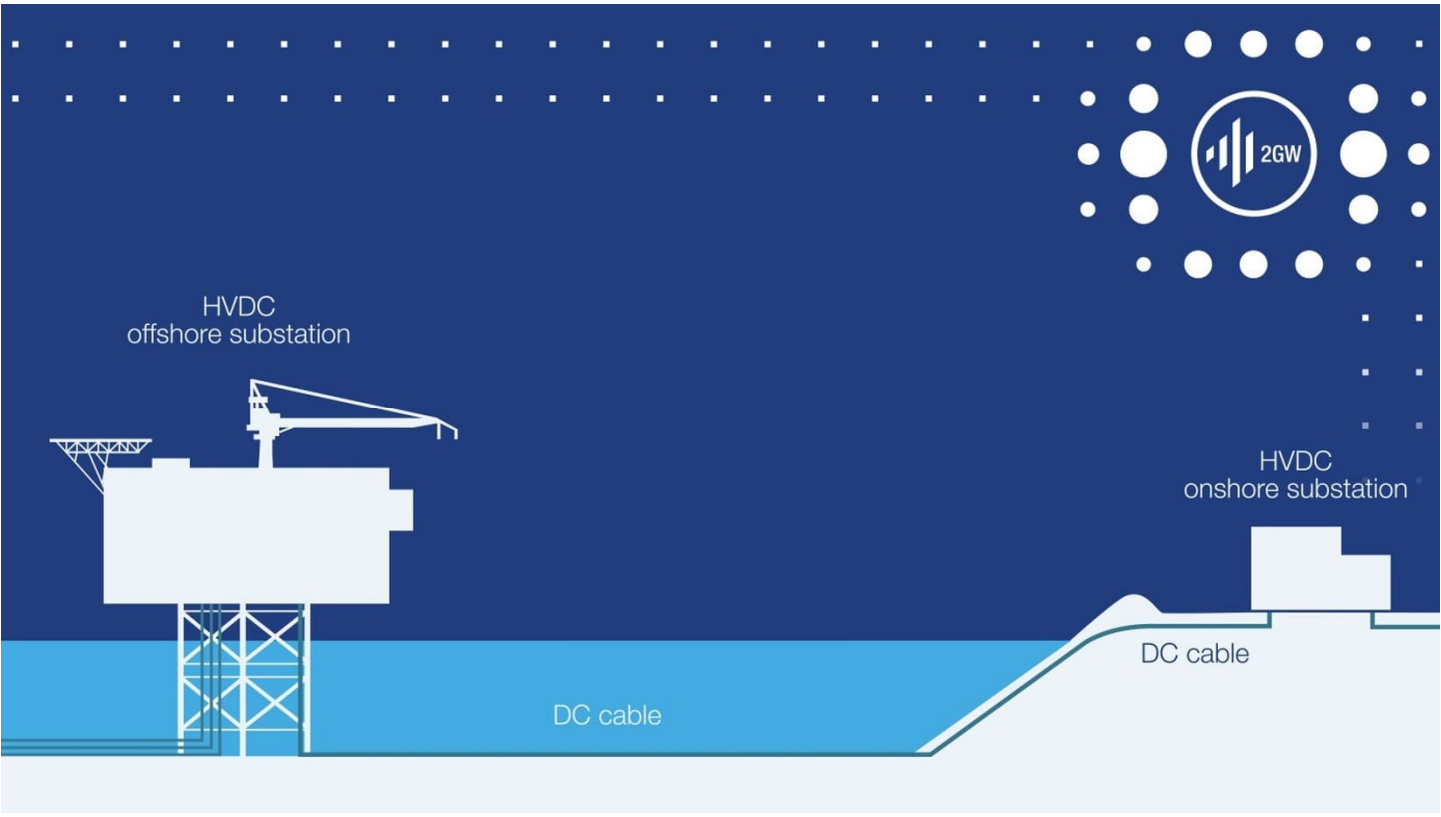



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TenneT Offshore 2GW

AIS Instrument Transformer






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Legend

Applicability	
Icon	Applicability
	DE
	Generic
	NL

1 Introduction

1.1 Purpose of this document

This document defines the Employer's Requirements for the AIS Instrument Transformer. The document is part of a set of Employer's Requirements specifying a 2GW Grid Connection System (GCS) and should be read in conjunction with the other Employer's requirements. The Employer's Requirements in this document are selected and reported from the requirements database based on applicability to the AIS Instrument Transformer.

The structure of this document and the whole of Employer's Requirements is explained in document SCM.01.015-2GW - General Contract documents structure.

Figure 1 gives a general overview of the structure of this document within the set of Employer's Requirements.

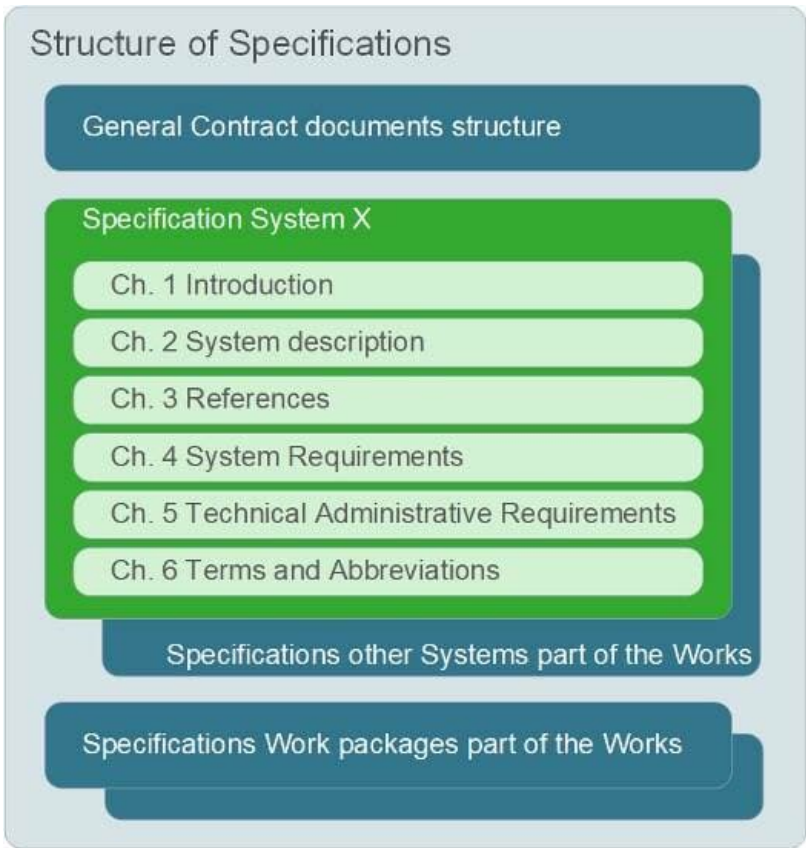



Figure 1: Structure of the Requirements Specification

1.2 Scope

The scope of this document concerns the Employer's Requirements of the AIS Instrument Transformer, the green marked System as shown in the System Breakdown Structure (SBS) of the GCS in the figure below. The parent requirements of this System can be found in the Specification of the parent System. The complete SBS is shown in document SPE.00.003-2GW - System Breakdown Structure.

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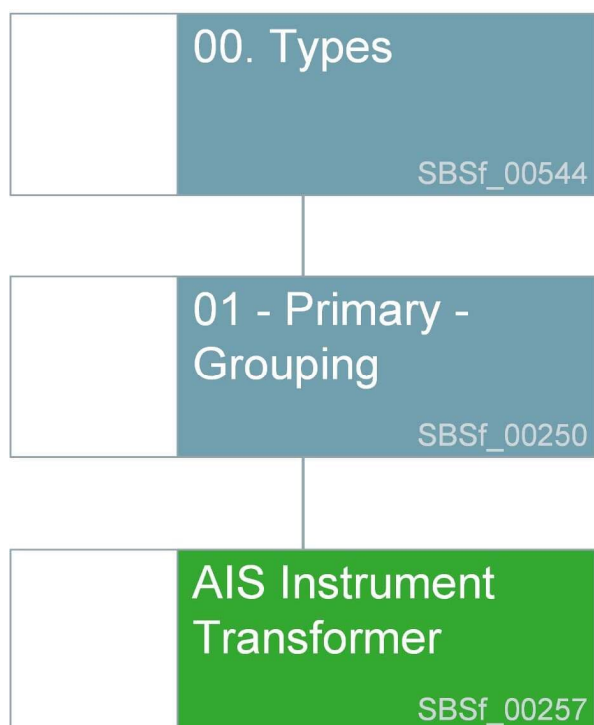



Figure 2 Position of AIS Instrument Transformer in System Breakdown

1.3 Document structure

This document contains the chapters with the following content:

- Chapter 2 illustrates the functions, systems/objects and interfaces within the scope of the System.
- Chapter 3 gives an overview of the applicable documents for the System.
- Chapter 4 describes the System Requirements that apply to the System, classified by functional requirements, aspect requirements, interface requirements and design constraints.
- Chapter 5 describes the Administrative Requirements specific allocated/applicable to the System.
- Chapter 6 gives an overview of all the Terms and Abbreviations mentioned in this document.

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2 System description

This chapter describes the AIS Instrument Transformer, it's functions, underlying systems with definitions, boundaries and interfaces, and the environment it operates in as part of the GCS.

2.1 Functional Breakdown and definitions

The Functions of the AIS Instrument Transformer as specified in this document are derived from the Functional Breakdown Structure (FBS) for the GCS. These Functions are based on functional analyses performed by Employer. The complete FBS is shown in document SPE.00.002-2GW - Functional Breakdown Structure.

The Functions of the AIS Instrument Transformer as specified in this document are listed and defined in the table below.

FBSs	Function	Description
FBSs_00349	Measure electrical quantities	Measure the electrical characteristics (U,I,Φ, ripple...).

Table 1: Functional Breakdown Structure (FBS) of the System.

2.2 System Breakdown and definitions

In the table below the Systems are defined which are part this Specification.

Code	System	Description
Type		
SBSf_00257	AIS Instrument Transformer	The AIS Instrument Transformer is a current and voltage measuring device used to transform currents and voltages of the primary system to the required values of the secondary system (C&P).

Table 2: Definition of Systems within the scope of AIS Instrument Transformer.

2.3 System context - Interfaces


Interface requirements have not been specified (yet). Part of the engineering management requirements is that the Contractor shall complete the specifications and shall perform among others interface analyses.

2.4 Function Allocation

The Function Allocation matrix below shows how the functions are linked to the AIS Instrument Transformer.

FBSs	Function	SBSf	System
FBSs_00349	Measure electrical quantities	SBSf_00020	AC Yard Grid Side (offshore)
		SBSf_00257	AIS Instrument Transformer
		SBSf_00571	AIS RC Voltage Divider
		SBSf_00129	GIS
		SBSf_00869	GIS Current transformer
		SBSf_00871	GIS RC Voltage Divider
		SBSf_00870	GIS Voltage transformer

Table 3: Function allocation AIS Instrument Transformer Functions and Systems.

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3 References

The following documents are referenced in the requirement text as Applicable Document.
















Code		Document number	Title	Annex
DOC-02815		DIN 42601	Messwandler für 50 Hz, U _m ab 72,5 kV und darüber - Grundanforderungen	No
DOC-02805		DIN 42603	Instrument transformers; rating plates	No
DOC_01597		DIN 46011	Erdungsanschlußpunkte in Schaltanlagen mit Bemessungsspannungen ab 52 kV; Hauptmaße, Zuordnung - Earthing terminals for substations with rated voltages of 52 kV and higher; principal dimensions, coordination	No
DOC-02748		DIN 46206-3	Anschlüsse für elektrische Betriebsmittel; Flachanschlüsse für Geräte ab 52 kV; Hauptmaße, Zuordnung	No
DOC-02823		DIN 46320	Corrosion resistant nickel plated brass with integrated strain relief	No
DOC_00404		DIN EN ISO 9001	Quality management systems - Requirements. EN ISO 9001:2015	No
DOC-02816		IEC 60695	Fire hazard testing	No
DOC_01550		IEC 61462	Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V - Definitions, test methods, acceptance criteria and design recommendations	No
DOC_02000		IEC 61869	Instrument transformers	No
DOC_00834		IEC 61869-2	Instrument transformers - Part 2: Additional requirements for current transformers	No
DOC_00835		IEC 62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear	No
DOC_00626		ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	No
DOC_02282		PMO.08.005-2GW-MA	Reference Designation Specification	Yes
DOC_01932		SPE.01.085-2GW-A01	Instrument Transformer Datasheet	Yes

Table 4: Applicable documents referred to in this Specification.


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4 System requirements


This chapter specifies all the relevant system requirements for the AIS Instrument Transformer.

4.1 - AIS Instrument Transformer



Function: FBSs_00349 - Measure electrical quantities



SRS_06055.3 - Current and voltage value accuracy	Parent: SRS_00010.1
 The AIS Instrument Transformer shall provide the secondary current and voltage values in relation to the primary value at the accuracy level required within the limits necessary for the intended purpose and in a suitable manner for the connected secondary equipment.	
Verification plan	Verification phase
Proposal by Contractor	E2 - Design




Aspect: Reliability

SRS_11905.2 - Withstand short-time current	Parent: SRS_06055.3
 The AIS Instrument Transformer shall be suitable for a short-time current duration of minimum 1 second.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


Aspect: Maintainability

SRS_06054.3 - Readability of display device values	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have a display device, the values of which can be clearly read from ground level without additional aids.	
 Explanation: In case of oil-filled equipment, the display device corresponds to oil-level indicator. In case of gas-filled equipment, the display device corresponds to density monitor.	
Verification plan	Verification phase
Proposal by Contractor	E3 - Manufacturing

SRS_12017.1 - Rating plate design	Parent: SRS_12020.4
 The AIS Instrument Transformer shall have labels or plates with sufficiently rounded corners.	
 Explanation: Inscription of signs by means of an embossed stamp is not permitted.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_12020.4 - Rating plate particularity	Parent: SRS_00005.1
 The AIS Instrument Transformer shall have a rating plate with particulars according to [applicable document].	
Applicable document(s):  DOC-02805 - DIN 42603  DOC_00834 - IEC 61869-2	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_12011.1 - Rating plate switching signs	Parent: SRS_12020.4
---	----------------------------

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 The AIS Instrument Transformer shall have switching signs (on the lid inside the connection box) and the earth sign in accordance with [applicable document].

Applicable document(s):

 DOC_01597 - DIN 46011


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_12010.1 - Rating plate readability	Parent: SRS_12020.4
---	----------------------------

 The AIS Instrument Transformer shall have a rating plate with a size large enough that the contents are readable when the component is placed at a height of 3 meter.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11994.2 - Circuit diagram of secondary terminal box	Parent: SRS_11973.2
--	----------------------------

 The AIS Instrument Transformer shall provide an easily readable circuit diagram on the inside of the lid of the secondary terminal box.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11993.2 - Option to seal secondary terminal boxes	Parent: SRS_11973.2
--	----------------------------

 The AIS Instrument Transformer shall have the option to seal the secondary terminal boxes, if it is used for metering purpose.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11992.2 - Links and bridges in secondary terminal box	Parent: SRS_11973.2
--	----------------------------

 The AIS Instrument Transformer shall be provided with the required connection links/bridges for the short circuiting of unused secondary circuits in the secondary terminal box, if it is a conventional IT for current measurement.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11982.2 - Labels of secondary terminal box	Parent: SRS_11973.2
---	----------------------------

 The AIS Instrument Transformer shall have labels with durable signage on all terminals, connection points and earthing points.


Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11979.2 - Warning plate of secondary terminal box	Parent: SRS_11973.2
--	----------------------------

 The AIS Instrument Transformer shall be equipped with a warning plate in the secondary terminal box displaying the following text:
- Current transformer: "WARNING! Connect loads to secondary windings or short-circuit them before putting into service!"
- Voltage transformers: "WARNING! Never short circuit secondary terminals."


Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11978.3 - Tan-delta-measurement tap	Parent: SRS_06055.3
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 The AIS Instrument Transformer shall be equipped with a measurement tap to perform a tan-Δ measurements, if it is an oil insulated AIS Instrument Transformer.


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SRS_11974.2 - Space in secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that provides sufficient space for easy installation of signalling cables.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_11973.2 - Characteristics of secondary terminal box	Parent: SRS_00010.1
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that is free from welding residues, sharp edges and burrs, to prevent damage the insulation of cables and wires risk of injury of the user.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11970.2 - Equipment attachment	Parent: SRS_00010.1
 The AIS Instrument Transformer equipment attachment takes place according to [applicable document] corresponding to the assigned voltage level, if the AIS Instrument Transformer is installed in the AC Yard Grid Side (onshore).	
Applicable document(s):  DOC-02815 - DIN 42601	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11962.2 - Primary connections	Parent: SRS_11904.2
 The AIS Instrument Transformer shall hold/contain all conducting and fastening material, regardless of the set primary ratio, to prevent the loss of critical parts, if the unit is primary reconnectable.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11961.2 - Primary connections with standard tools	Parent: SRS_11904.2
 The AIS Instrument Transformer shall be primary reconnectable on site with standard tools, if the unit is primary reconnectable.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11960.2 - Fixed positions of primary connections	Parent: SRS_11904.2
 The AIS Instrument Transformer shall have fixed positions for the primary connections regardless of the selected ratio, if the unit is primary reconnectable.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11954.2 - Terminal markings of AIS Instrument Transformer	Parent: SRS_11982.2
 The AIS Instrument Transformer shall have terminal markings in accordance to clause 6.13 of [applicable document].	
Applicable document(s):  DOC_00834 - IEC 61869-2	
Verification plan	Verification phase
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SRS_11952.2 - Valve with earth potential	Parent: SRS_11951.2
 The AIS Instrument Transformer shall have a valve with earth potential, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11951.2 - Valve to removal oil samples	Parent: SRS_11949.2
 The AIS Instrument Transformer shall be equipped with a valve for the removal of oil samples, located at the base of the AIS Instrument Transformer, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11949.2 - Oil expansion component	Parent: SRS_00005.1
 The AIS Instrument Transformer shall be equipped with a component for oil expansion made out of stainless steel, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11948.2 - Hermetical seal	Parent: SRS_11926.2
 The AIS Instrument Transformer shall be hermetically sealed, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11947.2 - Water pollution class	Parent: SRS_11951.2
 The AIS Instrument Transformer shall have a maximum water pollution class of the oil of WPC 1, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11945.2 - Oil paper insulation	Parent: SRS_11949.2
 The AIS Instrument Transformer shall have oil+paper insulation, if it is an oil filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11944.2 - Localization of breaking plate	Parent: SRS_12449.3
 The AIS Instrument Transformer shall have a breaking plate on the upper surface of the head, to allow a vertical upward blast direction, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11942.2 - Lifetime absorption filter	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have an adsorption filter that lasts for the complete estimated lifetime, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11939.2 - Density monitor with adsorption filter	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor with an adsorption filter (MOS filter), to keep the gas dry, if it is a gas filled unit.	


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SRS_11938.2 - Density monitor connected by a DILO valve	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor connected by a DILO valve with coupling plug DN 8 and has a fixed and an adjustable contact, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11937.2 - Density monitor with gas pressure	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor with the gas pressure displayed in MPa overload pressure at 20 °C, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11936.2 - Installation of density monitor	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor with a display that installed in an appropriate angle (i.e. 40° ~ 50°), to be easy readable from ground level, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11935.2 - Status of the gas density of density monitor	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor designed as a temperature compensating manometer with colour-labelled areas, which allows easy recognition of the respective status of the gas density, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11934.2 - Weather conditions	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor that is indifferent to weather conditions (e. g. direct sunlight), if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11933.2 - Test compound of density monitor	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor equipped with a test compound to test the density monitor without dismantling, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11932.2 - Characteristics of gas monitoring device	Parent: SRS_00005.1
 The AIS Instrument Transformer shall have a gas monitoring device that has an optical display and electrical contacts (changeover contact / alternative contact), if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11931.2 - Density monitor for gas monitoring	Parent: SRS_11932.2
 The AIS Instrument Transformer shall have a density monitor for gas monitoring, fitted to the base of the component, if	



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it is a gas filled unit.


Verification plan	Verification phase
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SRS_11929.2 - Gas filling valve	Parent: SRS_11653.2
 The AIS Instrument Transformer shall have a gas filling valve with gas seal and corrosion resistant protective cap and connection DILO valve DN 20 at the base of the component, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11928.2 - Leakage rate	Parent: SRS_11937.2
 The AIS Instrument Transformer shall have a leakage rate as low as possible, with a guaranteed gas leakage rate less than 0.5% per year, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11927.2 - Testing and minimum requirements	Parent: SRS_00005.1
 The AIS Instrument Transformer shall have an insulator tested according to [applicable document] and minimum requirements for application in the field of transformer manufacturing.	
Applicable document(s):  DOC_01550 - IEC 61462	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11926.2 - Insulating material of insulator	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have an insulator with insulating material only covering the glass-fibre reinforced plastic.	
 Explanation: Not covering the encasement material	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_11925.2 - High voltage diffusion and dielectric strength	Parent: SRS_11924.2
 The AIS Instrument Transformer shall have an insulator and designed for a high voltage diffusion and dielectric strength HD 2.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11922.2 - Insulator's high voltage creepage resistance	Parent: SRS_11926.2
 The AIS Instrument Transformer shall have an insulator with a high voltage creepage resistance HCR > 3.5 according to [applicable document].	
Applicable document(s):  DOC_01550 - IEC 61462	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11921.2 - Silicone rubber coating	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have a silicone rubber coating with a nominal thickness of at least 3 mm, using a durable chemical bond.	


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SRS_11919.2 - Insulator's siloxane content	Parent: SRS_11926.2
 The AIS Instrument Transformer shall have an insulator with siloxane content constitute at least 30%.	
 Explanation: EPDM are not permissible.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11916.2 - Secondary terminal box of AIS Instrument Transformer	Parent: SRS_11973.2
 The AIS Instrument Transformer shall have the one secondary terminal box for the secondary outputs of both the current cores and voltage windings, if it is a combined transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11915.2 - Size of secondary box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall have a sufficiently large secondary box.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11907.2 - Characteristics of bolts and screws	Parent: SRS_11973.2
 The AIS Instrument Transformer shall have bolts and screws that are not sticking out more than 2 or 3 windings/threads.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11943.2 - Dew point temperature	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have a dew point temperature that does not jeopardize the reliable operation of the AIS Instrument Transformer in all temperature ranges, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_12012.2 - Rating plate highest test values	Parent: SRS_12020.4
 The AIS Instrument Transformer shall have a rating plate displaying the highest test values to which the component is tested with type tests.	
 Explanation: A devaluation of the tested values is not allowed. This applies to the:	
<ul style="list-style-type: none"> - Short circuit withstand capability - Thermal long time current - Discharge capability 	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11984.2 - Movements of lids on secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box of which the lids can rotate sideways, fold downwards or be forward detachable.	
Verification plan	Verification phase
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SRS_11983.2 - Reachability of lids on secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box, of which the lid(s) must not, when open, extend into the high voltage area around the AIS Instrument Transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11981.3 - Earthing bar of secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box containing an earthing bar, enabling the earthing of all secondary interface terminals, of the tanδ measuring (terminal M) and of the earth screens of the secondary cables.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11971.3 - Lifting hooks of AIS Instrument Transformer	Parent: SRS_00005.1
 The AIS Instrument Transformer shall be equipped with lifting hooks at the head and the base of the component.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11963.2 - Reconnection variations	Parent: SRS_00005.1
 The AIS Instrument Transformer shall be equipped with a sign or sketch showing the reconnection variations fitted in the vicinity of each primary switching, if the unit is primary reconnectable.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11930.2 - Replenishment of AIS Instrument Transformer	Parent: SRS_11941.2
 The AIS Instrument Transformer shall be suitable to be filled with gas without removal of the density monitor, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11991.3 - Replacement of secondary terminal box	Parent: SRS_00005.1
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that is replaceable on site.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_11980.3 - Design of secondary terminal box to discard heating	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box, suitably designed with opening(s) for ventilation and exhaust and with insect protection filter(s) of corrosion resistant metal, so that heating is not necessary.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



Aspect: Safety, Health and Environment


SRS_11653.2 - AIS Instrument Transformer contact surface	Parent: SRS_00021.1
 The AIS Instrument Transformer contact surface for earthing shall be bare (free of paint) over an area of at least 110 mm x 60 mm.	
Verification plan	Verification phase



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SRS_11652.2 - AIS Instrument Transformer earthing connection	Parent: SRS_12449.3
 The AIS Instrument Transformer earthing connection according to [applicable document] shall provide two holes for M12-diameter screws in a distance of 60mm (centre to centre).	
Applicable document(s):  DOC_01597 - DIN 46011	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11651.1 - AIS Instrument Transformer earthing symbol	Parent: SRS_11652.2
 The AIS Instrument Transformer earthing symbol according to [applicable document], cl. 5.3 shall be applied to every connection surface.	
Applicable document(s):  DOC_00835 - IEC 62271-1	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11908.2 - Waterproof parts	Parent: SRS_12449.3
 The AIS Instrument Transformer shall have parts that are waterproof (e.g. imbus screws).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11965.2 - Earthing connections	Parent: SRS_11652.2
 The AIS Instrument Transformer shall be equipped with earthing connections according to [applicable document], suitable for the rated short time thermal current.	
Applicable document(s):  DOC_01597 - DIN 46011	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11964.2 - Number and location of earthing connections	Parent: SRS_11965.2
 The AIS Instrument Transformer shall be equipped with two earthing connections at the component base, placed at diagonally opposites, according to [applicable document].	
Applicable document(s):  DOC_01597 - DIN 46011	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11941.2 - Security of density monitor	Parent: SRS_00021.1
 The AIS Instrument Transformer shall have a density monitor that is sufficiently secured against shifting, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11920.2 - Protection of AIS Instrument Transformer	Parent: SRS_00009.1
 The AIS Instrument Transformer shall be equipped with glass-fibre reinforced plastic (GFRP), coated for protection against environmental influences (UV radiation, pollution and humidity).	


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Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_11998.2 - Earthing wire of AIS Instrument Transformer	Parent: SRS_00021.1
 The AIS Instrument Transformer shall be equipped with an earthing wire between the earthing bar and the M10 bolt on the gland plate.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11959.2 - Rounded primary terminals	Parent: SRS_00021.1
 The AIS Instrument Transformer shall have primary connections with sufficiently rounded corners ($\geq R10$) in order to avoid the corona effect, if the unit is primary reconnectable.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



Aspect: Security


SRS_12928.1 - Prohibition of Wireless Capabilities for Primary Components	Parent: SRS_08241.4
 The primary components shall not have wireless capabilities for communication with other systems nor for configuration purposes (e.g. NFC, Wifi), (no use of shared media – electromagnetic fields).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



Design Decision: DD-387 - Standard choice, AIS Instrument Transformer design


SRS_12003.2 - Attenuation characteristics	Parent: SRS_00021.1
 The AIS Instrument Transformer shall have attenuation characteristics with primary short circuits (transient conditions) and single phase relaxation oscillations (ferromagnetic resonance) are according to [applicable document], if it is an inductive voltage transformer.	
Applicable document(s):  DOC_02000 - IEC 61869	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11924.2 - High voltage arc resistance	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have an insulator and designed for a high voltage arc resistance HAR 3.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11923.2 - Combustibility classification	Parent: SRS_11927.2
 The AIS Instrument Transformer shall have an insulator and designed with a combustibility classification FV0 according to [applicable document].	
Applicable document(s):  DOC-02816 - IEC 60695	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


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SRS_11904.2 - Characteristic of primary connection		Parent: SRS_11959.2
 The AIS Instrument Transformer's primary connections shall be electrically and mechanically suitable for the specified short circuit current.		
 Explanation: In particular to be considered for voltage transformers when installed in the current-carrying path.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	



SRS_11906.2 - Sharp edges and corners		Parent: SRS_11927.2
 The AIS Instrument Transformer shall be free of sharp edges and corners.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	


SRS_12007.1 - Discharge capability of inductive voltage transformers		Parent: SRS_06055.3
 The AIS Instrument Transformer shall be able to withstand the discharge energy from cables and overhead circuits with a capacitance of 8 mF for inductive voltage transformers installed in the AC yard grid side.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	


SRS_12006.2 - Stationary oscillations		Parent: SRS_06055.3
 The AIS Instrument Transformer shall be free of stationary relaxation oscillations through suitable dimensioning, if it is a voltage transformer.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	

SRS_12004.1 - Resonances with grading capacitors of circuit breakers		Parent: SRS_06055.3
 The AIS Instrument Transformer shall not be stimulated to relaxation oscillations with their control capacitors when the respective circuit breaker is opened, if it is a voltage transformer installed next to a circuit breaker with grading capacitors.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	

SRS_11996.2 - Glands in secondary terminal box		Parent: SRS_11995.2
 The AIS Instrument Transformer shall be equipped with the amount and size of the glands according to agreement between Contractor and Employer during design phase.		
 Explanation: Basically to be designed with one gland per cable with size M25 or M32.		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	


SRS_11995.2 - Aluminium gland plate of secondary terminal box		Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box, which contains an aluminium gland plate of appropriate thickness and glands according to [applicable document].		
Applicable document(s):  DOC-02823 - DIN 46320		
Verification plan	Verification phase	
Proposal by Contractor	E - Execution	


SRS_11990.2 - Vertical load on secondary terminal box		Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box, designed in such a way that it can		


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withstand a vertical load of 100 kg without damaging the component or its parts.


Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11989.2 - Manufacturing of secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that is free of casting resin.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11988.2 - Design of secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that is constructively designed in such a way that its assembly or potential disassembly is possible without touching (opening) the insulation area (gas, oil).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11987.2 - Attachment secondary terminal box to transformer base	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box, which is attached to the transformer base in such a way that sufficient clearance is guaranteed for cable lead in.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11986.2 - Earthing of lids on secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box of which the lids are to be earthed with flexible Cu wire (minimum cross section 4 mm², labelled green/yellow) for galvanic connection.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11985.2 - Equipment of lids on secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box of which the lids are to be equipped with non-detachable locking screws (no wing screws) or knobs (turning knobs or star knobs), not lockable (without lock).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11976.2 - Water protection of secondary terminal box	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with a secondary terminal box that is well ventilated, free of condensation and protected against water ingress (protection class IP54).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11977.3 - Connection of secondary terminal box to secondary wires	Parent: SRS_11973.2
 The AIS Instrument Transformer shall be equipped with secondary terminals which are suitable for the connection of secondary wires from 4 mm² to 16 mm² cross section, if the AIS Instrument Transformer is connected analogue by cables to the secondary systems.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11972.2 - Material of secondary terminal box	Parent: SRS_11973.2
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 The AIS Instrument Transformer shall be equipped with a solid secondary terminal box made of metal.

Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11958.2 - Flat connection terminals	Parent: SRS_11904.2
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 The AIS Instrument Transformer shall be equipped with flat connection terminals according to [applicable document].

Applicable document(s):

 DOC-02748 - DIN 46206-3

Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11957.2 - Aluminum primary connections	Parent: SRS_11904.2
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 The AIS Instrument Transformer shall have aluminium primary connections.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11956.2 - Horizontally placed primary connections	Parent: SRS_11960.2
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 The AIS Instrument Transformer shall be equipped with horizontally placed primary connections.


Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_12374.2 - Connection between terminal and metal parts	Parent: SRS_11904.2
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 The AIS Instrument Transformer shall have an terminal P2 (line side) connected to the metal parts of the top housing.

Verification plan	Verification phase
Proposal by Contractor	E2 - Design

SRS_11918.2 - Silicone rubber insulators	Parent: SRS_12449.3
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 The AIS Instrument Transformer shall be equiped with silicone rubber insulators.

 **Explanation:** Room temperature vulcanized RTV or high temperature vulcanized HTV or liquid silicone rubber LSR.


Verification plan	Verification phase
Proposal by Contractor	E2 - Design

SRS_11912.2 - Inductive voltage transforming type	Parent: SRS_06055.3
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 The AIS Instrument Transformer shall be of the inductive voltage transforming type, if it is a combined transformer.


Verification plan	Verification phase
Proposal by Contractor	E2 - Design

SRS_11911.2 - Combi-transformer head type design	Parent: SRS_11927.2
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 The AIS Instrument Transformer shall be of the head type design for the current transforming part and a pot core design for the voltage transforming part, if it is a combined transformer.

Verification plan	Verification phase
Proposal by Contractor	E2 - Design


SRS_11910.2 - Capacitive voltage transformer construction	Parent: SRS_11989.2
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 The AIS Instrument Transformer shall be constructed with an inductive element if it is a capacitive voltage transformer.


Verification plan	Verification phase
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Proposal by Contractor	E2 - Design
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SRS_11909.2 - Current transformers construction	Parent: SRS_11989.2
 The AIS Instrument Transformer shall be of the head type, if it is an oil filled current transformer.	
Verification plan	Verification phase
Proposal by Contractor	E2 - Design



SRS_12002.2 - Continuous current in VT winding	Parent: SRS_12000.2
 The AIS Instrument Transformer shall have windings, for both metering and protection, that are suitable of conducting at least 70 A continuously, if it is an inductive voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_12001.2 - Predetermined breaking point	Parent: SRS_00005.1
 The AIS Instrument Transformer shall have predetermined breaking points with a limited cross section to protect the windings from thermal overloading, if it is an inductive voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_12000.2 - Short-circuit current on VT windings	Parent: SRS_00005.1
 The AIS Instrument Transformer shall have windings that are suitable of withstanding terminal short circuits, if it is an inductive voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

SRS_11999.2 - VT windings without fuses	Parent: SRS_12000.2
 The AIS Instrument Transformer shall be free from fuses in the winding circuit(s), if it is an inductive voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11955.2 - Insulated terminal of primary connections	Parent: SRS_11926.2
 The AIS Instrument Transformer shall have an insulated terminal P1 (busbar side).	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



SRS_11917.2 - Insulator's shape	Parent: SRS_11955.2
 The AIS Instrument Transformer shall have an insulator with alternating or normal shape.	
 Explanation: Helical shape is not permitted.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


SRS_11913.2 - Voltage connection	Parent: SRS_06055.3
 The AIS Instrument Transformer shall have the voltage connection A (U) connected with the current connection P2 (L) and joined to A/P2 if it is a combined transformer.	
 Explanation: In the event of a commutation this is to be carried out on the primary side.	
Verification plan	Verification phase

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Proposal by Contractor	E - Execution
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SRS_12448.3 - Measures to prevent animal nesting		Parent: SRS_00010.1
 The AIS Instrument Transformer measures shall prevent that birds or small animals built their nest in recesses and cavities of the equipment.		
Verification plan		Verification phase
Proposal by Contractor	E - Execution	

SRS_12449.3 - Measures to prevent explosive detonation		Parent: SRS_00021.1
 The AIS Instrument Transformer's measures shall ensure that the equipment is free of explosive detonation according to [applicable document] in case of a pressure overload.		
Applicable document(s):  DOC_02000 - IEC 61869		
Verification plan		Verification phase
Proposal by Contractor	E - Execution	

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5 Technical administrative requirements

This chapter specifies the Administrative Requirements that specifically apply to the AIS Instrument Transformer. These 'technical' Administrative Requirements are specified in addition to and should always be read in conjunction with the general Administrative Requirements.

Each chapter describes the technical administrative requirements for the activities and deliverables part of the work package.

The following work packages are included:



Work Package
ST_WP_g2.17.1.05 - AIS Instrument Transformer



5.1 - ST_WP_g2.17.1.05 - AIS Instrument Transformer


Activities
ST_Act_0499 - Design - AIS Instrument Transformer
ST_Act_3011 - Manufacturing - AIS Instrument Transformer
ST_Act_3039 - Construction and Installation - AIS Instrument Transformer
ST_Act_0938 - Commissioning - AIS Instrument Transformer
ST_Act_0895 - Operation & Maintenance and Spare Parts - AIS Instrument Transformer
ST_Act_0839 - Documentation - AIS Instrument Transformer
ST_Act_1227 - Reference Designation - AIS Instrument Transformer

Deliverables
ST_Del_2500 - Special test report - AIS Instrument Transformer
ST_Del_1175 - As-Built Package - AIS Instrument Transformer

ST_Act_0499 - Design - AIS Instrument Transformer


ADM_11649.2 - Design testing to prevent explosive detonation	Parent: ADM_03941.1
 The Contractor shall perform special tests according to [applicable document] chapter 6.9 and 7.4.6 to demonstrate, that AIS Instrument Transformer measures are design to prevent an explosive detonation in case of a pressure overload.	
Applicable document(s):  DOC_02000 - IEC 61869	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11647.3 - Operation conditions and technical data	Parent: ADM_11649.2
 The Contractor shall design the AIS Instrument Transformer based on the technical data mentioned in the datasheet template according to [applicable document].	
Applicable document(s):  DOC_01932 - SPE.01.085-2GW-A01	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


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ST_Act_3011 - Manufacturing - AIS Instrument Transformer

ADM_04181.2 - Test standards	Parent: ADM_11649.2
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 The Contractor shall perform as a minimum all type tests and special tests on the AIS Instrument Transformer according to [applicable document].

Applicable document(s):

 DOC_02000 - IEC 61869


Verification plan	Verification phase
Test: The Contractor shall demonstrate that no relaxation oscillations occur when one of the circuit breakers is opened by both calculation and also in the test laboratory, for all referred voltages and capacitor ranges and combinations, if it concerns a voltage transformer installed next to a circuit breaker with grading capacitors.	E - Execution

ADM_11658.1 - Demonstrate function of 'predetermined breaking point'	Parent: ADM_04181.2
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 The Contractor shall demonstrate the function of the 'predetermined breaking point' for acceptance, if it is a voltage transformer.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11659.1 - Voltage test of AIS Instrument Transformer	Parent: ADM_04181.2
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 The Contractor shall test the AIS Instrument Transformer with the voltage (operational voltage) in the range from 0.9 to 1.5 $U_n/\sqrt{3}$, if it is a voltage transformer next to a circuit breaker with grading capacitor.

Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11679.1 - Testing of AIS Instrument Transformer	Parent: ADM_04181.2
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 The Contractor shall test the AIS Instrument Transformer strictly according to [applicable document], unless stated otherwise in the requirements of the specification.

Applicable document(s):


 DOC_02000 - IEC 61869

Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11696.2 - Routine Test	Parent: ADM_04181.2
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 The Contractor shall conduct a strictly routine testing of the AIS Instrument Transformer according to [applicable document], unless otherwise stated in the requirements.

Applicable document(s):

 DOC_02000 - IEC 61869


Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11700.2 - Routine test of capacitive voltage transformers	Parent: ADM_11696.2
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 The Contractor shall test the AIS Instrument Transformer as completely assembled, that is to say, consisting of capacitive and inductive components, if it is a capacitive voltage transformer.

Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11701.2 - Routine test of internal resistance of windings	Parent: ADM_11696.2
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	Employer's Requirements Specifications	Siemens / Dragados SPE.01.085-2GW
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 The Contractor shall test the internal resistance of all windings during routine testing and enter the values in the test protocols with temperature specification and at a temperature of 20°C.


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11703.2 - Measurement points in the routine test protocol	Parent: ADM_11696.2
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 The Contractor shall enter all measurement points in the routine test protocols.

Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11704.2 - Testing sequence and criteria for partial discharge measurements	Parent: ADM_11724.2
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 The Contractor shall apply the following testing sequence and criteria for partial discharge measurements during routine testing (and FAT):

- a) Basic disturbance level $\leq 2\text{pC}$
- b) PD not measurable up to $1.1 \times U_m / \sqrt{3}$ (that is to say: less than basic disturbance level)
- c) PD onset and break off at $> 1.1 \times U_m / \sqrt{3}$
- d) $\leq 5\text{ pC}$ with $1.2 \times U_m / \sqrt{3}$
- e) $\leq 10\text{ pC}$ with $1.2 \times U_m$
- f) $\leq 50\text{ pC}$ with test alternating voltage


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11710.2 - Partial discharge test	Parent: ADM_11724.2
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 The Contractor shall perform a partial discharge test with the test voltage $1.2 \times U_m / \sqrt{3}$ and maximum partial discharge level $\leq 5\text{ pC}$, after each of the required impulse voltage testing a) to d).


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11711.3 - Factory acceptance test (FAT)	Parent: ADM_11696.2
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 The Contractor shall perform repeated routine test (FAT) if requested by the Employer.

Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11718.1 - Standards for type test	Parent: ADM_11649.2
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 The Contractor shall perform a strictly type test of the AIS Instrument Transformer according to [applicable document] standards and the STL guideline, unless otherwise agreed upon.

Applicable document(s):


 DOC_02000 - IEC 61869


Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11721.2 - Specific setup or configuration approval	Parent: ADM_11718.1
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 The Contractor shall request by the Employer approval for any specific setup or configuration, in case this is needed in preparation of the type testing.



Verification plan	Verification phase
Proposal by Contractor	E - Execution

	Employer's Requirements Specifications	Siemens / Dragados SPE.01.085-2GW
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ADM_11722.2 - Predetermined breaking point	Parent: ADM_04181.2
 The Contractor shall perform type tests of the AIS Instrument Transformer to prove compliance to all requirements related to predetermined breaking point.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11723.1 - Ferromagnetic resonance test	Parent: ADM_11718.1
 The Contractor shall perform a type test of the AIS Instrument Transformer to prove compliance to all requirements related to ferromagnetic resonance.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11724.2 - Discharge capability of inductive voltage transformers	Parent: ADM_11718.1
 The Contractor shall perform a type test of the AIS Instrument Transformer for discharge capability 8 consecutive times, according to the test description provided by the Employer during project execution.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



ADM_11725.3 - Quality assurance system	Parent: ADM_02056.2
 The Contractor shall provide proof of a continuous quality assurance system according to [applicable document], that guarantees a continuous safeguarding of the consistency of the product properties requested by the user and assured by the manufacturer, unless otherwise agreed upon.	
Applicable document(s):  DOC_00404 - DIN EN ISO 9001	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ST_Act_3039 - Construction and Installation - AIS Instrument Transformer

ADM_11734.2 - Take-back of used gas cylinders	Parent: ADM_11649.2
 The Contractor shall take back the gas cylinders and residual content immediately after the first filling of the component, if gas is applied.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11735.2 - Delivery and packaging information	Parent: ADM_03665.3
 The Contractor shall note specific information on the delivery container or individual packaging, if requested by the Employer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ST_Act_0938 - Commissioning - AIS Instrument Transformer



ADM_04181.2 - Test standards	Parent: ADM_11649.2
 The Contractor shall perform as a minimum all type tests and special tests on the AIS Instrument Transformer according to [applicable document].	
Applicable document(s):  DOC_02000 - IEC 61869	
Verification plan	Verification phase



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Test: The Contractor shall demonstrate that no relaxation oscillations occur when one of the circuit breakers is opened by both calculation and also in the test laboratory, for all referred voltages and capacitor ranges and combinations, if it concerns a voltage transformer installed next to a circuit breaker with grading capacitors.	E - Execution
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ADM_11658.1 - Demonstrate function of 'predetermined breaking point'	Parent: ADM_04181.2
 The Contractor shall demonstrate the function of the 'predetermined breaking point' for acceptance, if it is a voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11659.1 - Voltage test of AIS Instrument Transformer	Parent: ADM_04181.2
 The Contractor shall test the AIS Instrument Transformer with the voltage (operational voltage) in the range from 0.9 to 1.5 $U_n/\sqrt{3}$, if it is a voltage transformer next to a circuit breaker with grading capacitor.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11679.1 - Testing of AIS Instrument Transformer	Parent: ADM_04181.2
 The Contractor shall test the AIS Instrument Transformer strictly according to [applicable document], unless stated otherwise in the requirements of the specification.	
Applicable document(s):  DOC_02000 - IEC 61869	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11696.2 - Routine Test	Parent: ADM_04181.2
 The Contractor shall conduct a strictly routine testing of the AIS Instrument Transformer according to [applicable document], unless otherwise stated in the requirements.	
Applicable document(s):  DOC_02000 - IEC 61869	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11700.2 - Routine test of capacitive voltage transformers	Parent: ADM_11696.2
 The Contractor shall test the AIS Instrument Transformer as completely assembled, that is to say, consisting of capacitive and inductive components, if it is a capacitive voltage transformer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11701.2 - Routine test of internal resistance of windings	Parent: ADM_11696.2
 The Contractor shall test the internal resistance of all windings during routine testing and enter the values in the test protocols with temperature specification and at a temperature of 20°C.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11703.2 - Measurement points in the routine test protocol	Parent: ADM_11696.2
 The Contractor shall enter all measurement points in the routine test protocols.	

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Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11704.2 - Testing sequence and criteria for partial discharge measurements	Parent: ADM_11724.2
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 The Contractor shall apply the following testing sequence and criteria for partial discharge measurements during routine testing (and FAT):

- a) Basic disturbance level $\leq 2\text{pC}$
- b) PD not measurable up to $1.1 \times U_m / \sqrt{3}$ (that is to say: less than basic disturbance level)
- c) PD onset and break off at $> 1.1 \times U_m / \sqrt{3}$
- d) $\leq 5\text{ pC}$ with $1.2 \times U_m / \sqrt{3}$
- e) $\leq 10\text{ pC}$ with $1.2 \times U_m$
- f) $\leq 50\text{ pC}$ with test alternating voltage


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11708.1 - Lightning impulse withstand test	Parent: ADM_11649.2
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 The Contractor shall perform lightning impulse withstand tests on (at least) every 15th device, if it is an oil-paper insulated component.

Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11709.1 - Lightning impulse voltage test	Parent: ADM_11649.2
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 The Contractor shall perform additional lightning impulse withstand tests as routine testing on the primary windings as follows, if it is a gas filled component:

- a) 1 full impulse with rated withstand lightning impulse voltage with negative polarity,
- b) 2 chopped impulses with a peak value of 115 % of the full rated withstand lightning impulse voltage with negative polarity,
- c) 2 full impulses with rated withstand lightning impulse voltage with negative polarity,
- d) 3 full impulses with rated withstand lightning impulse voltage with positive polarity


Verification plan	Verification phase
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ADM_11710.2 - Partial discharge test	Parent: ADM_11724.2
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 The Contractor shall perform a partial discharge test with the test voltage $1.2 \times U_m / \sqrt{3}$ and maximum partial discharge level $\leq 5\text{ pC}$, after each of the required impulse voltage testing a) to d).


Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11711.3 - Factory acceptance test (FAT)	Parent: ADM_11696.2
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 The Contractor shall perform repeated routine test (FAT) if requested by the Employer.

Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11718.1 - Standards for type test	Parent: ADM_11649.2
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 The Contractor shall perform a strictly type test of the AIS Instrument Transformer according to [applicable document] standards and the STL guideline, unless otherwise agreed upon.


Applicable document(s):


 DOC_02000 - IEC 61869


Verification plan	Verification phase
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ADM_11721.2 - Specific setup or configuration approval	Parent: ADM_11718.1
 The Contractor shall request by the Employer approval for any specific setup or configuration, in case this is needed in preparation of the type testing.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11722.2 - Predetermined breaking point	Parent: ADM_04181.2
 The Contractor shall perform type tests of the AIS Instrument Transformer to prove compliance to all requirements related to predetermined breaking point.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11723.1 - Ferromagnetic resonance test	Parent: ADM_11718.1
 The Contractor shall perform a type test of the AIS Instrument Transformer to prove compliance to all requirements related to ferromagnetic resonance.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11724.2 - Discharge capability of inductive voltage transformers	Parent: ADM_11718.1
 The Contractor shall perform a type test of the AIS Instrument Transformer for discharge capability 8 consecutive times, according to the test description provided by the Employer during project execution.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11725.3 - Quality assurance system	Parent: ADM_02056.2
 The Contractor shall provide proof of a continuous quality assurance system according to [applicable document], that guarantees a continuous safeguarding of the consistency of the product properties requested by the user and assured by the manufacturer, unless otherwise agreed upon.	
Applicable document(s):  DOC_00404 - DIN EN ISO 9001	
Verification plan	Verification phase
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ADM_12146.2 - Laboratory type testing	Parent: ADM_11718.1
 The Contractor shall perform AIS Instrument Transformer type tests with an accredited laboratory according to [applicable document].	
Applicable document(s):  DOC_00626 - ISO/IEC 17025	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ST_Act_0895 - Operation & Maintenance and Spare Parts - AIS Instrument Transformer


ADM_02056.2 - Spare part scope	Parent: ADM_02473.4
 The Contractor shall deliver the following minimum scope of the spare parts, including the required fixing material, for each type and design used: - AIS Instrument Transformer: 1 unit (1-phase) per type used and design	


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ADM_11657.2 - Storage of AIS Instrument Transformer parts	Parent: ADM_02056.2
 The Contractor shall store the AIS Instrument Transformer parts together.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ST_Act_0839 - Documentation - AIS Instrument Transformer


ADM_03665.3 - Documentation provision	Parent: ADM_11647.3
 The Contractor shall hand over a complete AIS Instrument Transformer pass.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11651.2 - Chemical properties and insulator manufacturer information provision	Parent: ADM_03665.3
 The Contractor shall provide all information regarding the chemical properties (tensile strength, shore hardness, dielectric strength, creepage resistance, etc.) and insulator manufacturer if requested, according to the table presented.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11655.1 - Gas applications and handling information provision	Parent: ADM_03665.3
 The Contractor shall provide relevant information on gas applications and handling in the transformer's pass documentation, if it is a gas filled unit.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



ADM_11662.2 - QA certificate provision	Parent: ADM_03665.3
 The Contractor shall provide a copy of a valid QA certificate for the manufacturing site according to [applicable document], if requested by the Employer.	
 Explanation: The certification authority must be accredited by "Deutsche Akkreditierungsstelle" (DAkkS) or another agency that is a member of the "European co-operation for Accreditation" (EA).	
Applicable document(s):  DOC_00404 - DIN EN ISO 9001	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11663.1 - Regular monitoring prove	Parent: ADM_03665.3
 The Contractor shall provide a copy of the QA certificate and prove regular monitoring by the certification authority, if requested by the Employer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11664.1 - VDE mark approval prove	Parent: ADM_03665.3
 The Contractor shall prove valid VDE mark approval, if applicable and requested by the Employer.	
Verification plan	Verification phase
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ADM_11665.2 - Type certification reports provision	Parent: ADM_03665.3
 The Contractor shall provide type certification reports for designs that do not carry the VDE mark (the certification authority must be accredited by "Deutsche Akkreditierungsstelle" (DAkkS) or audited and recognized by "VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V." or "RvA Raad voor Accreditatie"), if requested by the Employer.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11666.1 - Type test provision	Parent: ADM_03665.3
 The Contractor shall provide all type tests to be performed by laboratories that are [applicable document] accredited.	
Applicable document(s):	
 DOC_00626 - ISO/IEC 17025	
Verification plan	Verification phase
Proposal by Contractor	E - Execution



ADM_11677.1 - AIS Instrument Transformer pass provision	Parent: ADM_03665.3
 The Contractor shall provide a paper copy of the transformer pass, protected against humidity, in the secondary terminal box, to have the information available on site.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11705.1 - Partial discharge requirements provision	Parent: ADM_03665.3
 The Contractor shall enter the background noise level, the actual measured partial discharge values in combination with the applied testing voltages values and the values for PD onset and offset in the routine test protocols.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11650.2 - Test documents of insulator	Parent: ADM_03665.3
 The Contractor shall provide all test documents of the insulator(s) if requested.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution

ADM_11695.2 - Routine test results	Parent: ADM_11696.2
 The Contractor shall provide all routine test results in one report per (single) component.	
Verification plan	Verification phase
Proposal by Contractor	E - Execution


ST_Act_1227 - Reference Designation - AIS Instrument Transformer

ADM_07199.11 - Reference designation	Parent: ADM_05221.3
 The Contractor shall provide all systems with Reference designation according to [Applicable document].	
Applicable document(s):	
 DOC_02282 - PMO.08.005-2GW-MA	
Verification plan	Verification phase
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ST_Del_2500 - Special test report - AIS Instrument Transformer

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ADM_11719.2 - Additional type test of special tests	Parent: ADM_11718.1
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 The AIS Instrument Transformer shall be type tested, in addition to the standard type test list of IEC, for the following special tests:

- a. Chopped impulse voltage withstand test on primary terminals
- b. Multiple chopped impulse test on primary terminals
- c. Measurement of capacitance and dielectric dissipation factor
- d. Transmitted overvoltage test
- e. Mechanical tests
- f. Internal arc fault test
- g. Enclosure tightness test at low and high temperatures
- h. Gas dew point test
- i. Corrosion test
- j. Fire hazard test

Verification plan	Verification phase
Proposal by Contractor	E - Execution


ADM_11720.2 - Type Test 3	Parent: ADM_11718.1
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 The AIS Instrument Transformer shall be type tested to prove compliance to all requirements related to 'Discharge capability', if the component is of the type 'Inductive voltage transformer'.

Verification plan	Verification phase
Proposal by Contractor	E - Execution


ST_Del_1175 - As-Built Package - AIS Instrument Transformer

ADM_02473.4 - HV components O&M manual content	Parent: ADM_00683.2
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 The HV components O&M manual for every single device shall at least include:

- Device type and serial number on the title page
- Functional description
- Technical data sheet
- As-built dimensional drawings incl. nameplate
- Part lists
- Circuit diagram of low voltage part (if applicable)
- FAT and SAT protocols
- Information on transport and storage
- Commissioning instructions
- Assembly instructions
- Maintenance instruction with description of activities and recommended intervals
- Replacement instructions

Verification plan	Verification phase
Document review	E - Execution

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6 Terms and Abbreviations

A complete list of all Terms and Abbreviations in the contract is included in: SPE.00.700-2GW. A subset of Terms and Abbreviations used in this document is listed below:

Abbreviation	Term	Description
ARS	Administrative Requirement Specification	Document that describes administrative requirements that apply to one or more activities or deliverables as defined in work packages in the Work Breakdown.
DAkKS	Deutsche Akkreditierungsstelle	Abbreviation of "Deutsche Akkreditierungsstelle".
EA	European co-operation for Accreditation	Abbreviation of "European co-operation for Accreditation".
FAT	Factory Acceptance Test	The Factory Acceptance Test (FAT) is a process that evaluates the equipment or system element during and after the assembly or manufacturing process by verifying that it is built and operating in accordance with design and interface specifications.
FBS	Functional Breakdown Structure	Hierarchical structure of functions that visualises all the subfunctions that are needed to fulfil the basic function of the considered system at multiple levels of detail. The FBS is based on the functional analysis of the system.
GCS	Grid Connection System	The umbrella term for all installations used for the transmission of electrical energy between the network connection terminal of an Offshore Windfarm and the grid connection point using the transmission network including landstation and subsea cables.
HTV	High Temperature Vulcanizing	High-temperature-vulcanizing (HTV) elastomers of higher viscosity.
HV	High Voltage	Electrical power with voltage higher than 1000 V AC or 1500 V DC.
HVDC	High Voltage Direct Current	High voltage direct current, a well-proven technology used to transmit electricity over long distances by overhead transmission lines or submarine cables. It is also used to interconnect separate power systems, where traditional alternating current (AC) connections cannot be used.
LSR	Liquid Silicone Rubber	Liquid silicones are characterised by very short vulcanisation times.
O&M	Operation & Maintenance	
QA	Quality Assurance	Quality assurance (QA) is a way of preventing mistakes and defects in manufactured products.
RvA	Raad voor Accreditatie	RvA primary task consists of accrediting and renewing the accreditations of conformity-assessment bodies: laboratories, inspection bodies, certification bodies and verification bodies.
RTV	Room Temperature Vulcanizing	Type of silicone rubber that cures at room temperature.
SPE	Specification	Document that describes system requirements and/or administrative requirements that apply to one or more Systems and/or Work Packages.
SBS	System Breakdown Structure	Hierarchical structure of systems that visualises all the parts (systems, subsystems, components) that the considered 'system of interest' consists of at multiple levels of detail. The SBS is the breakdown structure chosen to fulfill the required functions as stated in the FBS and is further described in document SPE.00.003-2GW - System Breakdown Structure.
SE	Systems Engineering	Systems Engineering is a method for developing successful systems that meet the customer needs; it is an interdisciplinary,

		well-structured way of working throughout the entire life cycle, that at any time makes explicit and traceable how a system meets the demands of the stakeholders
VDE	Verband der Elektrotechnik Elektronik Informationstechnik e. V.	German Association for Electrical, Electronic & Information Technologies.
WP	Work Package	A group of related activities and deliverables organized to achieve one or more stated goals.