protection of power transformers, outdoor busbars, overhead lines, cables, or any other power system assets generally used in a transmission network.

Standard Horizon Power Capacitor Voltage Transformers and descriptions are listed in Table 7 of Section 11.

The *Equipment* offered that is found on inspection not to conform to this Specification shall be replaced by the Vendor at no cost to Horizon Power.

3.2 Environmental Conditions

The performance of the *Equipment* must meet the requirements set out in Section 4.1 of the *Horizon Power Environmental Conditions* [1].

3.3 Technical Requirements

The *Equipment* shall be suitable for outdoor use and only connected in a phase to earth arrangement.

Equipment may be mounted on steel or any other structure with acceptable insulation meeting AS 61869.1 [6].

The technical performance of the *Equipment* must as a minimum meet AS 61869.1 [6] and AS 61869.5 [7].

3.3.1 Electrical Requirements

The *Equipment* shall be suitable for use on the 66 kV, 132 kV, 220 kV and 330 kV 3-phase 50 Hz distribution systems. The *Equipment* must be suitable for operation under the defined operating conditions and must meet the required performance requirements as set out in the table below:

Table 1: Electrical Requirements

Description		66 kV	132 kV	220 kV	330 kV
Maximum system voltage (U_m)	kV	72.5	145	245	362
Lightning impulse withstand	kV_{Peak}	325	650	1050	1175
Power frequency withstand (60 sec.)	$kV_{r.m.s.}$	140	275	460	520
Switching impulse withstand	kV_{Peak}	N/A	N/A	N/A	950
Secondary winding withstand voltage	kV	65	65	65	65
Primary voltage	kV	$66/\sqrt{3}$	$132/\sqrt{3}$	$220/\sqrt{3}$	$330/\sqrt{3}$
RIV level @ 1.1 $U_m/\sqrt{3}$	µV	≤2500			
Secondary voltage	V	$110/\sqrt{3}$			
Secondary windings		Measurement & Protection			
Measurement class and burden		0.2/100 VA			
Voltage factor		1.9/30s			
Thermal limit		≥100 VA			
Protection class and burden		3P/100 VA			
Method of Earthing		Effective			

3.3.2 Mechanical Requirements

The design and manufacturing process must confirm that the performance characteristics of the *Equipment* is not affected by changes in the ambient conditions, such as temperature or humidity, and meet forces presented during fault and environmental conditions (see Section 3.2 Environmental Conditions). The vendor shall submit the detailed design, materials used and manufacturing process of the *Equipment*.

The voltage transformer shall be suitable for use under the following conditions as set out in the table below:

Table 2: Mechanical Requirements

Description		66 kV	132 kV	220 kV	330 kV
CVT design type		Top core			
Insulator type		Polymer/composite			
Primary terminal material		Aluminium			
Creepage (≥31 mm/kV)[1]	mm	≥2232	≥4495	≥7595	≥11222
Static withstand test load[1]	N	≥2500	≥3000	≥4000	≥4000
Secondary terminal box	IP	54	54	54	54
Capacitor voltage tap		Yes			

3.3.3 Mounting Requirements

The *Equipment* shall be supplied fully assembled ready for mounting. All metal work shall meet AS 1627 [2] having no burrs or sharp edges.

4 holding down bolt holes arrange with maximum square 400 mm by 400 mm, diameter of the holes being minimum of M20.

Note: Manufacturer to provide adapter plate if *Equipment's* base dimensions are different to required parameters.

The vendor shall submit complete detail and drawings of the pedestal mounting assembly.

3.3.4 Primary Terminals

The *Equipment* shall be provided with suitable terminals to connect to the line and earth in concordance with AS 62271.301 [8]. The terminals on the line side shall be tin plated copper or aluminium and on the earth side, shall be of stainless steel grade 316 and shall be supplied with all required nuts, bolts and washers.

The line terminal shall be 4 hole NEMA pad, and the earth terminal shall be 14 mm holes or M12 bolt/stud.

[1] See AS 61869.1 Table 7 [6]

The vendor shall submit complete details and drawings of the line and earth terminals.

A warning label for the earthing terminal connection shall be fixed next to the CVT secondary connection diagram. The label shall read:

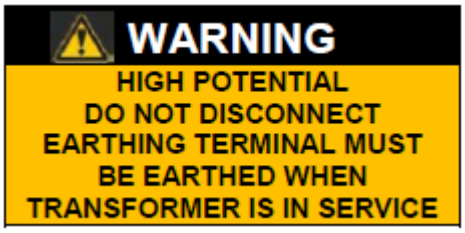

Figure 1 – Earth terminal Warming label

All ferrous nuts, bolts, washers and clamps used for any purpose other than for current carrying shall be hot dip galvanised.

All bolts, washers and clamps attached to current carrying parts shall be manufactured from stainless steel grade 304, and all nuts shall be from stainless steel grade 316.

All bolts and clamps, which may be required to carry an electrical current, shall be fitted with stainless steel spring washers.

3.4 Terminal Box

The secondary terminals shall be rated to IP 54 in accordance with AS/NZS 60529 [5].

The terminal box shall be fitted with an internal M6 earth stud, and a conductive removable gland plate shall be provided with a M32 pre-punched, spot welded knock-out (suitable for a size #3 mechanical gland). The removable gland plate shall be inherently non-corrosive and shall not be coated, so that it will remain conductive.

A 16 A fuse shall be included for each phase of the voltage transformer's secondary circuits.

3.4.1 Secondary Terminals

All terminals shall be M6 studs and shall be fitted with a nut, spring washer and washer.

3.4.2 Capacitive Voltage Terminal

Capacitive voltage tap terminal shall be a M6 stud and shall be fitted with a nut, spring washer and washer. The terminal shall have a removal earthing connection to allow for tan-delta testing of the capacitor.

A warning label for the earthing the terminal shall be fixed next to the CVT secondary connection diagram.

3.5 Lifting Facilities

All *Equipment* shall be provided with suitable lifting lugs. Lifting instructions shall be fitted to the outside of the CVT tank showing slinging method and centre of gravity. The label shall be etched on stainless steel.

3.6 Insulating Oil and Containment System

All *Equipment* that has its insulating system sealed from the atmosphere shall allow for expansion with the use of stainless steel bellows and shall incorporate in their design facilities to monitor the condition of the equipment. The facilities shall include pressure release/explosion venting and oil level indication as a minimum. Moisture in the insulating system shall be less than 0.5%. The Vendor shall submit the details of the insulating oil for Horizon Power's approval.

3.6.1 Oil Sampling Valve

An oil sampling valve shall be fitted at the bottom of the oil containment tank.

3.6.2 Oil Level Indication

An oil level indicator shall be fitted on the oil containment tank, providing an acceptable and low level marks. The oil level indicator is to be clearly visible from ground level without the aid of optical devices and be suitably marked to indicate the correct level at 20 ˚C, 40 ˚C and 60 ˚C.

3.7 Painting and Galvanising

All painting and galvanising shall conform to AS/NZS 2312.1 [3] and AS/NZS 4680 [4] respectively. The galvanising coating shall be smooth, clean and of uniform thickness, free from defects.

3.8 Name Plate

Equipment shall be provided with a nameplate incorporating details in accordance with clause 6.13, Table 505 of AS 61869.5 [7]. These details shall be stamped on laser etched stainless steel plate and attached to each tank. The details shall be clearly visible and preferably marked on the housing. The marking shall be permanent, weatherproof and corrosion proof.

The following minimum information shall be provided:

1) Manufacturer's name or trademark, type, and identification;
2) Type designation and arrangement;
3) Serial number and year of manufacture;
4) Rated primary and secondary voltage;
5) Rated frequency;
6) Rated output and corresponding accuracy class;
7) Rated insulation level;
8) Creepage distance (optional);
9) Rated voltage factor and corresponding rated time;
10) Rated capacitance of capacitor divider (C_r), HV capacitor (C_1) & intermediate capacitor (C_2);

11) Number of capacitor units and serial numbers;

12) Temperature range (optional);

13) Weight of Capacitor divider & electromagnetic unit insulation oil;

14) Weight of complete CVT;

15) Standard edition (year); and

16) On *Equipment* with more than one secondary winding, the use of each winding and its corresponding terminals.

4 PACKAGING REQUIREMENTS

The *Equipment* shall be suitably packaged, such that it is "fit for use" at any location in Horizon Power's operational area and specifically include all accessories needed. Packaging shall be capable of preventing damage whilst in storage and during transit to remote locations. The Vendor is required to nominate standard pack quantities and standard packs shall be clearly marked with the following information:

1) Manufacturer's name;

2) Manufacturer's part reference number;

3) Batch Number;

4) Horizon Power Order Number;

5) Horizon Power Stock Number;

6) Equipment description (voltage rating); and

7) Package weight.

Very strong consideration shall be given to appropriate packaging provided with any *Equipment* offered under this specification, with respects to satisfying the "fit for use" criteria mentioned above.

Each shipment shall be provided with box labels stating the part, stock, and contract number as well as the routine test reports.

Each package is to have an identifying bar code and number which identifies as a minimum the:

- Manufacturer's part number;
- Manufacturer;
- Factory of manufacture; and
- Month and year of manufacture.

Note: The vendor is required to identify the cost of providing bar coding as specified in this Section separately from the other cost requirements of this specification.

5 STORAGE

The *Equipment* shall be capable of being stored without deterioration within the temperature range of -10 °C to +45 °C for no less than 24 months.

6 RELIABILITY

Vendors shall provide information on the reliability of the *Equipment* and the performance of the materials offered over an operational life of 50 years under the specified field of application and conditions of service.

Information provided shall evidence the claimed reliability and performance for the *Equipment* offered, including details on Failure Mode and Effect Analysis, carried out in accordance with IEC 60812 [10]. Failure modes should be described; taking cantilever mechanical failure as an example, the failure may be excessive deflection, or brittle fracture. Electrical failure may be material damage such as puncture, polymer degradation, carbonisation, loss of hydrophobicity, etc.

Vendors may offer their standard *Equipment* but any variation to the foregoing standards must be clearly stated in writing at the time of the proposal. The products offered in the standing offer should be equal to or better in quality and performance than the existing items as listed under this Specification.

7 SAFETY

Material Safety Data Sheets (MSDS) applicable for each different *Equipment* or chemical ingredient in the *Equipment* which is considered harmful to personnel or environment in any manner, shall be supplied with the Proposal.

8 ENVIRONMENTAL CONSIDERATIONS

Vendors are required to provide information on the environmental soundness of the design and the materials used in the manufacture of the items offered. Vendors shall provide a detailed outline of the steps that have been put in place to fulfil any obligations that may be required pursuant to the *Waste Avoidance and Resource Recovery Act 2001* and any amendments. In particular:

a) Management of waste reduction;

b) The use of re-usable packing; and

c) Extended producer responsibility for the safe disposal of materials at the end of their life.

9 TESTS

9.1 Test Requirements

The Vendor shall prior to first delivery, complete the design, type, routine, sample and special tests and inspections as required by the relevant Australian or IEC standard.

The passing of such tests does not prejudice the right of Horizon Power to reject the *Equipment* or fitting if it does not comply with this Specification when installed.

Note: A condition of acceptance on imported products shall be completed to perform landing routine and sample tests completed in Australia on each batch imported. In these cases, each batch must obtain a passed landing test in order that the batch acceptance will be reflected on an acceptance list.

9.2 Test Certificates

At the time of submitting the offer on the tender, single copies of test certificates, in English, shall be provided and shall be clearly marked and contain a reference number. If all the required test certificates are not submitted the tender will be rated incomplete and may not be considered.

Electronic copies of type test certificates shall be arranged in the order set out in this Specification and shall be marked clearly with the identifier and description in the contents Section. Any extra test certificates shall be marked with “extra tests” and kept separate from the required test certificates.

All tests required by the relevant Australian or International standards shall be carried out. Test certificates shall be submitted in electronic format and shall be in Adobe Acrobat (.pdf) format.

9.3 Type Tests

The tests are intended to verify the main characteristics and suitability of the design, dimensions, materials, and method of manufacture (technology).

Certified type test results shall be submitted with the Proposal, these type tests shall include those outlined in AS 61869.1 [6] and AS 61869.5 [7]. The Vendor shall, in their evaluation submission, state which tests the *Equipment* have passed.

Table 3: Type Tests

Description	Standard
	AS 61869-1 & AS 61869-5 (Clause/s)
Temperature-rise tests	-1 (7.2.2)
Impulse voltage test on primary terminals	-1 (7.2.3)
Wet test [2]	-1 (7.2.4)
Electromagnetic Compatibility tests	-1 (7.2.5)
Accuracy tests	-5 (7.2.6)
Verification of the degree of protection by enclosure	-1 (7.2.7)
Enclosure tightness test at ambient temperature	-1 (7.2.8)
Pressure test for enclosure	-1 (7.2.9)
Capacitance and tanδ measurement at power frequency	-5 (7.2.501)
Short circuit withstand capacity test	-5 (7.2.502)

[2] The test shall be performed in accordance with IEC 60060.1 [9]

Description	Standard
Ferro-resonance test	-5 (7.2.503)
Transient response test	-5 (7.2.504)
Type test for carrier frequency accessories	-5 (7.2.505)

9.4 Special Tests

Special tests relating to Capacitive Voltage Transformers in accordance with AS 61869.5 [7] shall be completed and submitted during the Tender for consideration by Horizon Power.

Table 5: Type Tests

Description	Standard
	AS 61869-5 (Clause/s)
Transmitted overvoltage test	-5 (7.4.4)
Mechanical Tests	-5 (7.4.5)
Enclosure tightness test at high temperature	-5 (7.4.7)
Corrosion Test	-5 (7.4.9)
Fire Hazard Test	-5 (7.4.10)
Determination of the temperature coefficient (Tc)	-5 (7.4.501)
Tightness design test of capacitor units	-5 (7.4.502)

9.5 Routine Tests

Routine tests are intended to eliminate defective units and shall be carried out during the manufacturing process. Routine tests shall be carried out on every *Equipment* and should not consist of visual examination only, these routine tests shall include those outlined in AS 61869.1 [6] and AS 61869.5 [7].

The Vendor shall supply duly certified copies of the routine tests performed on the *Equipment* to Horizon Power, either prior to or upon delivery.

Table 6: Routine Tests

Description	Standard
	AS 61869-1 & AS 61869-5 (Clause/s)
Power-frequency voltage withstand on primary terminals	-1 (7.3.1)

Description	Standard
Partial discharge measurement	-1 (7.3.2)
Power-frequency voltage withstand between sections	-1 (7.3.3)
Power-frequency voltage withstand on secondary terminals	-1 (7.3.4)
Test for accuracy	-5 (7.3.5)
Verification of terminal markings	-1 (7.3.6)
Enclosure tightness test at ambient temperature	-1 (7.3.7)
Pressure test for enclosure	-1 (7.2.9)
Ferro-resonance check	-5 (7.3.501)
Routine tests carrier frequency accessories	-5 (7.3.502)
Visual Inspection	“Manufacturer’s Standard”

10 DOCUMENTATION AND SAMPLES

10.1 Documentation to be provided with Proposals

Submitted proposals shall provide all documentation and information as requested in this specification, including any further relevant information on the *Equipment* offered. The proposal must be complete in all respects. Failure to comply may cause the proposal to be considered incomplete and hence informal.

The vendor shall provide an electronic version of all documents in Adobe Acrobat (.pdf) format containing the information detailed below with their offer:

- Any non-compliance of the Specification shall be detailed in the Technical Deviation schedule;
- All information provided in Technical Requirements shall be in English and measurement units shall be in metric units;
- Material Safety Data Sheets;
- CAD drawings (Micro station preferred DGN format) of all *Equipment* showing all critical dimensions;
- *Equipment* data sheets showing the weight, material type, protective coatings, mechanical & electrical properties (Combined Load Charts shall be included);
- Installation instructions included in the packaging; and
- A copy of the Vendor’s current Quality Assurance accreditation and category.

Should the preferred vendor submit drawings for approval by Horizon Power, this will in no way exonerate it from being responsible for the correct and proper function of the *Equipment*.

10.2 Service history

Vendors shall state:

- Other Australian electricity supply authorities who have a service history of the items offered; and
- Contact details of those supply authorities who can verify the service performance claimed.

10.3 Training Materials

Training material in the form of drawings, instructions and/or audio-visuals must be provided for the items accepted under the offer.

Vendors shall state the availability of training materials which could include but is not limited to the following topics:

- Handling and storage;
- Application (particularly in areas of heavy coastal pollution);
- Installation;
- Maintenance;
- Environmental performance;
- Electrical performance;
- Mechanical performance;
- Disposal at the end of service life; and
- Production process and testing.

10.4 Samples

Samples of all proposed *Equipment* types are to be provided upon request of Horizon Power as part of the submitted proposals.

11 *EQUIPMENT* LIST AND DESCRIPTION

Table 8: Standard *Equipment* list and descriptions

Specification Item No.	Description
1	CAPACITOR VOLTAGE TRANSFORMER 66kV/√3 // 110/√3, 50HZ, CLASS - * 72.5/140/325kV, 1M-0.2/100VA, 1P-3P/100VA
2	CAPACITOR VOLTAGE TRANSFORMER 132kV/√3 // 110/√3, 50HZ, CLASS - * 145/275/650kV, 1M-0.2/100VA, 1P-3P/100VA
3	CAPACITOR VOLTAGE TRANSFORMER 220kV/√3 // 110/√3, 50HZ, CLASS - * 245/460/1050kV, 1M-0.2/100VA, 1P-3P/100VA
4	CAPACITOR VOLTAGE TRANSFORMER 330kV/√3 // 110/√3, 50HZ, CLASS - * 362/520/1175kV, 1M-0.2/100VA, 1P-3P/100VA

APPENDIX A REVISION INFORMATION

(Informative) Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification of errors or queries.

Each Standard makes use of its own comment sheet which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet found in **DM# 40584982** can be used to record any errors or queries found in or pertaining to this standard. This comment sheet will be referred to each time the standard is updated.

Date	Rev No.	Notes
26/05/2023	1	Initial Document Creation

APPENDIX B QUALITY ASSURANCE (TO BE COMPLETED BY STORES)

DOCUMENT NUMBER	HPC-8DJ-25-0002-2022		**QUALITY ASSURANCE**	**DM NUMBER**	
DEVICE DESCRIPTION	**LABEL MATERIAL NO.**		**EQUIPMENT PURCHASE**	**ASSET OWNER**	
	ASSET ID/ STOCK NO				
MANUFACTURER		**DIMENSION**			

ITEM	OPERATION/EQUIPMENT/FACILITY	DOCUMENT REF.	WHO CHECKS	INITIAL	DATE/ TIME	QUALITY ASSURANCE CRITERIA	PASS Y/N	COMMENTS
1	LABELLING							
1.1	Name of Manufacturer					*******		
1.2	Manufacturer's part reference number					*******		
1.3	Horizon Power Order Number					*******		
1.4	Horizon Power Stock Number					*******		
1.5	Voltage Transformer description					*******		
1.6	Package Weight					*******		
2	CONTENTS							
2.1	Installation Instructions					Clear, Legible and in English		
2.2	Bill of Materials					Clear, Legible and in English		
2.3	Material Safety Data Sheets (if required)					Clear, Legible and in English of all materials		
2.4	Accessories (if required)					As per Bill of Materials		

ITEM	OPERATION/EQUIPMENT/FACILITY	DOCUMENT REF.	WHO CHECKS	INITIAL	DATE/ TIME	QUALITY ASSURANCE CRITERIA	PASS Y/N	COMMENTS
2.5	Test and Inspection Reports					As per Standards referenced in the specification.		
3	PACKAGING							
3.1	Suitably stacked and secured on pallet					Packages suitably packed and prevented from coming loose		
3.2	Physical damage					Packages do not show puncture marks or other signs of damage		
3.3	Voltage Transformer/s in suitable packaging					Strong enough to prevent mechanical damage		
3.4	Packaging clearly labelled					Each package easily identifiable		
3.5	Items Individually Marked					Items clearly designated and marked		

SYMBOLS AND ABBREVIATIONS								
H = HOLD POINT	S = SUPERVISOR							
W = WITNESS POINT	T = TECHNICIAN, EL = ELECTRICIAN	REVISION						
V = VERIFICATION POINT	E = ENGINEER	DATE						
S/C = SUBCONTRACTOR	PM = PROJECT MANAGER	APPROVED BY						

APPENDIX C SCHEDULES A & B: ENQUIRY DOCUMENT

C1 Technical Schedules

Completion of the listed schedules below by the vendor shall indicate the product offered is fully compliant with the nominated Clauses in this specification. All information provided shall be in English and measurement units shall be in metric units.

Any deviation from the specification shall be listed on the "Technical Deviation Schedule C", provided in Appendix D with motivation to Horizon Power for consideration and written approval.

C2 Technical Requirements

Schedule A: Purchaser's specific requirements.

Schedule B: Particulars of *Equipment* to be supplied.

C2.1 Technical Schedules A and B for 66 kV Capacitor Voltage Transformers

HORIZON POWER	**SPECIFICATION ENQUIRY**	**HPC-8DJ-25-0002-2022**
	VENDOR'S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 1: 66 kV Capacitor Voltage Transformer

SCHEDULE A: Horizon Power's specific requirements
SCHEDULE B: Particulars of equipment to be supplied (to be completed by Vendor)

Item	Sub-clause	Description		Schedule A	Schedule B
1.		Manufacturer/ vendor of Capacitor Voltage Transformer		xxxxxx	
2.		Manufacturer's/ vendor's catalogue number		xxxxxx	
3.		Manufacturer's/ vendor's drawing number		xxxxxx	
4.	3.3.1	Electrical Requirements			
4.1		Rated voltage	kV	$66/\sqrt{3}$	
4.2		Max. system voltage	kV	72.5	
4.3		Lightning impulse withstand	kV	325	
4.4		Power frequency withstand	kV	140	
4.5		Switching impulse withstand	kV_{Peak}	N/A	
4.6		System frequency	Hz	50	
4.7		System neutral earthing conditions		effective earth	
4.8		RIV level @ 1.1 $U_m/\sqrt{3}$	µV	≤2500	

Item	Sub-clause	Description	Schedule A	Schedule B
4.9		Voltage factor	1.9/30 s	
4.10		Thermal limit	≥100 VA	
4.11		Measurement winding	*****	
4.12		Measurement voltage V	110/√3	
4.13		Measurement class and burden	0.2/100 VA	
4.14		Protection winding	*****	
4.15		Protection voltage V	110/√3	
4.16		Protection class and burden	3P/100 VA	
5.	3.3.2	Mechanical Requirements		
5.1		CVT design Type	Top Core	
5.2		Insulator type	Polymer/ Composite	
5.3		Minimum creepage distance mm	≥2232	
5.4		Static withstand load N	≥2500	
5.5		Dynamic withstand load N	*****	
5.6		Weight kg	*****	
5.7		Primary terminals	Aluminium	
5.8		Secondary terminal box	IP54	
5.9		Secondary terminals	M6 studs	
5.10		Capacitive voltage tap	Yes	

C2.2 Technical Schedules A and B for 132 kV Capacitor Voltage Transformers

HORIZON POWER	**SPECIFICATION ENQUIRY**	**HPC-8DJ-25-0002-2022**
	VENDOR'S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 2: 132 kV Capacitor Voltage Transformer

SCHEDULE A: Horizon Power's specific requirements
SCHEDULE B: Particulars of equipment to be supplied (to be completed by Vendor)

Item	Sub-clause	Description		Schedule A	Schedule B
1.		Manufacturer/ vendor of Capacitor Voltage Transformer		xxxxxx	
2.		Manufacturer's/ vendor's catalogue number		xxxxxx	
3.		Manufacturer's/ vendor's drawing number		xxxxxx	
4.	3.3.1	Electrical Requirements			
4.1		Rated voltage	kV	132/√3	
4.2		Max. system voltage	kV	145	
4.3		Lightning impulse withstand	kV	650	
4.4		Power frequency withstand	kV	275	
4.5		Switching impulse withstand	kV_{Peak}	N/A	
4.6		System frequency	Hz	50	
4.7		System neutral earthing conditions		effective earth	
4.8		RIV level @ 1.1 $U_m/\sqrt{3}$	µV	≤2500	
4.9		Voltage factor		1.9/30 s	
4.10		Thermal limit		≥100 VA	
4.11		Measurement winding		*****	
4.12		Measurement voltage	V	110/√3	
4.13		Measurement class and burden		0.2/100 VA	
4.14		Protection winding		*****	
4.15		Protection voltage	V	110/√3	
4.16		Protection class and burden		3P/100 VA	
5.	3.3.2	Mechanical Requirements			
5.1		CVT design Type		Top Core	
5.2		Insulator type		Polymer/ Composite	
5.3		Minimum creepage distance	mm	≥4495	
5.4		Static withstand load	N	≥3000	
5.5		Dynamic withstand load	N	*****	
5.6		Weight	kg	*****	

Item	Sub-clause	Description	Schedule A	Schedule B
5.7		Primary terminals	Aluminium	
5.8		Secondary terminal box	IP54	
5.9		Secondary terminals	M6 studs	
5.10		Capacitive voltage tap	Yes	

C2.3 Technical Schedules A and B for 220 kV Capacitor Voltage Transformers

HORIZON POWER	**SPECIFICATION ENQUIRY**	**HPC-8DJ-25-0002-2022**
	VENDOR'S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 3: 220 kV Capacitor Voltage Transformer

SCHEDULE A: Horizon Power's specific requirements
SCHEDULE B: Particulars of equipment to be supplied (to be completed by Vendor)

Item	Sub-clause	Description		Schedule A	Schedule B
1.		Manufacturer/ vendor of Capacitor Voltage Transformer		xxxxxx	
2.		Manufacturer's/ vendor's catalogue number		xxxxxx	
3.		Manufacturer's/ vendor's drawing number		xxxxxx	
4.	3.3.1	Electrical Requirements			
4.1		Rated voltage	kV	220/$\sqrt{3}$	
4.2		Max. system voltage	kV	245	
4.3		Lightning impulse withstand	kV	1050	
4.4		Power frequency withstand	kV	460	
4.5		Switching impulse withstand	kV_{Peak}	N/A	
4.6		System frequency	Hz	50	
4.7		System neutral earthing conditions		effective earth	
4.8		RIV level @ 1.1 $U_m/\sqrt{3}$	µV	≤2500	
4.9		Voltage factor		1.9/30 s	
4.10		Thermal limit		≥100 VA	

Item	Sub-clause	Description	Schedule A	Schedule B
4.11		Measurement winding	*****	
4.12		Measurement voltage V	110/√3	
4.13		Measurement class and burden	0.2/100 VA	
4.14		Protection winding	*****	
4.15		Protection voltage V	110/√3	
4.16		Protection class and burden	3P/100 VA	
5.	3.3.2	Mechanical Requirements		
5.1		CVT design Type	Top Core	
5.2		Insulator type	Polymer/ Composite	
5.3		Minimum creepage distance mm	≥7595	
5.4		Static withstand load N	≥4000	
5.5		Dynamic withstand load N	*****	
5.6		Weight kg	*****	
5.7		Primary terminals	Aluminium	
5.8		Secondary terminal box	IP54	
5.9		Secondary terminals	M6 studs	
5.10		Capacitive voltage tap	Yes	

C2.4 Technical Schedules A and B for 330 kV Capacitor Voltage Transformers

HORIZON POWER	**SPECIFICATION ENQUIRY**	**HPC-8DJ-25-0002-2022**
	VENDOR'S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 3: 330 kV Capacitor Voltage Transformer

SCHEDULE A: Horizon Power's specific requirements
SCHEDULE B: Particulars of equipment to be supplied (to be completed by Vendor)

Item	Sub-clause	Description	Schedule A	Schedule B
1.		Manufacturer/ vendor of Capacitor Voltage Transformer	xxxxxx	

Item	Sub-clause	Description	Schedule A	Schedule B
2.		Manufacturer's/ vendor's catalogue number	xxxxxx	
3.		Manufacturer's/ vendor's drawing number	xxxxxx	
4.	3.3.1	Electrical Requirements		
4.1		Rated voltage kV	330/√3	
4.2		Max. system voltage kV	362	
4.3		Lightning impulse withstand kV	1175	
4.4		Power frequency withstand kV	520	
4.5		Switching impulse withstand kV_{Peak}	950	
4.6		System frequency Hz	50	
4.7		System neutral earthing conditions	effective earth	
4.8		RIV level @ 1.1 $U_m/\sqrt{3}$ µV	≤2500	
4.9		Voltage factor	1.9/30 s	
4.10		Thermal limit	≥100 VA	
4.11		Measurement winding	*****	
4.12		Measurement voltage V	110/√3	
4.13		Measurement class and burden	0.2/100 VA	
4.14		Protection winding	*****	
4.15		Protection voltage V	110/√3	
4.16		Protection class and burden	3P/100 VA	
5.	3.3.2	Mechanical Requirements		
5.1		CVT design Type	Top Core	
5.2		Insulator type	Polymer/ Composite	
5.3		Minimum creepage distance mm	≥11222	
5.4		Static withstand load N	≥4000	
5.5		Dynamic withstand load N	*****	
5.6		Weight kg	*****	
5.7		Primary terminals	Aluminium	

Item	Sub-clause	Description	Schedule A	Schedule B
5.8		Secondary terminal box	IP54	
5.9		Secondary terminals	M6 studs	
5.10		Capacitive voltage tap	Yes	

APPENDIX D TECHNICAL SCHEDULE C: COMPLIANCE DOCUMENT

The Vendor shall indicate below whether this offer is fully compliant with the nominated clause in this Specification. A YES shall ONLY be indicated if the offer is 100% compliant with the relevant Clause. If NO is indicated and supporting documents are submitted, then mark the ATT box with the attachment number. Details of departure shall be provided in Schedule D Appendix E.

CLAUSE NUMBER		YES	NO	ATT.
3	Requirements			
3.1	General	☐	☐	
3.2	Environmental Conditions	☐	☐	
3.3	Technical Requirements			
3.3.1	*Electrical Requirements*	☐	☐	
3.3.2	*Mechanical Requirements*	☐	☐	
3.3.3	*Mounting Requirements*	☐	☐	
3.3.4	*Primary Terminals*	☐	☐	
3.4	Terminal Box	☐	☐	
3.4.1	*Secondary Terminals*	☐	☐	
3.4.2	*Capacitive Voltage Terminal*	☐	☐	
3.5	Lifting Facilities	☐	☐	
3.6	Insulating Oil and Containment System	☐	☐	
3.6.1	*Oil Sampling Valve*	☐	☐	
3.6.2	*Oil Level Indication*	☐	☐	
3.7	Painting and Galvanising	☐	☐	
3.8	Name Plate	☐	☐	
4	Packaging Requirements	☐	☐	
5	Storage	☐	☐	
6	Reliability	☐	☐	
7	Safety	☐	☐	
8	Environmental Considerations	☐	☐	
9	Tests			
9.1	Test Requirements	☐	☐	
9.2	Test Certificates	☐	☐	
9.3	Type Tests	☐	☐	
9.4	Special Test	☐	☐	
9.5	Routine Tests	☐	☐	
10	Documentation and Samples			

CLAUSE NUMBER		YES	NO	ATT.
10.1	Documentation to be provided with Proposals	☐	☐	
10.2	Service history	☐	☐	
10.3	Training Materials	☐	☐	
10.4	Samples	☐	☐	

APPENDIX E SCHEDULE D: DEPARTURES FROM TECHNICAL SPECIFICATION

The Vendor shall nominate the Clause and describe the departure:

CLAUSE NO.	DEPARTURE