Base Load Power Hub (BLPH)

Technical Specification, IDS and DDS for 6.6kV Switchgear

Document Number: 123A90-DDL-EL-SP-20019

Document Class: 2

01	03/05/2024	Accepted for construction (AFC)	GPA	LMA/AMA	MDO
00	27/10/2023	Issue for Review (IFR)	DSF	CB/AMA	OYFO/MDO
Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

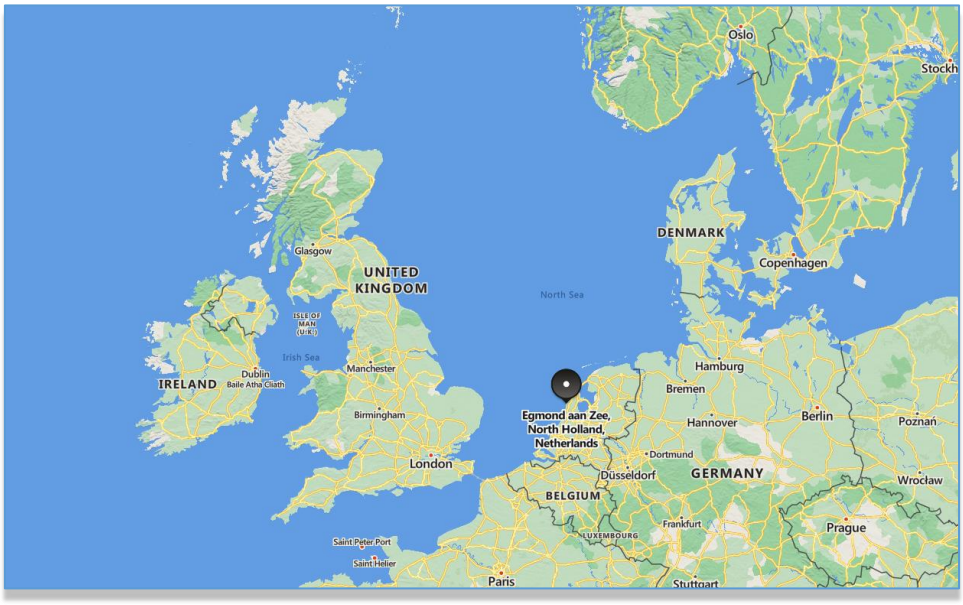


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

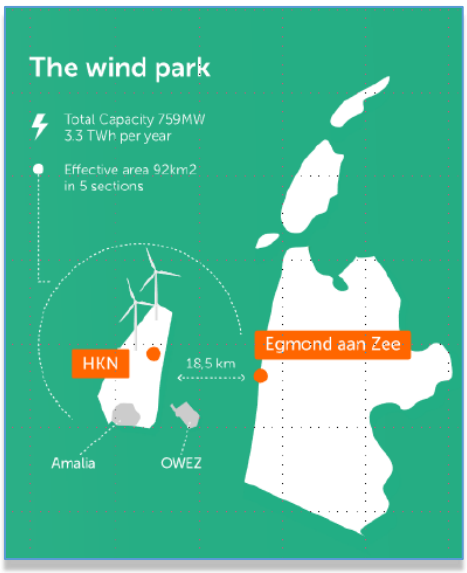


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

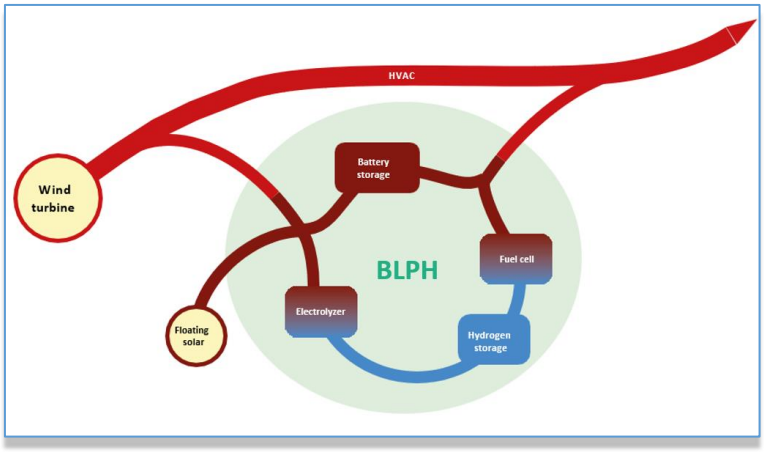


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

This specification covers the general criteria, the scope of work and minimum requirement for the design, material selection, construction, supply, inspection, testing, documentation and preparation for shipment of for the 6.6 kV Switchgear. Technical requirements of this specification are based upon considerations to performance, and functionality.

As attachment of this specification and related to the tests and documentation, are include the "Inspection Data Sheet" and the "Document Data Sheet".

Any failure by the VENDOR to take exception to any part of this specification in the initial bid proposal shall indicate complete compliance to the specification.

It shall be the VENDOR's responsibility to be, or to become, knowledgeable of the requirements of the standards and codes referenced in section 4.

The switchgear manufacturing shall follow the International Association of Oil and Gas Producers (IOGP) "Supplementary Specification to IEC 62271-200 for High-voltage Switchgear and Controlgear" attached in the Annex-II, as well as the specifications indicated in the following chapters of this document.

Related to the quality assurance and test shall be apply the "Quality Requirements High-voltage Switchgear Controlgear (IEC)" attached in Annex-III, which for the project purpose will be known as "Inspection Data Sheet".

The Documents that shall be supply along with the technical proposal and during the manufacturing phase are indicated in the document "Information Requirements for Information Requirements for High-voltage Switchgear and Controlgear (IEC)", attached in Annex-IV, which for the project purpose will be known as "Documents Data Sheet".

2.1 REFERENCES

Doc. No.	Description
123A90-DDL-EL-DS-20020	Technical Data Sheet (TDS) for 6.6kV Switchgear
123A90-DDL-EL-DG-20014	Electrical Control, Protection and Metering Diagrams
123A90-DDL-EL-DG-20016	Electrical Single Line Diagram 6.6 kV System
S-620	Supplementary Specification to IEC 62271-200 for High-voltage Switchgear and Controlgear
S-620Q	Quality Requirements for High-voltage Switchgear and Controlgear (IEC) – IDS (Inspection Data sheet)
S-620L	Information Requirements for High-voltage Switchgear and High-voltage Switchgear – DDS (Document data sheet)

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.

PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
INSPECTION AUTHORITY :	The organization representing the Owner or Vendor /Contractor that verifies that the equipment and facilities have been designed, constructed, inspected and tested in accordance with the requirements of this specification and the Purchase Order/Contract.
INSPECTOR:	A qualified individual representing the Owner, Vendor/Contractor or the assigned Inspection Authority, who verifies that the equipment and facilities have been designed, constructed, inspected and tested in accordance with the requirements of this specification and the Purchase Order/Contract.
VENDOR:	IMESA SPA
IOGP:	International Association of Oil and Gas Producers
IDS:	Inspection Data Sheet
DDS:	Document Data Sheet

Table 2 - Definitions and Abbreviations

3 GENERAL CONDITIONS

3.1 LANGUAGE

All correspondence, engineering documents and manuals shall be in the English language.

4 APPLICABLE CODES AND STANDARDS

The following documents list shall constitute an integral part of this specification.

IEC - International Electrotechnical Committee (latest edition shall be applied).

- IEC 62271-1 High High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear
- IEC 62271-200 High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

- IEC 62271-102 High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches
- IEC 62271-100 High-voltage switchgear and controlgear - Part 100: Alternating-current circuit-breakers
- IEC 62271-106 High-voltage switchgear and controlgear - Part 106: Alternating current contactors, contactor-based controllers and motor-starters
- IEC 60265-1 High-voltage switches - Part 1: Switches for rated voltages above 1 kV and less than 52 kV
- IEC 60439 Low Voltage Switchgear and Controlgear Assemblies
- IEC 61850 Communication networks and systems for power utility automation
- IEC 60445 Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
- IEC 60529 Degree of Protection provided by Enclosures (IP Code)
- IEC 60038 IEC standard voltages
- IEC 60044-7 Instrument transformers - Part 7: Electronic voltage transformer
- IEC 60044-8 Instrument transformers - Part 8: Electronic current transformers
- DEP 33.67.51.31 High-voltage switchgear and controlgear assemblies for rated voltages between 1 kV and 52 kV (endorsement of IOGP-620 amendments/supplements to IEC 62271-200)

5 ENVIRONMENTAL AND OPERATING CONDITIONS

5.1 ENVIRONMENTAL CONDITIONS

The site climate conditions are indicated in the relevant Technical Data Sheet.

6 EQUIPMENT CHARACTERISTIC AND REQUIREMENTS

The design shall be based on continuous and reliable service, safety of personnel and equipment, ease of maintenance of equipment and ease of interchangeability of equipment.

The electrical equipment will be selected, designed and manufactured taking into account the site offshore conditions.

VENDOR standard quality materials shall be used for parts and accessories not detailed in the specifications.

HV electrical equipment shall be designed for use in an electrical system as stated in the relevant data sheet.

HV electrical equipment, components and material shall be suitable for the combined voltage and frequency conditions variable respectively in the ranges ± 10% and ± 5% and with max network voltage distortion of ±5% without causing temperature in excess of limits specified by applicable standards.

All the components shall be able to withstand continuously the respective current at nominal voltage and frequency and at the ambient condition specified with a temperature rise, in all equipment and in all the different parts, not more than the allowable values specified by applied codes.

Units of measurements shall be in S.I. (System International) units; British unit to be shown between brackets.

7 6,6 KV ELECTRICAL SYSTEM DESCRIPTION – 6,6 KV AIS SG-100D1

The 6,6kV switchgear SG-100D1 is air insulated type, single Busbar Rated for 630A. It consists of 7 panels as described below:

Feeder name	Product	Feeder designation	Current [A]	Qty
A-20000 Electolyser Package	Circuit Breaker	A1	630	1
TR-200ED1 Solar Package	Fuse Contactor	A2	400	1
A-85000 BESS Package	Fuse Contactor	A3	400	1
TR-200DE1 transformer 1.6 MVA	Fuse Contactor	A4	400	1
Measure	Voltage transformer	A5	NA	1
Incomer	Circuit Breaker	A6	630	1
A-80000 Fuel Cell Package	Fuse Contator	A7	400	1

8 6.6 KV SWITCHGEAR

8.1 GENERAL

The Miniver C units allow the creation of reinforced MV panels with metal casing, suitable for indoor installation. The Miniver C units are pre-assembled and factory tested.

The Miniver C units are suitable for all the needs of the primary distribution with operating voltages up to 24 kV and can take different configurations according to the customer's requirements.

All normal operations are carried out on the front of the unit with the doors closed. Only maintenance and the replacement of spare parts require opening of the doors on the front.

The circuit breaker compartment can be equipped with removable switches or contactors.

The panels made with the Miniver C units can be placed against the walls as they are fully accessible from the front for manoeuvres, maintenance and installation operations.

The Miniver C units allow the construction of internal arc sealed panels according to the requirements of IEC 62271-200, Annex AA, accessibility class A, criteria 1 to 5.

Each panel unit consists of five compartments: instrument unit [A], switch unit [B] line unit [C] distribution busbars unit [D] and voltage transformer unit [E]. The compartments are segregated from each other by metallic partitions. Please refer to Figure 4 and Figure 5.

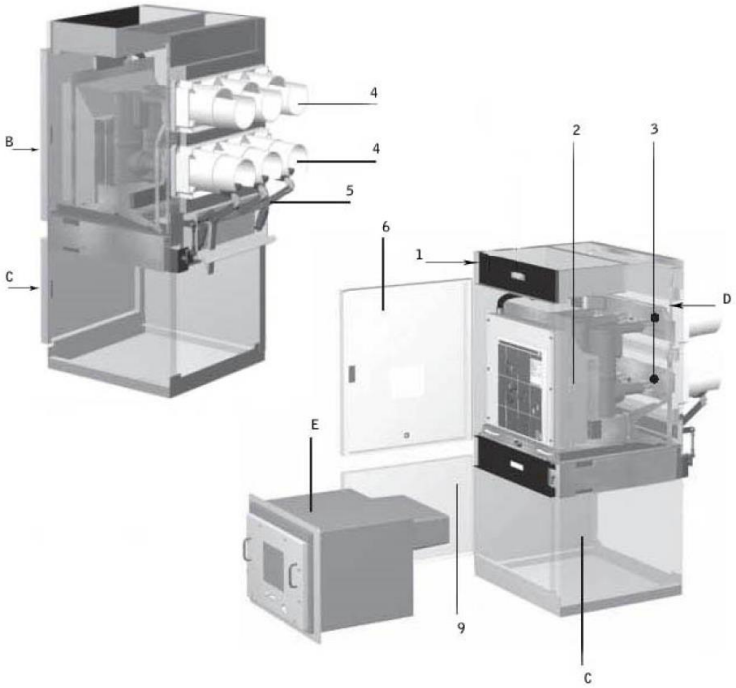


Figure 4- Miniver/C typical section



Figure 5- Miniver/C front of the electrical panel

The switchgear is modular and is built up by placing standardized units side by side in a coordinated way. The switchgear is simple to configure, and selection of the apparatus and instruments does not imply dedicated solutions.

Each Circuit breaker has a clearly visible, mechanically operated position indicator.

The circuit breaker truck has two positions namely, service and test/disconnected position. The circuit breaker truck can be withdrawn from service to test/disconnected position for inspection and maintenance without removing or dislocating the neighboring assembly parts of the switchgear.

The switchgear is fitted with all the interlocks and accessories needed to guarantee the highest level of safety and reliability for both installation and personnel. The detailed description of interlocks is presented in paragraph 10.

Each feeder will be provided with local control cubicle housing protection, metering and control equipment. All electrical auxiliaries for commands, signaling and interlocking are incorporated in the low voltage compartment.

8.2 AUXILIARY POWER SUPPLY

Switchgear has two 110V DC UPS supplies and one 230V AC, 50Hz non-UPS supply.

For 110V DC, two sources shall be connected in parallel (with diodes).

In case of failure of one source, the switchgear can be operated with other feeder to cover all necessary loads (2 X 100%). UPS 110V DC power supply will be used for protection relays power supply, CB spring charging motors, energizing the IED binary inputs, control and signalling circuits.

Single non UPS 230V AC supply will be used for panel internal heating, lighting and socket outlet.

8.3 VD4 CIRCUIT BREAKER

8.3.1 General

The VD4 are vacuum circuit-breaker for indoor installation. VD4 medium voltage circuit-breakers use vacuum to extinguish the electric arc and as the insulating medium. The VD4 circuit breakers type for Crosswind project is VD4/P, 12kV, 630A and 25kA.

The VD4 circuit-breaker is installed on a truck. The truck is provided with a wheel system which makes the operations for racking the apparatus into and out of the switchgear unit possible with the door closed. The truck allows efficient earthing of the circuit-breaker by means of the metallic structure of the switchgear unit.

The front part of the circuit-breaker provides the user interface. It features the following equipment:

- ON pushbutton.
- OFF pushbutton.
- Operation counter.
- Indicator of the circuit-breaker open and closed state.
- Indicator of the charged or discharged state of the operating mechanism springs.
- Manual charging device for the operating mechanism springs.



Figure 6- Circuit Breaker

8.4 VACUUM CONTACTOR VSC7/P 7.2KV 400A SCO

The contactors basically consist of a moulded resin monoblock, housing the vacuum interrupters, moving apparatus, control electromagnet, multivoltage control feeder and auxiliary accessories. The monoblock is also the support for assembly of the fuse-holder frame. Closing of the main contacts is carried out by the control electromagnet. Opening is carried out by a special opposing spring. The contactor can be equipped with electrical or mechanical latching. The fuses are positioned in special supports to be connected in series with the contactor.

The contactors used in Crosswind project are electrically latched.

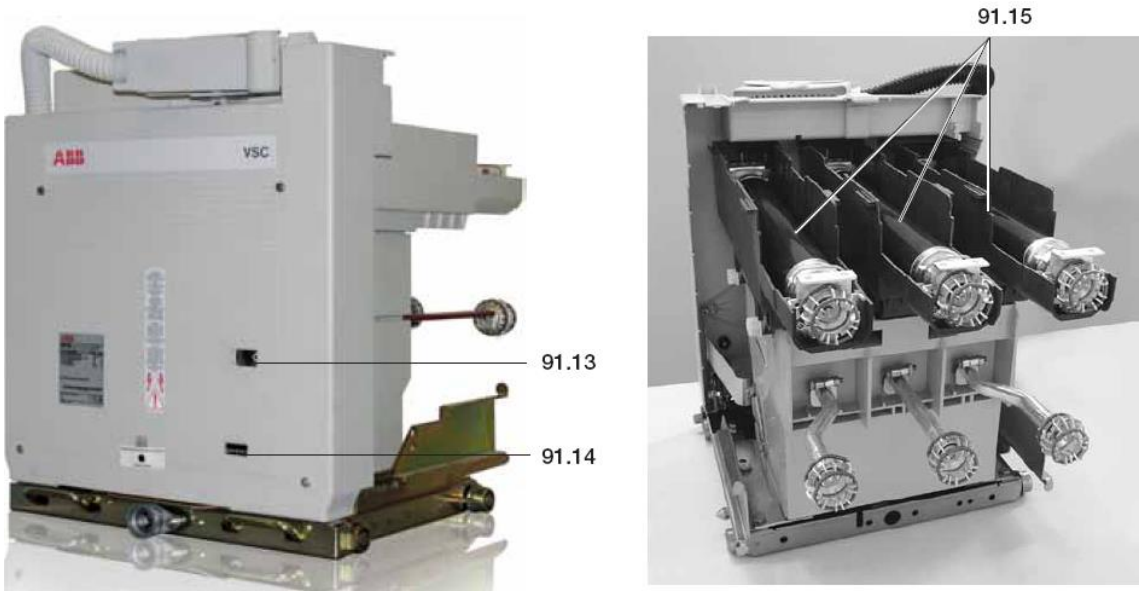


Figure 7- Vacuum contactor VSC Rack-in/out

91.13 Signalling device ON/OFF

91.14 Operating cycle counter

91.15 MV fuses

8.5 EARTHING SWITCH

The earthing switch has a snap closing mechanism, which is independent of the rotation of the drive shaft. An earthing switch allocated to an apparatus is only enabled for switching when apparatus is in the racked-out position or removed from the switchgear panel.

All panels in switchgear are equipped with earthing switches.

Bus bar earthing switch is placed in the measure panel. To close the earth switch, all other apparatus shall be in racked-out position and earthed.

8.6 VOLTAGE AND CURRENT TRANSFORMERS

Conventional current and voltage transformers are installed in the 6.6 kV switchgear to provide inputs to the multifunction relays both for measurement and protection purposes.

Characteristics of CTs and VTs are shown on the project SLDs.

8.7 ARC PROTECTION

The arc protection functionality is integrated in the IEDs. The pre-manufactured sensors are installed in each compartment, as detailed herein after.

Standard CB feeders (LSC2B) include 3 compartments:

1) BB compartment = when the arc fault is detected here the REX640 sends the trip signal to the Incoming CB (via process bus)
2) CB compartment = when the arc fault is detected here the REX640 sends the trip signal to the Incoming CB (via process bus)
3) Cable compartment = when the arc fault is detected here the REX640 trips own CB. For the incoming, the arc detection in the cable compartment trips also the 66 kV circuit breaker (via hardwired signal).

Fused contactor feeder (LSC2A) includes 2 MV compartments:

1) BB compartment = when the arc fault is detected here the REX640 sends the trip signal to the Incoming CB (via process bus)
2) Contactor compartment = when the arc fault is detected here the REX640 sends the trip signal to Incoming CB (via process bus)
3) Cable compartment = when the arc fault is detected here the REX640 sends the trip signal to Incoming CB (via process bus).

8.8 EXERTHERM

Exertherm is a system specifically designed to provide continuous predictive monitoring of mission critical electrical equipment, detecting and identifying hotspot issues and problems before they develop into major failure. A compromised joint or connection can only be identified by the excess heat it generates. It is essential that excess heat is not confused with heat rise due to increased load or external environmental conditions. Consequently, the Exertherm™ system measures the Delta T (target temperature rise over ambient). Exertherm™ utilizes small, plastic, infrared, non-contact, non-powered sensors that are installed inside electrical equipment to directly view, and continuously monitor the thermal condition of critical joints in energised electrical equipment. This enables permanent, non-invasive, 24x7 detection of hotspots at an early stage of development; thus avoiding potential downtime resulting from Arc Flash / power outage incidents.

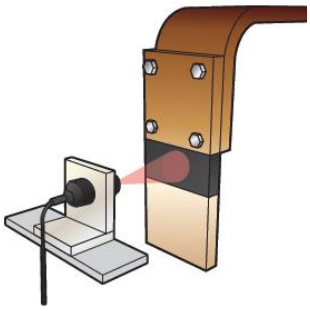


Figure 8- Exertherm IR sensor

There will be 8 IR sensors in each panel: 3 sensors located in the cable compartment monitoring the cable connections + 3 sensors for breaker connection to main bus bar + 2 sensors for main bus bar connection. All IR sensors within a panel are connected to Exertherm Data Cards, which linearize, condition & convert signal to Modbus protocol. There will be one datacard per panel and it will be installed in the LV compartment. All Data Cards are inter-connected, using standard RS485 cable to form a multi-drop link.

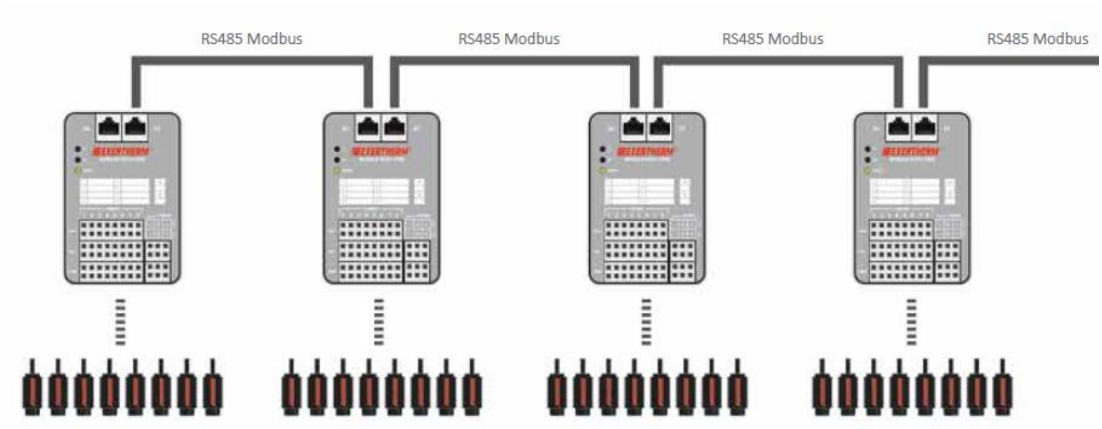


Figure 9- Exertherm Data Card Connection

8.9 PARTIAL DISCHARGE MONITORING SYSTEM

PDCOM is a solution, able to monitor the partial discharge trend in a switchgear and provide specific PD related health index and KPIs, by means of the ABB system SWICOM.

Partial Discharge is a term used to indicate a number of related phenomena, which are still different in the physical details. Common to all phenomena is a local breakdown in a part of the electrical installation, breakdown that is not able to bridge the full distance between two electrodes or between electrode and ground.

IEC 60270 standard defines the term "partial discharge" as: "a localized electrical discharge that only partially bridges the insulation between conductors and which can or can not occur adjacent to a conductor".

The selected PD monitoring system can detect various types of partial discharges and can be used in both old and new switchgear.

The working principle of this system is based-on capacitance variation detected by coupler capacitors or capacitive sockets typically already present inside the switchgear.

The SWICOM system architecture is simple and scalable, with one PDCOM able to monitor up to 10 panels inside the switchgear.

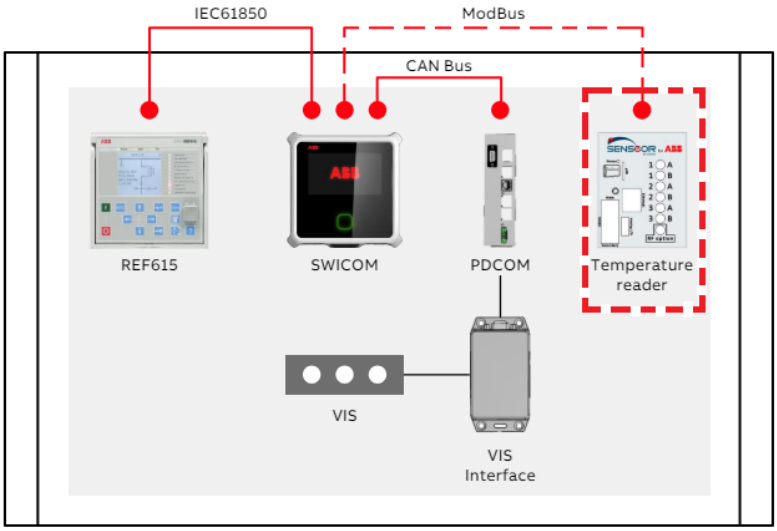


Figure 10- PD monitoring system architecture

The SWICOM system collects the data and makes them available in a compressed form as a time series according to the following data flow:

- PDCOM produces KPIs every five minutes based on the data acquired during that period
- PDCOM calculates base KPIs (Signals) at fixe time intervals
- SWICOM computes PDLIKE as instantaneous logical signal
- Measurements are compressed time series of PD events, predominantly used for display
- Indicators are logical values used as input for the alert system (also for display)
- The alert system converts the indicators to two levels of alert warning and alarms

8.10 PROTECTION RELAYS

RELION series (REX640) of protection relays are used in 6,6kV SWGR. Protection relays are used to meet protection requirements. REX640 series is used for control & interlock functions in addition to protection requirements.

640 series consist of IEDs for protection, control, measurement and supervision of medium and large asynchronous motors, power transformers etc. in utility and industry power distribution substations. The supported communication protocols including IEC 61850 offer seamless connectivity to various station automation and SCADA systems.

8.11 IED - EVENT LOGGING/ RECORDING

The Intelligent Electronic Device shall include the Event and Fault Recording capability as follows:

a) Events Record

Some events such as circuit breaker switching, switching over from normal to standby unit etc. shall be logged in Electrical Control System (ECS). Automatic log printing of events through printers shall be possible.

Sequence of events (SOE) recording shall have minimum resolution of 1 msec with date and time stamping. It shall be possible to assign priority on selective basis for each event.

Sampling shall be achieved with time discrimination of 10 msec.

b) Waveform Capture

Shall record up to 64 cycles of data, with a minimum sampling frequency of 1,6 kHz (1500 samples per second), for minimum 10 waveforms (e.g. line currents, voltages of all phases, ground fault currents, differential currents) each time a trip occurs on a feeder, etc., as well as the breakers status and protection relay trips.

c) Software

The software provided shall include disturbance analysis tools. It shall be possible to program the triggers of the recording based on any of the digital inputs, a combination of digital inputs or on the analogue values crossing a threshold.

9 COMMUNICATION

IEDs included in the 6.6kV switchgear are connected into overall communication network via a redundancy network HSR, as defined by IEC 624329-3.

IEC 61850 is the communication protocol to be used for the IEDs.

The internal switchboard communication between protection relays shall be done with IEC61850 GOOSE signals.

10 INTERLOCKS

The manoeuvres must be carried out with the normal operating force (not exceeding 200 N) using only the appropriate levers. If the manoeuvres are prevented, do not force the mechanical interlocks and check the correctness of the manoeuvres themselves.

The blocks can be operated with a maximum force of 400 N, using the appropriate manoeuvring tools.

The blocks used in Miniver C units are mechanical and electrical with microswitches that give continuity or interrupt the circuit. The mechanical blocks are divided into:

- force blocks;
- impediment blocks;
- electromechanical blocks;
- safety blocks (padlocks/keys).

The blocks provided for the Miniver C modules are the followings:

- Electrical block that prevents the devices from closing when the trolley is not in the inserted and disconnected positions.
- Mechanical block that, in the closed position, prevents insertion and extraction of the devices.
- Mechanical block that prevents the devices from closing when the trolley is not in the inserted and disconnected positions.
- A block that prevents the insertion of an appliance into a compartment designed for an appliance of a different type or size. The block is located in the connector.
- Locking electromagnet on the trolley of the appliances which, in the absence of voltage, prevents insertion or extraction.
- Mechanical interlock with earthing disconnector:
  - when the earthing disconnector is closed, the appliances cannot be inserted;
  - with devices inserted or in the intermediate positions between inserted and disconnected, it is not possible to close the earthing disconnector.
- Mechanical block that prevents extraction of the connector of the auxiliary circuits when the devices are inserted and during insertion and extraction.

- Door block with earthing disconnector open.

11 TAGGING PROCEDURE

All equipment shall be tagged as indicated on the switchgear SLD and Functional Diagrams.

12 EQUIPMENT IDENTIFICATION

Corrosion-resistant identification plate shall be fixed by means of rivets or screws to each panel or equipment front. The plate shall, as a minimum, carry the following information:

- The VENDOR's / CONTRACTOR's name or trademark
- The equipment/panel tag number and Service
- Degree of mechanical protection
- Electrical protection mode (EEx) if applicable

A corrosion-resistant identification plate shall be fixed by means of rivets or screws close to each individual operational device fitted onto the panel front. The plate shall carry the following information:

- Device tag number and Service
- Operational actions (start, stop, open, reset, test, etc)

13 INSPECTION AND TESTING

13.1 INSPECTION

Any supplied equipment shall be subjected to the factory tests stated in the relevant specifications and applicable standards. The COMPANY or CONTRACTOR, or his appointed representative, may, at his discretion, witness all or part of the factory tests. The tests results shall in any case be made available to the COMPANY.

The Manufacturer shall allow the free access of inspectors to his manufacturing shop, shall give all information required and shall make available all copies of internal orders to other sub-suppliers.

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13.2 TEST PROCEDURE

Tests shall be carried out in Manufacturer's workshop at his care and expense.

The Vendor/Contractor shall submit his test procedures in writing to the CONTRACTOR for approval, prior to the start of the testing program.

The tests shall be carried out in the presence of Inspector(s) from the CONTRACTOR's Inspection Authority.

For the tests, the motors shall be fully assembled and fitted with all accessories for the test.

In addition to the Test Reports and letters of conformity, the following certificates shall be provided with each motor/instrument/component as minimum and as applicable:

- Inspection Release Certificate.
- Code Compliance Certificate.
- Type Test Certificate.
- Calibration Certificates (where applicable).

Tests shall be carried out in compliance with the requirements of the IEC 62271-1 standard.

13.3 TESTS

All tests shall be as per IEC standards and as stated in the Annex III.

14 SPARE PARTS

Supply of the suggested spare parts for commissioning, start-up and final performance/ acceptance test shall be included in the base VENDOR scope of work. If additional spares are required during this period, VENDOR shall supply them on his account released by CONTRACTOR satisfaction.

Spare fuses in quantity not less than 50% of those mounted, and with a minimum of 4 for each type shall always be supplied; the same shall apply for signal lamps.

No less than 20% spare the terminal blocks shall be provided inside the Control Panel.

Typology and quantity of the suggested spare parts shall be based on the VENDOR experience and is subject for CONTRACTOR's approval.

VENDOR shall ensure spare availability for at least 10 years form final acceptance certificates released by CONTRACTOR.

The spare parts offered shall be new and original supply from the same equipment Manufacturer.

VENDOR shall submit also a recommended priced spare part list for two (2) years operation.

VENDOR shall analyse the life expectancy of the components of equipment, based on Manufacturer Maintenance Manual; and shall evaluate carefully the required spare parts and quantity. COMPANY will purchase such spares separately.

15 TRAINING

The training for two separate teams of 6 people each shall be included as part of the supply and as per Manufacturer standard for the switchgear to be supplied.

The training shall be held on the factory facilities, including all the needed didactical material (one set for each participant) and shall consist of two separate sessions one theoretical and one practical, where this last one should be preferably over the switchgear to be supplied.

16 PAINTING

The following minimum requirements for painting shall be met.

Painting and protective coatings shall take into account the methods of transport to be used (e.g, deck cargo).

Outdoor equipment external painting shall be corrosion resistant and suitable against salt air conditions.

Painting and coating of metal parts shall be suitable for the local environmental offshore conditions.

VENDOR's standard painting and coating systems may be acceptable subject to the CONTRACTOR's approval, provided they are equal or better to the CONTRACTOR's standards and are equally suitable for the site offshore environmental conditions.

17 DOCUMENTATION

The supply shall include the preparation of any required documentation, with its approval cycle, as stated in the Annex IV.

The required documentation shall cover the design, fabrication, inspection, selection, fabrication and testing for the supplied equipment including any device and accessory.

Vendor shall provide the documents related to design, selection, fabrication, inspection and testing and all details necessary for the installation, showing switchgear and cable arrangements, clearances, mounting of

structures on the foundations, structure details and loadings to demonstrate to how the switchgear and cables will fit in the switchgear building.

The detailed list of documents that are required will be attached to the Purchase Order/Contract. However, as a minimum the following listed documents shall be provided by the VENDOR:

- Certified drawings (including General Arrangement) showing dimensions and stating weights, consumption and dissipated heat - Foundation Lay-out
- Electrical single line diagrams
- Electrical schematic diagrams
- Electrical block diagrams
- Electrical connection diagrams
- Data sheets
- Calculations
- Test Procedures
- Material and test certificates
- Result of testing
- Non-conformity list
- Hazardous Area Certificates (if applicable)
- Shipping conditions
- Installation / Operations Manual
- Commissioning procedures
- Maintenance Manual
- Spare Part list

18 WARRANTY

VENDOR shall guarantee the equipment in term of design, materials and workmanship for two (2) years after being placed in service. The equipment shall be guaranteed to operate satisfactorily at rated conditions and all other conditions within the specified range as indicated in the relevant data sheet and applicable codes/specifications referenced at clause 4.

All equipment and materials within VENDOR scope of work shall be designed for a 20 years design life.

18.1 MAKE GOOD

In case of any equipment and/or components are to demonstrate do not meet the required performance guarantees at the operating/design conditions, VENDOR shall provide at its care and cost any necessary corrective action to comply with the required performance values.

Corrective actions shall include, but not limited to, design modification of supplied equipment, substitution or repairing of involved materials.

19 SUB-VENDOR

Proposed SUB-VENDORs of equipment, components and items not directly manufactured by VENDOR shall be listed in the VENDOR's Bid.

After the placement of the Purchase Order, no modification in the SUB-VENDOR list shall be allowed, without prior CONTRACTOR's approval.

VENDOR shall control, co-ordinate, expedite and resolve all problems with own SUB-VENDORs in order to meet the requirements of this specification. VENDOR shall guarantee and be responsible for the design and performance of all sub-vendor items. VENDOR shall ensure that all the applicable information, reference documents and project requirements are transmitted to the SUB-VENDORs.

No modifications will be allowed upon placement of PO without prior approval of the CONTRACTOR.

20 ANNEX I – DEVIATION LIST

Present specification is aligned with the supply, no further deviations were issued and discussed during the bid phase.

21 ANNEX II – SUPPLEMENTARY SPECIFICATION TO IEC 62271-200 FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR

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International Association of Oil & Gas Producers

SPECIFICATION

IOGP S-620

December 2022

Version 2.0

Supplementary Specification to IEC 62271-200 for High-voltage Switchgear and Controlgear

JIP33 JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
2.0	December 2022	Second Edition
1.0	October 2018	First Edition

Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

This second edition cancels and replaces the first edition published in October 2018.

Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

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Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of high-voltage switchgear and controlgear in accordance with IEC 62271-200, Edition 3.0, May 2021 for application in the petroleum and natural gas industries.

This specification follows a common document structure comprising the four documents as shown below, which together with the purchase order define the overall technical specification for procurement.



JIP33 Specification for Procurement Documents
Supplementary Technical Specification

This specification is to be applied in conjunction with the supporting procurement data sheet, information requirements specification (IRS) and quality requirements specification (QRS) as follows.

IOGP S-620: Supplementary Specification to IEC 62271-200 for High-voltage Switchgear and Controlgear

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to IEC 62271-200, following the IEC 62271-200 clause structure. Clauses from IEC 62271-200 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to IEC 62271-200 defined in this specification are identified as Add (add to clause or add new clause), Replace (part of or entire clause) or Delete.

IOGP S-620D: Procurement Data Sheet for High-voltage Switchgear and Controlgear (IEC)

The procurement data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The procurement data sheet may also include fields for supplier provided information attributes subject to purchaser's technical evaluation. Additional purchaser supplied documents may also be incorporated or referenced in the procurement data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-620L: Information Requirements for High-voltage Switchgear and Controlgear (IEC)

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the supplier. It may also define specific conditions which invoke information requirements.

IOGP S-620Q: Quality Requirements for High-voltage Switchgear and Controlgear (IEC)

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the data sheet or in the purchase order.

The terminology used within this specification and the supporting procurement data sheet, IRS and QRS follows that of IEC 62271-200 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

The procurement data sheet and IRS are published as editable documents for the purchaser to specify application specific requirements. The supplementary specification and QRS are fixed documents.

The order of precedence (highest authority listed first) of the documents shall be:

a) regulatory requirements;

b) contract documentation (e.g. purchase order);

c) purchaser defined requirements (procurement data sheet, IRS, QRS);

d) this specification;

e) IEC 62271-200.

1 Scope

Replace fourth list item with

– indoor installation;

Replace second paragraph with

This specification covers:

– three-phase air-insulated switchgear and three-phase gas-insulated switchgear with fixed, removable or withdrawable parts or combinations thereof;

– minimum requirements for digital interfaces based on IEC 61850;

– the requirements for generator circuit-breakers.

Add after second paragraph

This specification does not cover:

– high-voltage switchgear and controlgear assemblies installed outdoors, other than bus duct and outdoor termination bushings;

– detailed user requirements for electrical control and management systems;

– integrated power semiconductor systems;

– integrated high-voltage variable (adjustable) speed drives in accordance with IEC 61800-5;

– ring main units;

– explosion protected "Ex" equipment incorporating a type of explosion protection in accordance with the IEC 60079 series;

– DC uninterruptible power supply systems for auxiliary power.

2 Normative references

Add to start of clause

The following publications are referred to in this document, the procurement data sheet (IOGP S-620D) or the IRS (IOGP S-620L) in such a way that some or all of their content constitutes requirements of this specification.

Add to clause

IEEE C37.2, *IEEE Standard Electrical Power System Device Function Numbers, Acronyms, and Contact Designations*

API Specification Q2, *Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries*

IEC 60038, *IEC standard voltages*

IEC 60051-1, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 1: Definitions and general requirements common to all parts*

IEC 60051-2, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 2: Special requirements for ammeters and voltmeters*

IEC 60051-3, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 3: Special requirements for wattmeters and varmeters*

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60092-101, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 60099-4, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems*

IEC 60255 (all parts), *Electrical relays*

IEC 60269-1, *Low-voltage fuses – Part 1: General requirements*

IEC 60269-2, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to K*

IEC 60282-1, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60417, *Graphical symbols for use on equipment (available at http://www.graphical-symbols.info/equipment)*

IEC 60617, *Graphical Symbols for Diagrams*

IEC 60644, *Specifications for high-voltage fuse-links for motor circuit applications*

IEC 60688, *Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals*

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61000-2-4, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances*

IEC TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling*

IEC 61511-1, *Functional safety – Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming requirements*

IEC 61554, *Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting*

IEC 61800-5 (all parts), *Adjustable speed electrical power drive systems – Part 5 Safety requirements*

IEC 61850 (all parts), *Communication networks and systems for power utility automation*

IEC 61869-1, *Instrument transformers – Part 1: General requirements*

IEC 61869-2, *Instrument transformers – Part 2: Additional requirements for current transformers*

IEC 61869-3, *Instrument transformers – Part 3: Additional requirements for inductive voltage transformers*

IEC 61869-5, *Instrument transformers – Part 5: Additional requirements for capacitor voltage transformers*

IEC 61869-6, *Instrument transformers – Part 6: Additional general requirements for low-power instrument transformers*

IEC 61869-10, *Instrument transformers – Part 10: Additional requirements for low-power passive current transformers*

IEC 61869-11, *Instrument transformers – Part 11: Additional requirements for low power passive voltage transformers*

IEC 61892-3, *Mobile and fixed offshore units – Electrical installations – Part 3: Equipment*

IEC 62052-11, *Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62243-4-2, *Security for industrial automation and control systems – Part 4-2: Technical security requirements for IACS components*

IEC 62271-1, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*

IEC 62271-3, *High-voltage switchgear and controlgear – Part 3: Digital interfaces based on IEC 61850*

IEC 62271-4, *High-voltage switchgear and controlgear – Part 4: Handling procedures for sulphur hexafluoride (SF6) and its mixtures*

IEC TS 63107, *Integration of internal arc-fault mitigation systems in power switchgear and controlgear assemblies (PSC-assemblies) according to IEC 61439-2*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 10005, *Quality management — Guidelines for quality plans*

3 Terms, definitions and abbreviated terms

Add new subclause 3.0 before subclause 3.1

3.0 Abbreviated terms

For the purposes of this document, the abbreviated terms given in IEC 62271-200 and the following apply.

AIS air-insulated switchgear

DCS distributed control system

DMZ demilitarized zone

ECMS electrical control and management system

GIS gas-insulated switchgear

HMI human machine interface

HSR high-availability seamless redundancy

ICSS integrated control and safety system

IED intelligent electronic device

MCB miniature circuit breaker

PMS power management system

PRP parallel redundancy protocol

SPS site pollution severity class

VDIS voltage detecting and indicating system

3.5 Parts of switchgear and controlgear

Add new term 3.5.122

3.5.122

bus coupler

functional unit that contains a mechanical switching device which electrically connects together two bus sections

Add new term 3.5.123

3.5.123

bus section

line-up of sections connected together in service by a physically continuous main busbar

4 Normal and special service conditions

Add to clause

Outdoor portions of bus ducts and bushings shall be in accordance with IEC 62271-1, 4.1.3.

5 Ratings

5.2 Rated voltage (U_r)

Add to subclause

The assembly shall be rated to withstand with a three-phase nominal system voltage variation not exceeding +/-10 % in accordance with IEC 60038.

Add to subclause

For offshore applications, the assembly shall be rated to operate with a system voltage transient variation not exceeding +/-15 % with 1,5 s maximum recovery time.

Add to subclause

For offshore applications, the assembly shall be rated to operate with a system voltage maximum variation not exceeding +/-20 %.

Add to subclause

The assembly shall be rated to operate as a minimum in a class 2 power system supply environment with voltage harmonic content of up to 8 % total harmonic distortion in accordance with IEC 61000-2-4.

5.3 Rated insulation level (U_d, U_p, U_s)

Add to subclause

Main busbars, branches and fixings installed in air-filled compartments shall be fully insulated.

Add to subclause

Insulation covering joints between busbars, branches and fixings shall be removable to facilitate the maintenance of the joints.

5.5 Rated continuous current (I_r)

Add to subclause

Air-insulated switchgear assemblies with a rated continuous current less than or equal to 3 150 A shall not depend on forced ventilation.

Add to subclause

Gas-insulated switchgear assemblies with a rated continuous current less than or equal to 2 500 A shall not depend on forced ventilation.

Add to subclause

Continuous current rating shall be inclusive of derating factors.

Add to subclause

Continuous current rating shall be constant for the entirety of the main busbars.

Add to subclause

Busbars in air-insulated or gas-air mixture filled compartments shall be manufactured from hard drawn, high-conductivity electrolytic copper.

5.6 Rated short-time withstand currents (I_k, I_{ke})

5.6.102 Rated short-time phase-to-earth withstand current (I_{ke})

Replace second sentence with

For systems without a solidly earthed neutral, the value of rated short-time phase to earth withstand current (I_{ke}) shall be at least 87 % of the rated short-time withstand current (I_k) of the main circuit.

Add to subclause

For systems with a solidly earthed neutral, the value of rated short-time phase to earth withstand current (I_{ke}) shall be equal to the rated short-time withstand current (I_k) of the main circuit.

5.7 Rated peak withstand currents (I_p, I_{pe})

5.7.102 Rated peak phase to earth withstand current (I_{pe})

Replace second sentence with

The value of rated peak phase to earth withstand current (I_{pe}) shall be at least 87 % of the rated peak withstand current (I_p) of the main circuit.

5.8 Rated durations of short-circuit (t_k, t_{ke})

5.8.102 Rated duration of phase to earth short-circuit (t_{ke})

Replace second sentence with

The value of rated duration of phase to earth short-circuit (t_{ke}) shall be equal to the rated duration of short-circuit (t_k) of the main circuit.

6 Design and construction

6.1 Requirements for liquids in switchgear and controlgear

Replace subclause with

Liquids shall not be used as a switching or insulating medium.

6.3 Earthing of switchgear and controlgear

6.3.101 Earthing of the high-voltage conductive parts

Add to subclause

Facilities for earthing the high-voltage conductive parts shall be provided on the incoming side of supply generator/transformer circuits and on the outgoing (cable) side of feeder/load circuits in accordance with Figures 1 through 7 to the provided loss of service continuity category.

Add to subclause

A functional unit with a busbar earthing switch or a dedicated busbar earthing compartment shall be provided per bus section.

Add to subclause

Operation of earthing devices shall be manually initiated.

Add to subclause

Switching devices or isolators shall be interlocked to prevent closure when circuit earths are connected.

6.3.102 Earthing of the enclosure(s)

Add to subclause

A hard-drawn high conductivity copper main earth bar shall be installed along the length of the assembly.

Add to subclause

Earth bar ends shall provide bolted connections for an external earth cable or earth bar.

Add new subclause

6.3.105 Earthing for withdrawable type switchgear

6.3.105.1

Insertion of the withdrawable busbar earthing device shall only be possible for incoming supply functional units or dedicated busbar earthing compartments.

6.3.105.2

Application of an earth connection to high-voltage conductive parts shall only be possible when the main circuit switching device is isolated and not in the service position.

6.3.105.3

Earthing connection devices shall be interlocked with other incomers, feeders and bus coupler circuit breakers via a mechanical or electrical interlocking system to prevent connecting an energized circuit to earth.

6.3.105.4

Insertion of a withdrawable main circuit switching device into the service (circuit) position shall not be possible when the earthing provision is connected to the same functional unit.

Add new subclause

6.3.106 Earthing for non-withdrawable (fixed) type switchgear

6.3.106.1

Incoming and outgoing circuit earthing shall be via the functional unit circuit-breaker or by an integrated three-position switch.

6.3.106.2

The bus coupler shall incorporate the busbar earthing system.

6.3.106.3

Application of an earth connection to high-voltage conductive parts shall only be possible when the main circuit switching device in the same functional unit is isolated.

6.3.106.4

De-isolation shall not be possible when the earthing provision within the same functional unit is applied.

Add new subclause

6.3.107 Voltage detecting and indicating systems

6.3.107.1

When specified, integrated voltage detecting and indicating systems shall be of the capacitive three-phase voltage type in accordance with IEC 62271-213.

6.3.107.2

When specified, a separable voltage detecting and indicating system shall be of the capacitive three-phase voltage type in accordance with IEC 62271-213 and IEC 62271-215.

6.3.107.3

When a voltage detecting and indicating system is specified, indicators shall be installed next to the connection (cable) compartment on incoming circuits, outgoing feeders and the front of bus coupler panels.

6.4 Auxiliary and control equipment and circuits

6.4.1 General

Add to subclause

An alarm shall be initiated on the loss of incoming auxiliary or control power supplies.

Add to subclause

Functional unit auxiliary and control supplies shall be protected by dedicated miniature circuit breakers (MCBs).

Add to subclause

Auxiliary and control supply MCBs shall incorporate an auxiliary contact to initiate a trip remote alarm.

Add to subclause

Failure of the functional unit tripping circuit supply shall inhibit main circuit-breaker/contactor closure and initiate local and remote alarms.

6.4.2 Protection against electric shock

Add new subclause

6.4.2.3 Precautions for auxiliary and control circuits

Equipment and terminals powered from an external source shall be labelled accordingly.

Circuits operating above safety extra low voltage shall incorporate isolation facilities.

6.4.3 Components installed in enclosures

6.4.3.4 Requirements for auxiliary and control circuit components

6.4.3.4.1 General

Add to subclause

Low-voltage fuses shall be in accordance with IEC 602691 and IEC 602692.

Add to subclause

IEDs shall be provided with the ability for multifunction control including protection, indication, metering, supervisory input/output and communication functions.

Add to subclause

Plug-in type auxiliary components shall be provided with retaining clips.

6.4.3.4.2 Cables and wiring

Add to subclause

Self-aligning contacts or a multi-conductor cable with plug and socket shall be used for withdrawable device auxiliary circuit connections.

Add to subclause

Interposing relay contacts shall be terminated in the low-voltage control compartment.

6.4.3.4.4 Auxiliary switches

Add to subclause

High-voltage switching device volt-free auxiliary contacts shall be directly activated by the main operating mechanism.

Add to subclause

High-voltage switching device volt-free auxiliary contacts shall be a minimum of Class 2 in accordance with IEC 62271-1, Table 8.

6.4.3.4.5 Auxiliary and control contacts

Add to subclause

Control and auxiliary device utilization categories shall be in accordance with IEC 60947-5-1.

Add to subclause

AC switching elements shall be utilization category AC-15.

Add to subclause

DC switching elements shall be at least utilization category DC-13.

Add to subclause

Rated operational currents (I_e) shall be at least 5 A at 230 V AC rated operational voltage and 1 A at 110 V DC rated operational voltage.

6.4.3.4.6 Heating elements

Add to subclause

Assembly space heaters shall have a degree of protection of at least IP2X in accordance with IEC 60529.

Add to subclause

Assembly space heaters shall incorporate a guard when the heater surface temperature exceeds 60 °C.

Add to subclause

Assembly space heaters and motor space heaters shall be individually powered from external sources.

Add to subclause

Assembly and motor space heaters shall be protected by a 30 mA residual current device with volt-free contacts wired to terminals.

Add to subclause

Motor space heater auxiliary circuits shall be energized when the main circuit switching device is open while in the service position or test position.

Add to subclause

Assembly space heater supplies shall have a front of panel indicating LED lamp with a label engraved "Heater supply on".

Add new subclause

6.4.4 Actuators and indication

6.4.4.1

When colour defines function, actuators shall be green for start/on and red for stop/off.

6.4.4.2

Status colour coding of indicator components and colour human machine interface (HMI) screens shall be in accordance with Table 105.

NOTE Colour coding of status indicator does not apply to intelligent electronic devices (IEDs) or protection relays with a suite of status light emitting diodes (LEDs) which are all the same colour.

Add new Table 105

Table 105 – Colour coding of status indicator

Colour	Meaning	High-voltage – Assembly application	
	Safety of persons or environment	Circuit-breaker	Motor starter / contactor feeder
Red	Danger	Closed (On)	Running (On)
Yellow	Warning/caution	Tripped	Tripped
Green	Safe	Open (Off)	Stopped (Off)
Blue	Mandatory significance	Trip circuit healthy (or unhealthy)	Not applicable
White	No specific meaning assigned	Voltage indication (Heater On)	Motor heater on
NOTE The colours detailed in this table are in accordance with IEC 60073.			

6.4.4.3

Indication lamps shall be light emitting diodes.

6.4.4.4

Discrete indication lamps shall operate at the same voltage except those directly connected to heater supply circuits.

Add new subclause

6.4.5 Security for industrial automation and control systems

6.4.5.1

When specified, industrial automation and control system components shall be in accordance with IEC 62443-4-2.

6.10 Pressure/level indication

Add to subclause

Local indication and alarms with remote interfaces shall be provided.

6.12 Locking devices

Add to subclause

High-voltage compartment doors shall be padlockable in the closed position.

Add to subclause

Disconnectors and circuit-breakers shall be padlockable in the open position.

Add to subclause

When withdrawable functional units are removed, safety shutters shall be padlockable in the closed position.

Add to subclause

Earth switches shall be padlockable.

Add to subclause

Switching device local/remote selectors shall be lockable in the "local" and "remote" positions.

6.16 Gas and vacuum tightness

Add to subclause

The relative leakage rate F_{rel} for SF_6 and SF_6 mixtures shall not be greater than 0,1 % per year.

6.101 General requirements for assemblies

Add to subclause

Assemblies specified for marine installations shall be in accordance with IEC 60092-101.

Add to subclause

Assemblies specified for offshore installations shall be in accordance with IEC 61892-3.

Add to subclause

Assemblies shall be rated for continuous operation at rated load under normal service conditions for at least 36 000 h (4 years).

Add to subclause

During a continuous operation period of 45 000 h (5 years), the main busbars and the distribution busbars (dropper system) shall not require de-energizing for maintenance or inspection.

Add to subclause

Equipment shall be accessible from the front of the assembly, except for cable termination chambers which can be accessible from the front or rear.

Add to subclause

Components in back-to-wall mounted assemblies shall be accessible from the front.

Add to subclause

Pre-drilled holes shall be provided at free ends of bus bars for future on-site extension.

Add to subclause

Where withdrawable main circuit feeders are provided with a contactor and fuses, the fuses shall be part of the withdrawable assembly.

6.102 Metal enclosure

6.102.1 General

Replace first sentence of third paragraph with

The enclosure shall have a degree of protection of at least IP3X in accordance with IEC 60529.

6.102.2 Covers and doors

In first sentence of second bullet, replace "with provision for locking" with

with provision for padlocking

Add to subclause

Doors or covers with mounted electrical components shall have supplementary equipotential bonding.

Add to subclause

On floating offshore, mobile offshore and marine installations, doors shall be securable in the open position.

6.103 High-voltage compartments

6.103.1 General

Add to first paragraph after list

For gas-insulated switchgear assemblies, the minimum LSC category shall be LSC2.

Add to first paragraph after list

For air-insulated switchgear circuit-breaker functional units, the minimum LSC category shall be LSC2B.

Add to first paragraph after list

For air-insulated switchgear contactor feeder functional units, the minimum LSC category shall be LSC2A.

Add to fourth paragraph

Busbar compartments shall contain no more than one busbar section.

Add to fourth paragraph

Busbar risers on different sides of a bus coupler switching device shall be in separate compartments.

6.103.2 Fluid-filled compartments (gas or liquid)

6.103.2.4 Pressure relief of fluid-filled compartments

Add to subclause

Fluid filled compartments shall be provided with a pressure-relief device.

6.103.3 Partitions and shutters

6.103.3.2 Metal partitions and shutters

Add to subclause

Accessible shutters preventing access to live parts, shall be marked in accordance with ISO 7010:2019, Graphical Symbol W012 "Warning; Electricity".

Add to subclause

Three-phase shutters for main conductors shall have a manually operated facility, securable in the open position.

Add to subclause

For withdrawable parts, accessible shutters shall be identified in accordance with Table 106.

Add new Table 106

Table 106 – Identification of accessible shutters

Equipment	Text
Busbars	BUSBAR
Incoming unit supply circuit	SUPPLY
Outgoing unit feeder cables	CIRCUIT

6.104 Removable parts

Add to subclause

When specified, facilities for remote testing of withdrawable main circuit units shall be provided by means of extension umbilicals or specific test modules.

Add to subclause

Withdrawable main circuit units shall only be interchangeable between positions of same electrical function and rating.

6.106 Internal arc fault

Add to subclause

The internal arc classification (IAC) of the assembly shall be all sided protection FLR.

Add to subclause

Internal arc tests shall be for a rated three-phase arc fault current (I_A) value at least that of the specified short-time withstand current (I_k) for a minimum arc fault duration of 1 s.

Add new subclause

6.107 Labelling and identification

6.107.1 General

6.107.1.1

Graphical symbols, safety colours and safety signs shall be in accordance with ISO 7010.

6.107.1.2

Text-only warning labels shall have white characters on a red background.

6.107.1.3

Informative labels shall have black characters on a white background.

6.107.1.4

Assemblies shall be provided with a front-mounted label that includes the equipment tag number.

6.107.1.5

Withdrawable parts shall be labelled with their designated functional unit compartment number.

6.107.2 Circuit labels

6.107.2.1

Functional units shall have a front-of-panel circuit designation label.

6.107.2.2

Assemblies with rear access shall have additional circuit designation labels at the rear.

6.107.2.3

Circuit designation labels shall include the following information:

a) functional unit compartment number;

b) tag number of connected equipment;

c) service description of connected equipment;

d) circuit kW or kVA rating.

6.107.3 Identification of main and auxiliary circuit conductors

Conductor identification of main and auxiliary circuits shall be in accordance with Table 107.

Add new Table 107

Table 107 – Identification of conductors

Conductor	Main circuit marking	Auxiliary circuit marking	Supplementary colour marking (when used)
AC circuits			
Phase 1	L1	L1	As specified
Phase 2	L2	L2	As specified
Phase 3	L3	L3	As specified
Neutral		N	As specified
Protective earth	PE and/or earth symbol	PE and/or earth symbol	Yellow/Green
DC circuits			
Positive pole		(+)	Red
Negative pole		(-)	White

Add new subclause

6.108 Main circuit switching devices

6.108.1 Isolating switching devices (disconnectors)

6.108.1.1

Disconnectors and earthing switches shall be in accordance with IEC 62271-102.

6.108.1.2

Switches shall be in accordance with IEC 62271-103.

6.108.2 Circuit-breakers

6.108.2.1

Circuit-breakers shall be at least class S1 in accordance with IEC-62271-100.

6.108.2.2

Circuit-breaker operating mechanisms shall have spring-stored energy.

6.108.2.3

Circuit-breaker operating mechanisms shall have a spring-charging motor.

6.108.2.4

Circuit-breaker operating mechanisms shall have a closing release coil with an interlock to inhibit closing if a trip condition exists.

6.108.2.5

Circuit-breaker operating mechanisms shall have a spring-charged/discharged indicator.

6.108.2.6

Circuit-breaker operating mechanisms shall have a manual spring charge facility.

6.108.2.7

Circuit-breaker operating mechanisms shall have an anti-pumping device.

6.108.2.8

Circuit-breaker operating mechanisms shall have a shunt trip coil release of energize-to-trip type.

6.108.2.9

Circuit-breaker operating mechanisms shall have a mechanically operated position indicating device showing the position of the main circuit contacts in accordance with IEC 60417.

6.108.2.10

Circuit-breaker operating mechanisms shall have an operations counter.

6.108.2.11

Withdrawable circuit-breakers with identical rating and duty shall be physically interchangeable between receiving compartments of matching rating and duty.

6.108.2.12

Circuit-breakers shall have at least two spare normally open auxiliary contacts wired to terminals in the outgoing terminal block.

6.108.2.13

Circuit-breakers shall have at least two spare normally closed auxiliary contacts wired to terminals in the outgoing terminal block.

6.108.2.14

Withdrawable circuit-breakers shall have two spare "in service" position auxiliary contacts wired to terminals in the outgoing terminal block.

6.108.2.15

Withdrawable circuit-breakers shall have two spare "out of service" position auxiliary contacts wired to terminals in the outgoing terminal block.

6.108.3 Generator circuit-breakers

Generator circuit-breakers shall be in accordance with IEC/IEEE 62271-37-013.

6.108.4 Motor starters and contactor feeders

6.108.4.1

Contactors shall be in accordance with IEC 62271-106.

6.108.4.2

The no-load operating cycle mechanical endurance shall be at least 0,1 for latched contactors in accordance with IEC 62271-106:2021, 5.105.

6.108.4.3

The no-load operating cycle mechanical endurance shall be at least 0,3 for unlatched contactors in accordance with IEC 62271-106:2021, 5.105.

6.108.4.4

Classification of acceptable damage shall be type c in accordance with IEC 62271-106:2021, 5.107.3.4 for the largest fuse size rated for the fuse holder.

6.108.4.5

Motor starter contactors shall be rated for continuous and intermittent duty of at least class 12 in accordance with IEC 62271-106:2021, 5.102.2.

6.108.4.6

Contactor feeders shall be mechanically latched with an electrical trip coil and guarded manual release.

Add new subclause

6.109 Voltage transformers

6.109.1

Voltage transformers shall be in accordance with IEC 61869-1.

6.109.2

Inductive voltage transformers shall be in accordance with IEC 61869-1 and IEC 61869-3.

6.109.3

Capacitive voltage transformers shall be in accordance IEC 61869-1 and IEC 61869-5.

6.109.4

Low-power voltage transformers shall be in accordance with IEC 61869-1 and IEC 61869-6.

6.109.5

Low-power passive voltage transformers shall be in accordance with IEC 61869-1 and IEC 61869-11.

6.109.6

Voltage transformer accuracy class shall be at least class 1,0 for measuring applications and class 3P for protection applications in accordance with IEC 61869-3.

6.109.7

For tariff metering applications, voltage transformer accuracy class shall be at least class 0,2 s in accordance with IEC 61869-3.

6.109.9

Withdrawable voltage transformers shall be protected by HRC fuses or have a current self-limiting protective feature.

6.109.10

Where withdrawable voltage transformers are protected by HRC fuses on the primary side, the fuses shall be accessible on withdrawal of the voltage transformer.

6.109.11

Voltage transformers shall be protected by MCBs with an auxiliary contact for trip indication on the secondary windings.

6.109.12

Withdrawable voltage transformers shall have automatic shutters operated by the racking mechanism.

6.109.13

Withdrawable voltage transformer automatic shutters shall be padlockable in the withdrawn position.

6.109.14

Disconnectable voltage transformers shall be padlockable in the disconnected position.

6.109.15

Three-phase voltage transformers shall incorporate star-connected windings with the secondary star-point earthed at a single point via an accessible removable link.

Add new subclause

6.110 Current transformers

6.110.1

Current transformers shall be in accordance with IEC 61869-1.

6.110.2

Inductive current transformers shall be in accordance with IEC 61869-1 and IEC 61869-2.

6.110.3

Low-power current transformers shall be in accordance with IEC 61869-1 and IEC 61869-6.

6.110.4

Low-power passive current transformers shall be in accordance with IEC 61869-1 and IEC 61869-10.

6.110.5

Current transformer accuracy class shall be at least class 1,0 for measuring incoming applications, class 3,0 for measuring outgoing applications and class 5P for protection applications in accordance with IEC 61869-2.

6.110.6

Current transformers connected to external circuits shall have shorting links located at the outgoing terminals.

6.110.7

Current transformer secondary windings shall be connected to earth via a single disconnecting link.

Add new subclause

6.111 Surge arresters

When specified, metal oxide surge arresters in accordance with IEC 60099-4 shall be installed on the circuit side of the main circuit switching device within an enclosure compartment.

Add new subclause

6.112 Indication and measuring devices

6.112.1 General

6.112.1.1

Discrete indicating and measuring device dimensions shall be in accordance with IEC 61554.

6.112.1.2

Discrete indicating and measuring devices shall be flush mounted with a non-reflective display.

6.112.1.3

Indicating devices shall have an accuracy class of at least 2,5 for analogue instruments in accordance with IEC 60051-1.

6.112.2 Analogue instruments

6.112.2.1

Analogue devices shall have black characters on a white background displaying actual primary circuit values.

6.112.2.2

An external zero adjustment shall be provided.

6.112.2.3

Analogue voltmeters and ammeters shall be in accordance with IEC 60051-2.

6.112.2.4

Analogue ammeters and voltmeters shall be provided with a selector switch equipped with an "off" position.

6.112.2.5

Ammeter selector switches shall be "make-before-break" type.

6.112.2.6

A maximum demand facility with a period of 30 min shall be provided for incomers and outgoing feeders in accordance with IEC 62052-11.

6.112.2.7

The lower scale reading for analogue ammeters on non-motor circuits shall not be less than 20 % of rated load.

6.112.2.8

Analogue wattmeters and varmeters shall be in accordance with IEC 60051-3 for three-phase unbalanced loads.

6.112.3 Energy metering

Static energy meters shall be rated for three-phase unbalanced loads in accordance with IEC 62052-11.

6.112.4 Transducer outputs

6.112.4.1

Transducer outputs shall be in accordance with IEC 60688.

6.112.4.2

Transducer outputs shall be wired to terminals in the outgoing terminal block.

Add new subclause

6.113 Protection devices

6.113.1

Protection relays shall be multi-function intelligent electronic devices (IEDs) in accordance with the IEC 60255 series.

6.113.2

HMIs and front of panel mounted relays shall be flush mounted.

6.113.3

The part of the protection device providing the protection function shall be demountable without disconnection of I/O wiring.

6.113.4

Protection relays shall have facilities for calibration and injection testing at the front of the functional unit without disconnection of secondary wiring.

6.113.5

Fuses for main circuit feeder protection shall be in accordance with IEC 60282-1.

6.113.6

Fuses for motor circuit protection shall be in accordance with IEC 60644.

Add new subclause

6.114 Cable terminations

6.114.1 Terminals for external conductors

6.114.1.1

Separate termination compartments for high-voltage and low-voltage connections shall be provided.

6.114.1.2

Where high-voltage terminations utilize cable lugs, high-voltage cable termination (bar) conductors shall be pre-drilled.

6.114.1.3

Where high-voltage terminations utilize cable glands, undrilled gland plates shall be provided.

6.114.1.4

Where single core line conductors have been specified, gland plates shall be fabricated using a non-magnetic material.

6.114.1.5

High-voltage terminations utilizing proprietary separable insulated connector systems shall be deadbreak connectors.

6.114.2 Terminals for control and auxiliary circuits

6.114.2.1

Wiring for external connections shall be brought out to individual terminals on a terminal block.

6.114.2.2

Terminal blocks shall be grouped by function and operating voltage.

6.114.2.3

Terminal block groups shall be separated using barrier plates or earthed terminals.

6.114.2.4

Functional groups, voltage levels and discrete terminals shall be identified by labels.

6.114.2.5

Terminals that remain live following a functional unit isolation shall display a warning label.

6.114.2.6

Terminals powered from external supplies shall display a warning label.

6.114.2.7

When specified, spare I/O contacts of protection/auxiliary relays shall be wired to terminal blocks and numbered.

6.114.2.8

Terminals associated with inductive current transformer circuits shall be provided with shorting links.

6.114.2.9

Instrument circuits requiring dedicated earthing shall be in accordance with IEC TR 61000-5-2.

Add new subclause

6.115 Interfaces

6.115.1 Interface with external equipment packages and control systems

Emergency shutdown interface relays shall be safety integrity level (SIL) rated in accordance with IEC 61511-1.

6.115.2 Application of communication protocols to protective functions

6.115.2.1

Digital interfaces shall be in accordance with IEC 62271-3.

6.115.2.2

Signals and values for protective functions exchanged by IEDs on the same IEC 61850 station bus network shall function independently of servers, firewalls and additional communications infrastructure.

Add new subclause

6.116 Condition monitoring

6.116.1 General

When specified, condition monitoring systems shall be in accordance with the requirements in 6.116.1.1 through 6.116.1.6

6.116.1.1

The system shall be integral to the assembly.

6.116.1.2

The system shall provide real-time continuous monitoring.

6.116.1.3

Sensors shall be maintenance free for at least 45 000 h (5 years).

6.116.1.4

Data shall be displayed on an HMI.

6.116.1.5

Data from monitored equipment shall be accessible by the site supervisory system.

6.116.1.6

The condition monitoring system shall not impact performance or continued service of the assembly.

6.116.2 Thermal monitoring

Busbar joints, circuit breaker to busbar connections and cable terminations shall, as a minimum, be monitored.

6.116.3 Partial discharge

Partial discharge condition monitoring shall be in accordance with IEC 60270.

6.116.4 Circuit breaker monitoring

Circuit breaker monitoring shall, as a minimum, include opening and closing times, spring charging data, failed spring charging attempts and number of operations.

8 Routine tests

8.6 Design and visual checks

Add new subclause

8.6.1

Visual inspection shall the validate the assembly layout in accordance with the manufacturer's drawings.

Add new subclause

8.6.2

Visual inspection shall validate the functional unit and assembly labelling.

Add new subclause

8.6.3

Visual inspection shall validate the integrity of internal wiring connections and earthing.

Add new subclause

8.6.4

Visual inspection shall validate wiring in accordance with final wiring diagrams.

8.102 Mechanical operation tests

In third paragraph, add new list item

– padlocking facilities, interlocks, mechanisms and limit switches function correctly.

11 Transport, storage, installation, operation and maintenance

Add new subclause

11.6 Special tools

11.6.1

Special tools for installation, operation and maintenance including circuit breaker operating handles, earthing switch operating handles and software interrogation cables, shall be shipped with the assembly.

11.6.2

Operational removable or withdrawable parts weighing more than 25 kg shall be provided with labels confirming the actual weight.

11.6.3

Where a separable voltage detecting and indicating system (VDIS) is specified, the external phase comparator instrument shall be provided.

13 Influence of the product on the environment

Add to clause

Handling of SF6 during manufacture, transport, installation and commissioning shall be in accordance with IEC 62271-4.

Add new Annex E

Annex E
(normative)

Additional requirements for fault current limiter assembly

E.1 General

This annex specifies requirements additional to the main body of this specification for fault current limiters incorporated within an assembly or forming a free-standing fault current limiter assembly.

E.2 Ratings – rated normal current and temperature rise

E.2.1 Rated normal current (I_r)

The rated continuous current (I_r) of the fault current limiter shall not be less than the rated continuous current of the associated incoming circuit, bus sections or bus coupler.

E.2.2 Rated short-time withstand currents (I_k)

The rated short-time withstand current (I_k) and the rated short-time phase to earth withstand current (I_{ke}) of the fault current limiter shall not be less than the rated short-time withstand currents of the associated incoming circuit, bus sections or bus coupler.

E.2.3 Rated peak withstand current (I_p)

The rated peak withstand current (I_p) and the rated peak phase-to-earth withstand current (I_{pe}) of the fault current limiter shall not be less than the rated peak withstand currents of the associated incoming circuit, bus sections or bus coupler.

E.2.4 Rated durations of short-circuit (t_k)

The rated duration of short-circuit current (t_k) and the rated duration of phase-to-earth short-circuit current (t_{ke}) of the fault current limiter shall not be less than the rated durations of short-circuit currents of the associated incoming circuit, bus sections or bus coupler.

E.3 Design and construction

E.3.1 Auxiliary and control equipment

E.3.1.1

Fault current limiter protective function circuits shall prevent common mode failures between phases including sensors, signal treatment and triggering system.

E.3.1.2

Fault current limiter protective function circuits shall provide an external function where operation is disabled when a system fault level is within an acceptable range.

E.3.1.3

Operation selector switches shall be lockable.

E.3.1.4

Operation selector switches shall be located front of panel.

E.3.1.5

A watchdog module shall be provided to continuously monitor triggering unit functions.

E.3.1.6

Triggering systems shall be powered by individually protected auxiliary circuits.

E.3.1.7

Triggering units shall operate independently of each other.

E.3.1.8

Front of panel operation selector switches shall provide "on", "inhibited" and "off" positions with auxiliary contacts for remote status indication.

E.3.2 Isolating switching devices (disconnectors)

The fault current limiter assembly shall provide isolation points on the incoming and outgoing sides of main circuit conductors.

E.3.3 Interlocking devices

E.3.3.1

Circuit-breakers installed in series with the fault current limiter shall be opened automatically when the fault current limiter is triggered.

E.3.3.2

Circuit-breakers installed in series with the fault current limiter shall be interlocked to prevent closure when interrupting elements are activated and the fault current limiter triggering unit is not reset.

E.3.3.3

Access to the fault current limiter compartment shall be prevented unless in-series circuit-breakers are open.

E.3.3.4

Access to the fault current limiter compartment shall be prevented unless the in-series connected switching devices or isolators are in the open position.

E.3.3.5

Access to the fault current limiter compartment shall be prevented unless incoming and outgoing sides of the main circuit conductor are earthed.

E.3.3.6

Series switching devices or isolators shall be interlocked to prevent closure when fault current limiter earths are connected.

E.3.4 Design and visual checks

In addition to switchgear assembly inspections, fault current limiters shall have functional checks of the measuring unit, the triggering and indication unit, excluding final elements.

E.4 Transport, storage, installation, operation and maintenance

E.4.1 Special tools

E.4.1.1

Special tools for fault current limiter installation, operation and maintenance shall be shipped together with the assembly.

E.4.1.2

A test unit with leads shall be provided for commissioning and function testing.

E.4.1.3

Three-phase copper bars shall be provided.

E.4.1.4

The three-phase copper bars shall be attachable at the active elements point of connection.

E.4.1.5

The three-phase copper bars shall be of a current rating equal to the assembly busbars.

E.4.2 Basic input data by the manufacturer

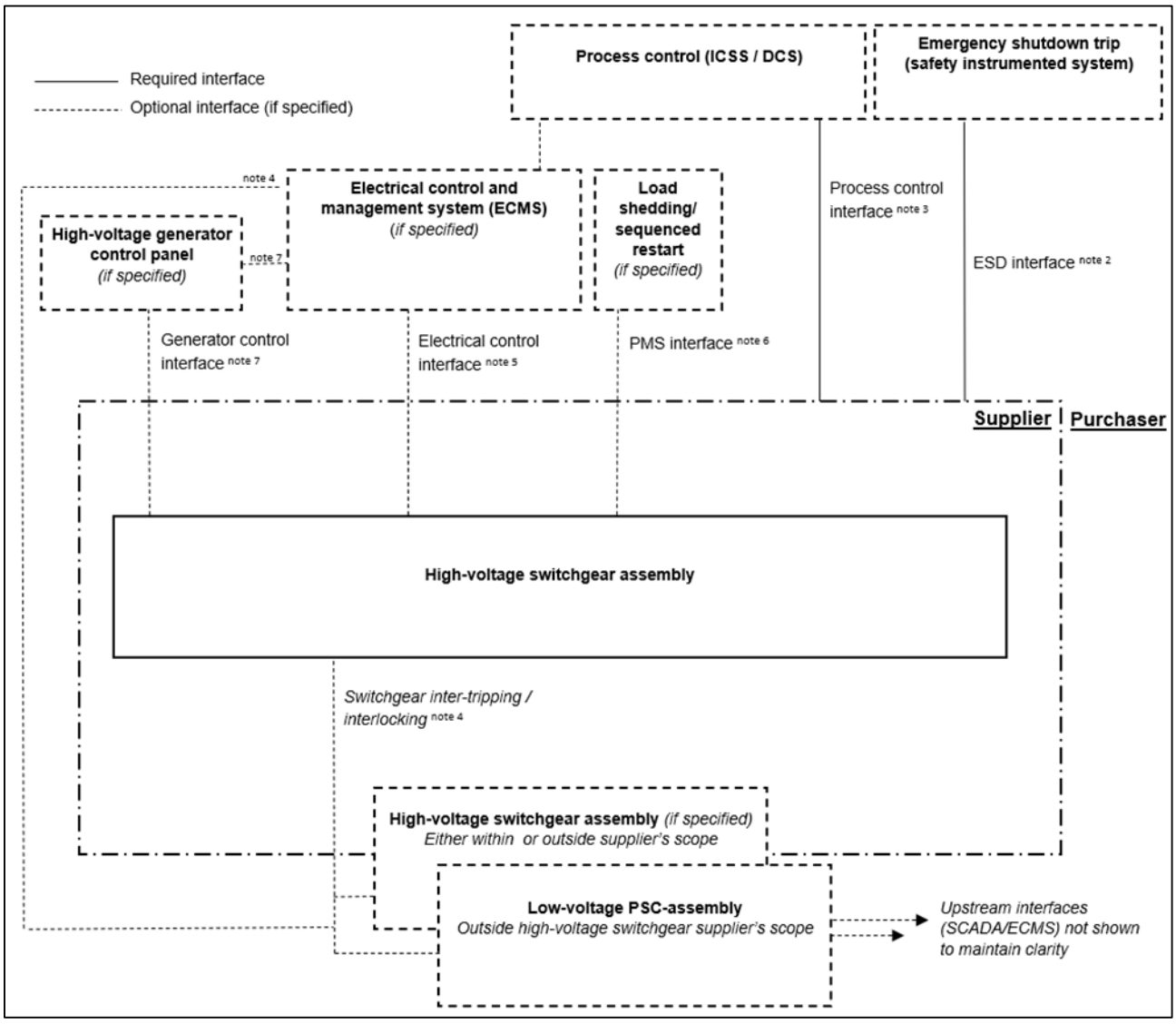
The triggering value of the fault current limiter shall be set according to the specified minimum and maximum short-circuit fault level.

Add new Annex F

Annex F
(informative)

Integration with external systems

Add new Figure F.1



Note 1 This figure is for illustrative purposes only as control system integration topologies are user/project specific. This figure is not intended to assign any IEC 62264-1 (ISA-95) hierarchy levels 0 to 4 or imply any demilitarized zone (DMZ) perimeter boundaries.

Note 2 High integrity emergency shutdown – highest priority interface. Assumed default is hardwired fail-safe. The alternate use of SIL rated digital protocol control is subject to user agreement.

Note 3 Interface between the automated process control system and process related load circuits. It is either discrete hardwired I/O or via digital protocol, or multiple interfaces (mainly via digital protocol but with hardwired motor stop/starts as defined by the user). The process control interface should be segregated/firewalled from the electrical control and management system (ECMS).

Note 4 Incoming circuit breaker intertripping/interlocking to either downstream (low-voltage) switchboards or interconnectors to adjacent high-voltage switchgear assemblies. The assumed default is hardwired from switchgear assembly to downstream switchboards, but it may also be IED-to-IED communication or via the ECMS.

Note 5 Non-process control/supervisory interface to an ECMS. It may also enable network connectivity to the process control system, other high-voltage switchgear assemblies and generator control panels(s). The ECMS may enable authorized user interface for IED remote configuration / remote access.

Note 6 Interface to power management system (PMS) for load shedding and/or sequenced restart. The PMS may be integral to the ECMS with communication via the electrical control interface or a standalone load shedding system acting directly on the switchgear assembly circuits, (e.g. hardwired discrete trips, load start inhibits and status monitoring).

Note 7 It is typically for on-site generation, switchgear assembly to generator control interface for the generator incomer circuit breaker control. The interface may be hardwired, IED-to-IED communication or via the ECMS.

Figure F.1 – Communications interface block diagram

Bibliography

Add to Bibliography

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[16] IEC 62402, *Obsolescence management – Application guide*

Registered Office
City Tower
Level 14
40 Basinghall Street
London EC2V 5DE
United Kingdom

T +44 (0)20 3763 9700
reception@iogp.org

Brussels Office
Avenue de Tervuren 188A
B-1150 Brussels
Belgium

T +32 (0)2 790 7762
reception-europe@iogp.org

Houston Office
15377 Memorial Drive
Suite 250
Houston, TX 77079
USA

T +1 (713) 261 0411
reception-americas@iogp.org

www.iogp.org



22 ANNEX III – "QUALITY REQUIREMENTS FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR– SPECIFICATION S-620Q"

International Association of Oil & Gas Producers

SPECIFICATION

IOGP S-620Q

December 2022

Version 2.0

Quality Requirements for High-voltage Switchgear and Controlgear (IEC)

JIP33 JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
2.0	December 2022	Second Edition
1.0	October 2018	First Edition

Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

This second edition cancels and replaces the first edition published in October 2018.

Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

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Introduction

The purpose of this quality requirements specification (QRS) is to specify quality management requirements and the proposed extent of purchaser intervention activities for the procurement of high-voltage switchgear and controlgear in accordance with IOGP S-620 for application in the petroleum and natural gas industries.

Purchaser intervention activities are identified through the selection of one of four conformity assessment system (CAS) levels based on a risk and criticality assessment. The applicable CAS level is specified by the purchaser in the procurement data sheet or purchase order.

This QRS shall be used in conjunction with the specification (IOGP S-620), the procurement data sheet (IOGP S-620D) and the information requirements specification (IOGP S-620L) which together comprise the full set of specification documents. The introduction section in the specification provides further information on the purpose of each of these documents and the order of precedence for their use.



JIP33 Specification for Procurement Documents
Quality Requirements Specification

1 Scope

To specify quality management requirements for the supply of high-voltage switchgear and controlgear to IOGP S-620 including:

a) supplier quality management system requirements;

b) purchaser conformity assessment (surveillance and inspection) activities;

c) traceability requirements.

2 Normative references

For the purpose of this document, the documents referenced in IOGP S-620 and those listed below, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

IOGP S-620, *Supplementary Specification to IEC 62271-200 for High-voltage Switchgear and Controlgear*

ISO 9001, *Quality management systems — Requirements*

ISO 29001, *Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IOGP S-620 and ISO 9000 (normative to ISO 9001), and the following shall apply.

3.1
conformity assessment
demonstration that specified requirements are fulfilled

Note 1 to entry: Conformity assessment (or assessment) includes but is not limited to review, inspection, verification and validation activities.

Note 2 to entry: Assessment activities may be undertaken at a supplier/sub-supplier's premises, virtually by video link, desktop sharing, etc. or by review of information.

3.2
conformity assessment system
CAS
system that provides different levels of purchaser interventions to assess and verify supplier conformance to specified requirements

Note 1 to entry: CAS A applies to the highest risk and associated extent of verification. CAS D is the lowest.

3.3
hold point
H
<conformity assessment> point in the chain of activities beyond which an activity shall not proceed without the approval of the purchaser or purchaser's representative

3.4
witness point
W
<conformity assessment> point in the chain of activities that the supplier shall notify the purchaser or purchaser's representative before proceeding

Note 1 to entry: The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

3.5
surveillance
S
<conformity assessment> observation, monitoring or review by the purchaser or purchaser's representative of an activity, operation, process, product or associated information

3.6
review
R
<conformity assessment> review of the supplier's information to verify conformance to requirements

4 Symbols and abbreviations

For purposes of this document, the following symbols and abbreviations apply.

CAS	conformity assessment system
IRS	information requirements specification
QMS	quality management system
QRS	quality requirements specification (this document)

5 Quality requirements

5.1 Quality management system

The manufacturer shall operate and maintain a quality management system (QMS) that conforms with ISO 9001, ISO 29001, API Specification Q1 or an equivalent quality management system standard.

5.2 Conformity assessment system (CAS)

5.2.1

The conformity assessment system (CAS) provides different levels of assessment of the supplier control activities. The CAS level is defined by the purchaser, using a risk-based approach, and included in the purchase order/contract. The defined CAS level may be adjusted by the purchaser during manufacture based on supplier performance and re-assessment of risk.

NOTE For industrial proven solutions, CAS level D is specified unless risk assessment indicates that a more stringent CAS level is required.

5.2.2

Quality plans and inspection and test plans shall include provision for purchaser intervention activities based on the CAS level selected in the procurement data sheet or purchase order. See Annex A.

5.2.3

Supplier performance in meeting the requirements may be routinely assessed during execution of the scope and where appropriate, corrective action requested and conformity assessment activities increased or decreased consistent with criticality and risk.

6 Certification and traceability

The manufacturer shall maintain traceability of sub-assembly components including, but not limited to, gas insulated switchgear, air insulated switchgear, moulded case circuit breakers, intelligent electronic devices, busbars and bus duct, voltage transformers and current transformers to the original component manufacturer tag / serial number and where applicable, associated certification.

7 Evidence — conformance records

Documents and information shall be provided for in accordance with the associated IRS.

Annex A
(normative)
Purchaser conformity assessment requirements

This annex defines four conformity assessment systems (CAS) or levels of purchaser assessment.

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
1	**Operational planning and control activities**				
1.1	Quality planning	H	W	S	-
1.2	Inspection and test planning	H	H	W	R
1.3	Pre-assessment/inspection planning	H	W	W	-
2	**Design and development activities**				
2.1	Type testing (if type test certificates are not available)	H	H	H	H
3	**Control of external supply**				
3.1	External supply scope, risk assessment and controls	H	W	S	-
3.2	Nominated sub-suppliers of circuit breakers and protective devices	H	W	-	-
4	**Production and service provision**				
4.1	Materials verification				
4.1.1	Input material and components identification, traceability and certification (IOGP S-620 5.5, 6.3.102, E.4.1.3)	S	S	S	-
4.2	Assembly routine tests				
4.2.1	Dielectric test on the main circuit (IOGP S-620 8.2)	H	W	S	R
4.2.2	Test on auxiliary and control circuits (IOGP S-620 8.3.1, 8.3.2)	H	W	S	-
4.2.3	Measurement of the resistance of the main circuits (IOGP S-620 8.4)	W	W	S	-
4.2.4	Tightness test (applicable to gas/liquid-filled assemblies only) (IOGP S-620 8.5)	W	W	S	-
4.2.5	Design and visual checks (IOGP S-620 8.102, 8.6.1, 8.6.2, 8.6.3, 8.6.4)	H	W	S	-
4.2.6	Mechanical operation test (IOGP S-620 8.102)	H	W	S	-
4.2.7	Pressure tests of gas compartments (applicable to gas filled assemblies only) (IOGP S-620 8.103)	W	W	R	R
4.3	Switchgear special tests (if included in scope as defined by the user in the data sheets) (IOGP S-620, Clause 7)				
4.3.1	Partial discharge measurement (IOGP S-620 8.101)	H	W	S	-
4.3.2	ECMS simulation test	H	W	S	-

	PURCHASER ASSESSMENT ACTIVITIES *(continued)*	CAS			
		A	B	C	D
5	**Release of product or service**				
5.1	Verify conformance to purchase order including as applicable				
5.1.1	Inspection of loose ship item, spares special tools as applicable (IOGP S-620 11.6.1, 11.6.3, E.4.1.1)	W	W	S	-
5.1.2	Handling, preservation and packaging	W	W	S	-
5.2	Release equipment	H	H	H	H

Key
H: Hold point
W: Witness point
R: Review
S: Surveillance

Registered Office
City Tower
Level 14
40 Basinghall Street
London EC2V 5DE
United Kingdom

T +44 (0)20 3763 9700
reception@iogp.org

Brussels Office
Avenue de Tervuren 188A
B-1150 Brussels
Belgium

T +32 (0)2 790 7762
reception-europe@iogp.org

Houston Office
15377 Memorial Drive
Suite 250
Houston, TX 77079
USA

T +1 (713) 261 0411
reception-americas@iogp.org

www.iogp.org



23 ANNEX IV: "INFORMATION REQUIREMENTS FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR– SPECIFICATION S-620L"

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy.

International Association of Oil & Gas Producers

SPECIFICATION
IOGP S-620L

December 2022
Version 2.0

Information Requirements for High-voltage Switchgear and Controlgear (IEC)

JIP33
JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
2,0	December 2022	Second Edition
1,0	October 2018	First Edition

Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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IOGP S-620L (2.0) Information Requirements for High-voltage Switchgear and Controlgear (IEC)

Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

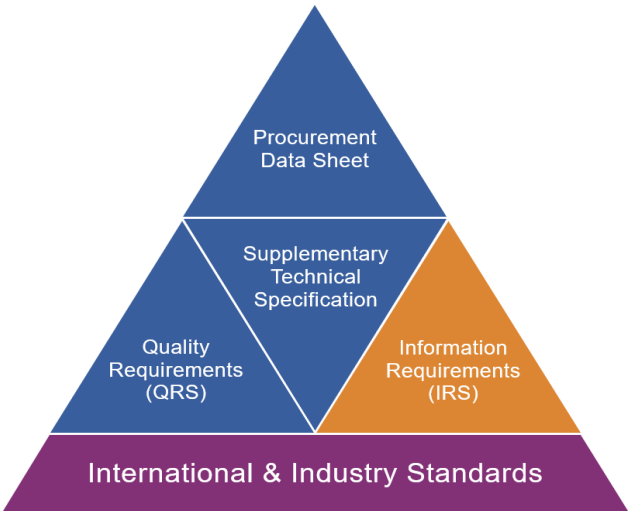
This second edition cancels and replaces the first edition published in October 2018. Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

IOGP S-620L (2.0) Information Requirements for High-voltage Switchgear and Controlgear (IEC)

Introduction

The purpose of this information requirements specification (IRS) is to define information requirements for the procurement of high-voltage switchgear and controlgear in accordance with IOGP S-620 for application in the petroleum and natural gas industries. The IRS defines the information requirements, including format, timing and purpose, for information to be provided by the supplier. It also defines the specific conditions which must be met for conditional information requirements to become mandatory. The information requirements listed in the IRS provide references to the source of the requirement.

This IRS shall be used in conjunction with the specification (IOGP S-620), procurement data sheet (IOGP S-620D) and quality requirements specification (IOGP S-620Q) which together comprise the full set of specification documents. The introduction section in the specification provides further information on the purpose of each of these documents and the order of precedence for their use.



JIP33 Specification for Procurement Documents
Information Requirements Specification

IOGP S-620L (2.0) Information Requirements for High-voltage Switchgear and Controlgear (IEC)

Instructions

In response to invitation to tender (ITT)

Suppliers shall submit information as defined in column E 'Submit At Proposal' in 'Requirements' sheet and in accordance with the ITT instructions.

On award of purchase order (PO)

Specified information requirements shall be submitted in accordance with the purchase order information submission instructions.
Suppliers shall prepare and submit the supplier master information schedule (SMIS) incorporating information requirements in accordance with column F 'First Issue Post Purchase Order' in the 'Requirements' sheet.
The supplier shall demonstrate compliance with each IRS requirement either:
a) by providing document number cross reference to the requirement in the SMIS; or
b) if specified in the purchase order, by using column J 'Fulfilled by Document Number(s)' in the 'Requirements' sheet.

On completion of scope

Suppliers shall validate that the information delivered meets the IRS requirements either:
a) through cross reference to the deliverable type in a as-built version of the SMIS; or
b) if specified in the purchase order, by providing an as-built version of the IRS with column J 'Fulfilled by Document Number(s)' in the 'Requirements' sheet populated with the specific document numbers issued to the purchaser.

IRS Structure Contents

1 'Front & Preliminaries' sheet

The 'Front & Preliminaries' sheet comprises the standard JIP33 introductory sections: IRS front sheet, revision history table, acknowledgements, disclaimer, copyright notice, foreword and introduction.

2 'Instructions' sheet

The 'Instructions' sheet provides instructions that suppliers shall follow in response to this IRS.

3 'Requirements' sheet

The 'Requirements' sheet lists information requested during tendering and shall be supplied following award of the PO.

The information requirements are grouped under three broad categories:

— Contract Management Information Requirements
Key information requirements relating to planning, managing, assuring and reporting the execution of the technical scope.

— Technical Information Requirements
Technical information developed by the supplier or their sub-suppliers, during the execution of the PO.

— Purchase Order Specific Information Requirements
Information requirements specified by the purchaser in addition to those detailed by the IRS to meet specific operational, project or legislative requirements.

The 'Requirements' sheet comprises columns A to L.

Column A — 'Code' contains IOGP JIP33 unique record identification code specific to the individual information requirement for the particular equipment.

Column B — 'Information Requirements' contains data, documents or models to be provided by suppliers, based on the industry standard or IOGP JIP33 specification.

Column C — 'Condition Invoking Requirement' identifies any specific conditions under which the information requirement is deemed to be needed.

Column D — 'Typical Deliverable' is provided for the purchaser to identify the deliverable type that the information would typically appear within. This also allows the purchaser's requisitioning engineers to group the various information requirements by deliverable type. This column accommodates names from CFIHOS discipline-document types.

Column E — 'Submit At Proposal' (Yes / No) defines if the information requirement is requested to be submitted with the supplier's proposal. Preliminary information submitted at proposal shall be matured and delivered to the purchaser as per the PO and delivery times identified in column G 'Weeks' and column H 'Period'.
As default, column ‘Submit At Proposal’ is prepopulated for CAS D procurement.

Column F — First Issue Post Purchase Order, 'Purpose' (For Information / For Acceptance) is prepopulated for CAS D procurement.
'For Information' means that information is issued for information only.
'For Acceptance' means that the information is issued for client, or delegated authorised person/organisation, to review and accept the content for use in further equipment development activities.
Information acceptance does not relieve the supplier of any PO responsibility or liability.

Column G and Column H — First Issue Post Purchase Order, ('Weeks' and 'Period') include durations for the first issue of the deliverable with respect to specific activities.

(Period)	Long description
WAD	Weeks After Delivery
WAI	Weeks After Inspection
WAO	Weeks After Order
WAO (Monthly)	Weeks After Order Monthly
WAT	Weeks After Test
WPTD	Weeks Prior To Delivery
WPTF	Weeks Prior to Fabrication
WPTT	Weeks Prior To Test

Table 1 — Information Submission Abbreviations

Column I — 'Required As Built' (Yes / No), where “Yes” chosen, identifies any information requirements that shall incorporate all changes that have been made to the procured equipment original information prior to the completion of the PO.

Column J — 'Fulfilled by Document Number(s)' shall be used by the supplier to demonstrate compliance with the information requirement either:
a) by providing document number cross reference to the information requirement in the SMIS; or
b) if specified in the PO, by using this column within IRS .

Column K — 'Translation Required' (Yes / No)
Specifies if the information requirement shall be translated into another language additional to the main language specified in the PO.
'Yes' means the information requirement should be translated into other language(s) additional to the main language (to be advised in contractual documentation).
'No' means to be provided in main language only.

Column L — 'Remarks' may include additional information needed to clarify the information requirement.

4 'Definitions' sheet

The 'Definitions' sheet comprises columns A to F.

Column A — 'Code' contains the JIP33 unique record identification code specific to the individual information requirement for the particular equipment.

Column B — 'Information Requirements' contains data, documents or models to be provided by suppliers, based on the industry standard or IOGP JIP33 specification.

Column C — 'Description' provides a description of the information requirement based on an industry standard, or developed by IOGP JIP33 or JIP36 (CFIHOS).

Column D — 'Reference' gives a reference to the IOGP JIP33 specification where the information requirement is identified.

Column E — 'Format' identifies the format of the relevant information deliverable to be submitted by the supplier as described in Table 2 below.
Note: Project or software specific formats shall be specified by the purchaser by means of their hand over specifications.

Drop-down value	Definition	CFIHOS ID
Native	A native file is the default file format that a software application is designed to work with.	CFIHOS-60000835
PDF	A universal file format developed by Adobe® and standardized as ISO 32000 which preserves all the fonts, formatting, graphics, and colour of any source document, regardless of the application and platform used to create it. PDF's must be in Optical Character Recognition (OCR) format which is text searchable and indexed.	CFIHOS-60000933
Hardcopy	A permanent reproduction or copy of data which cannot be easily edited or manipulated, in the form of a physical object, of any media suitable for direct use by a person (e.g. paper).	CFIHOS-10000123

Table 2 — Deliverable Formats

Column F — 'CFIHOS Document Type Code' relates to the CFIHOS document type that is used to classify the document having this IRS content.

5 Abbreviations and definitions

The following abbreviations, terms and definitions have been used in the various sheets of this workbook.

buyer	organisation placing a contract or purchase order with supplier for equipment or services on project; may be alternatively referred to as 'user' or 'purchaser'
CFIHOS	Capital Facilities Information Hand Over Specification
company	project operating entity or the organisation the contractor is under contract to
contractor	project contractor responsible for procuring equipment.
information	data, documents and/or models
IRS	information requirements specification
PO	purchase order
QRS	quality requirements specification
SMIS	supplier master Information schedule
supplier	organisation supplying equipment or services to the company and/or contractor on project; may alternatively be referred to as "vendor", "seller" or "manufacturer".

6 CFIHOS

The information requirements in the IRS are classified according to the IOGP JIP36 Capital Facilities Information Hand Over Specification (CFIHOS). The objective of mapping JIP33 IRS information requirements to CFIHOS is to facilitate value delivery across the supply chain through increased digitalization. Further information on CFIHOS can be found at:

https://www.jip36-cfihos.org

7 Document metadata

Typical metadata for Information deliverables to be provided by suppliers in the SMIS is shown in Table 3 below. Metadata listed below are as per CFIHOS defined document properties (metadata) defined in CFIHOS C-SP-001 CFIHOS Specification Document, chapter Document properties (metadata).

Name	Definition	CFIHOS unique ID
Document number	The document master to which this revision is related	CFIHOS-10000154
Document revision code	A code used to identify the content of a document at a certain point in time.	CFIHOS-10000162
Document title	A description, in a short and concise manner, of the content of the document	CFIHOS-10000168
Document revision date	The date the document was revised	CFIHOS-10000076
Originator company	The name of the company who has generated the document revision	CFIHOS-10000077
Document revision author	The name of the person who created the document revision	CFIHOS-10000078
Document revision approver	The name (or the User ID) of the person who has approved the document revision	CFIHOS-10000079
Document revision file name	The name of the electronic file (including the file extension) with the full path. When this attribute is populated the attribute physical storage location shall be left empty.	CFIHOS-10000080
Originator document number	The unique identifier for the Document according to the originator document numbering scheme.	CFIHOS-10000160
Originator document revision code	A code used to identify the content of a document at a certain point in time according to the originator which doesn't necessarily conform to the Owner/Operator's document revision coding scheme.	CFIHOS-10000081
Document status code	The status of the document revision	CFIHOS-10000083
ISO language code	The primary language that the document revision is written in.	CFIHOS-10000147
Document type short code	At alternate way of identifying uniquely a combination of discipline and document type	CFIHOS-10000207
Project code	The code that identifies the project the document revision refers to.	CFIHOS-10000161
Document revision comment	Any additional comment / explanation for a document revision.	CFIHOS-10000085
Plant code	The plant that the document revision is related to.	CFIHOS-10000005
Export control classification	The Export Control Rule that is applicable for the document revision (e.g., ECCN, EAR).	CFIHOS-10000086
Transmittal number	The transmittal through which this document revision was communicated.	CFIHOS-10000087
Security classification	Indicates internal Owner-Operator access restriction applicable for the document	TBA

Table 3 — Supplier Deliverable Metadata

IOGP S-620L (2.0) Information Requirements for High-voltage Switchgear and Controlgear (IEC)

JIP33 JOINT INDUSTRY PROGRAMME

Requirements

Column	Heading — Details and requirements
A	Code — Contains IOGP JIP33 unique record identification code specific to the individual information requirement for the particular equipment.
B	Requirement — Contains data, documents or models to be provided by suppliers, based on the industry standard or IOGP JIP33 specification.
C	Condition Invoking Requirement — Describes condition(s) under which the information requirement is required (e.g. service offshore and weight greater than one tonne means information is required). Note: if blank, always required.
D	Typical Deliverable — Purchaser to advise the short description of the information deliverable that would typically include this information requirement
E	Submit At Proposal — 'Yes' or 'No', where 'Yes' means the information requirement is required to be submitted with the supplier's proposal or 'No' is not required.
F, G & H	First Issue Post Purchase Order — Issue purpose ('For Information' or 'For Acceptance'), time in weeks for issue of the information requirement and period defined after the purchase order placement. See the 'Instructions' sheet, Table 1 for full description of codes use in column H 'Period'.
I	Required As Built — Any information incorporating all changes that have been made to the procured equipment original information prior to the completion of the purchase order.
J	Fulfilled by Information Deliverable Number(s) — Identifies which information requirement(s) listed in the supplier master information schedule (SMIS) addresses the purchaser's requirements. Note: It should be noted that one information deliverable can fulfil more than one information requirement.
K	Translation Required — 'Yes' or 'No', specifies if the information requirement shall be translated into another language additional to the main language specified in the purchase order.
L	Remarks — Additional information needed to clarify the information requirement.

Col A	Col B	Col C	Col D	Col E	Col F	Col G	Col H	Col I	Col J	Col K	Col L
Code	Requirement	Condition Invoking Requirement	Typical Deliverable	Submit At Proposal	First Issue Post Purchase Order			Required As Built	Fulfilled by Document Number(s)	Translation Required	Remarks
				(Yes/No)	Purpose	(Weeks)	(Period)	(Yes/No)			
Contract Management Information Deliverables											
S620-IR-66	Supplier master information schedule		Information deliverables list	No	For Information		-	-		-	
S620-IR-67	Delivery schedule		Delivery/production schedule	Yes	For Information		-	-		-	Preliminary with proposal
S620-IR-68	Progress report		Progress report	No	For Information		-	-		-	
S620-IR-69	Quality plan	Required for CAS A, CAS B	Quality plan	-	-		-	-		-	Preliminary with proposal
S620-IR-71	Sub-supplier delivery schedule		Delivery/production schedule	Yes	For Information		-	-		-	Preliminary with proposal
S620-IR-72	Inspection and test plan (ITP)		Inspection and test plan (ITP)	Yes	For Acceptance		-	-		-	Preliminary with proposal
S620-IR-73	Handling, shipping and storage procedure		Handling, shipping and storage procedure	No	For Acceptance		-	-		-	
S620-IR-74	Non-conformance records		Non-conformance records	No	For Information		-	-		-	
S620-IR-75	Concession request		Concession request	No	For Acceptance		-	-		-	
S620-IR-76	Obsolescence management plan		Obsolescence management plan	Yes	For Information		-	-		-	Preliminary with proposal
S620-IR-77	IED configuration responsibilities	Where IEDs are included in scope	Authority matrix	Yes	For Information		-	-		-	Preliminary with proposal
Technical Information Deliverables											
S620-IR-78	Functional design specification		Functional design specification	Yes	For Information		-	-		-	
S620-IR-79	General arrangement details		General arrangement diagram	Yes	For Acceptance		-	-		-	Preliminary with proposal
S620-IR-80	Foundation and Installation details		Installation diagram	No	For Information		-	-		-	
S620-IR-81	Current transformer sizing calculations		Curves and tables calculations	No	For Information		-	-		-	
S620-IR-82	Current transformer characteristics		Curves and tables calculations	No	For Information		-	-		-	
S620-IR-83	High-voltage protective devices characteristics and ratings		Curves and tables calculations	No	For Information		-	-		-	
S620-IR-84	Utility load schedule		Utility consumption report	No	For Information		-	-		-	
S620-IR-85	Heat dissipation calculation and loads		Heat dissipation calculation and loads	No	For Information		-	-		-	
S620-IR-86	Connection diagram		Connection diagram	No	For Information		-	-		-	
S620-IR-87	Switchgear I/O schedule	Where IEDs included in scope	Input, output list	No	For Information		-	-		-	
S620-IR-88	Functional logic diagram		Logic diagram	No	For Acceptance		-	-		-	
S620-IR-89	Switchgear single line diagram		Single line diagram	No	For Acceptance		-	-		-	
S620-IR-126	Gas compartment diagram	Where GIS switchgear is provided	Single line diagram	No	For Acceptance		-	-		-	
S620-IR-128	Arc duct or gas duct arrangement drawing		Arrangement drawing	No	For Acceptance		-	-		-	
S620-IR-90	Circuit and wiring diagram		Wiring diagram	No	For Acceptance		-	-		-	
S620-IR-91	Inter-panel wiring diagram		Connection diagram	No	For Information		-	-		-	
S620-IR-125	Inter-panel logic diagram		Logic diagram	No	For Acceptance		-	-		-	
S620-IR-92	Probability of failure on demand reliability data	Where SIL performance requirements are included in scope	Reliability, availability, safety integrity level calculation	No	For Information		-	-		-	
S620-IR-93	IED interrogation and programming software	Where IEDs included in scope	Application software	No	For Information		-	-		-	
S620-IR-94	Relay IED configuration files	Where IEDs included in scope	Configuration file	No	For Information		-	-		-	
S620-IR-95	IEC 61850 configuration files	Where IEDs included in scope with IEC 61850 interface to remote systems	Configuration file	No	For Information		-	-		-	
S620-IR-123	Manufacturer data sheet		Manufacturer data sheet	Yes	For Acceptance		-	-		-	
S620-IR-96	Installation manual		Installation manual	No	For Information		-	-		-	
S620-IR-110	Maintenance manual		Maintenance manual	No	For Information		-	-		-	
S620-IR-111	Operating manual		Operating manual	No	For Information		-	-		-	
S620-IR-97	Recommended spare part list (RSPL)		Spare part list	No	For Information		-	-		-	
S620-IR-124	Special tools list		Special tools list	No	For Information		-	-		-	
S620-IR-98	Chemical inventory and material safety data sheets		Manufacturer data sheet	No	For Information		-	-		-	
S620-IR-99	Bill of materials		Bill of materials	No	For Information		-	-		-	
S620-IR-100	Type test certificate		General certificate	No	For Information		-	-		-	
S620-IR-101	Lifting equipment test certificate	If lifting equipment included in scope	Lifting equipment test certificate	No	For Information		-	-		-	
S620-IR-102	Weight data sheet		Weight report	No	For Information		-	-		-	
S620-IR-103	ECMS simulation test procedure	If ECMS simulation included in scope	Test procedure	No	For Acceptance		-	-		-	
S620-IR-104	ECMS simulation test report	Where IEDs included in scope	Test report	No	For Information		-	-		-	
S620-IR-105	Routine verification test (FAT) procedure		Factory acceptance test (FAT) procedure	No	For Acceptance		-	-		-	
S620-IR-106	Routine verification test (FAT) results		Factory acceptance test (FAT) records	No	For Acceptance		-	-		-	
S620-IR-108	Site acceptance test (SAT) procedure		Site acceptance test (SAT) procedure	No	For Acceptance		-	-		-	To incorporate site interfaces
S620-IR-109	Site acceptance test (SAT) report		Site acceptance test (SAT) records	No	For Acceptance		-	-		-	
S620-IR-127	Cyber security certification	Where specified	Cyber Security Documentation	No	For Information		-	-		-	
S620-IR-107	Certificate of conformity	Where class or regional certification is included in scope	Certificate of conformance	No	For Information		-	-		-	Marine class approval from an independent verification body
Purchase Order Specific Information Requirements											

IOGP S-620L (2.0) Information Requirements for High-voltage Switchgear and Controlgear (IEC)

Definitions

Column	Heading — Details and requirements
A	Code — Contains IOGP JIP33 unique record identification code specific to the individual information requirement for the particular equipment.
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C	Description — Provides a description of the information requirement based on an industry standard, or developed by IOGP JIP33 or JIP36 (CFIHOS).
D	Reference — Reference to the IOGP JIP33 specification where the information requirement is identified.
E	Format — Defines the required format of the relevant information requirement to be submitted by the supplier.
F	CFIHOS Document Type Code — CFIHOS document type code that is used to classify the document having this IRS content.

Col A	Col B	Col C	Col D	Col E	Col F
Code	**Requirement**	**Description**	**Reference**	**Format**	**CFIHOS Document Type Code**
		Contract Management Information Deliverables			
S620-IR-66	Supplier master information schedule		10,1	PDF	CFIHOS-70000099
S620-IR-67	Delivery schedule	Schedule depicting, as applicable to the service or product scope, design, supply, manufacture, inspection, testing and delivery activities to be executed by manufacturer/suppliers. Schedule details typically** include;. a) Contractual milestones b) Activity early/late start/completion dates, durations, dependencies (Calendar Dates) c) Critical path and float d) Outsourced services and equipment (cross referenced to purchase order and supplier) e) Information deliverable submission dates identifying any execution activity dependencies Once agreed , changes to planned dates are subject to agreement by user. Progress against planned dates is measured and the schedule updated and reported to the user in accordance with contract reporting agreements. ** Schedule development tools, formats and submission protocols follow the manufacturer's standard practice unless otherwise agreed in the contract.		PDF	CFIHOS-70000298
S620-IR-68	Progress report	Report detailing activities completed in the period, percent complete against planned, activities planned for the next period, risks/areas of concern, cause of any delays and proposed recovery plans, concessions, internal and outsourced inspection and audit activities.. Note: may also include actionable items such as Health, Safety, Security & Environment (HSSE) incidents & status if required under the Contract.		PDF	CFIHOS-70000300
S620-IR-69	Quality plan	Plan specifying the actions, responsibilities and associated resources to be applied by the manufacturer, and when applicable sub-suppliers, to deliver the services or procured item(s) in conformance with the agreed requirements. ISO9001 Clause 8.1 and ISO10005 may be used to inform the development of quality plans for specific applications, processes or products..		PDF	
S620-IR-71	Sub-supplier delivery schedule	Definition of processes, products or services that will be externally provided and the controls to be applied by the [supplier] to ensure conformance with agreed requirements. The schedule includes evidence of the basis of capability assessment , quality management system certification (or equivalent), process or product qualification for proposed suppliers of outsourced products and services when nominated in the Contract or Quality Requirements Specification (QRS) . Note: ISO9001, API Specs Q1/Q2 define requirements for assessing risks and establishing controls for outsourced products and services.		PDF	CFIHOS-70000298
S620-IR-72	Inspection and test plan (ITP)	Tabular presentation of a quality plan typically used for process or product applications to define the specific sequence of operational activities, instructions, acceptance criteria, records and associated manufacturer, user and independent conformity assessment activities. ISO9001 Clause 8.1 and ISO10005 may be used to inform the development of inspection and test plans for specific processes and products.		PDF	CFIHOS-70000180
S620-IR-73	Handling, shipping and storage procedure	Definition of practices to be followed during the; storage, transport, lifting and preservation of the equipment and materials included in the scope of supply to maintain their functionality and guarantees. Procedures typically define: a) Packaging requirements; contents, identification, size, weight and number of packages/container (s), b) special packing/unpacking/handling requirements c) storage location and requirements, d) preservation requirements detailing inspection periods and required maintenance, materials required etc., both prior to installation and post installation, but prior to commissioning.		PDF	CFIHOS-70000154
S620-IR-74	Non-conformance records	Details of non-conformances raised by or to the manufacturer/sub suppliers against technical requirements prior to or during the delivery of the products or services. Non-conformance is managed by the manufacturer in accordance with ISO9001 Clause 8.7 and associated records typically include; description of non-conformance, analysis and disposition, correction implemented and details of any retesting or inspection taken to demonstrate subsequent conformance. Note: Instances where the proposed disposition is to accept a nonconforming condition are subject to agreement by the user in accordance with the concession management protocols defined in the Contract.		PDF	CFIHOS-70000226
S620-IR-75	Concession request	Formal submission seeking user agreement to accept deviations from the contracted scope or technical requirements. Requests may be raised as a result of, as examples, material or service availability, obsolescence, innovation, non-conformance. Requests are typically raised as required during execution with a summary report detailing concessions raised, user directions, agreed action status provided with progress reports and at contract closeout		PDF	CFIHOS-70000389
S620-IR-76	Obsolescence management plan	Plan defining the manufacturer's co-ordinated activities to direct and control the strategies for the identification and mitigation of the effects of obsolescence to the user, through all stages of the life of all components within the high-voltage switchgear and controlgear assembly. An example of the principles of this plan is defined within IEC 62402, Obsolescence management – Application guide.		PDF	
S620-IR-77	IED configuration responsibilities	Responsibility matrix or flow chart detailing device configuration and set-point responsibilities including protection relay, IED generic configuration and IED functional logic files for the purpose of interface control between user and manufacturer during the development of the switchgear and controlgear assembly.	6.113.1	PDF	CFIHOS-70000023
		Technical Information Deliverables			
S620-IR-78	Functional design specification	A document containing specific design data and performance requirements for the equipment. This document covers the design, available functionality and the hardware included in the scope. This document can also include images of hardware, topology sketches and extracts from general arrangement drawings in addition to text to provide a common understanding of the assemblies. To include motor starter and contactor feeder number of on-load operating cycles. Details to include integration with site systems and equipment interlocking/intertripping functionality.	E.3.1.7	PDF	CFIHOS-70000244
S620-IR-79	General arrangement details	The manufacturer's standard general arrangement drawing showing overall dimensions and critical interface dimensions. The drawing contains references to main specifications and standards. For equipment / components the drawing may include cross sectional views. This will include details of the arc chutes when a dedicated arc chute arrangement drawing is not provided.	5.5, 6.103.2.4, 6.3.102, 6.116.1.1, 6.4.5.2.6, 8.6.1, E.3.1.4	PDF	CFIHOS-70000153
S620-IR-80	Foundation and Installation details	The manufacturer's standard installation drawing showing; • Critical interface dimensions • Interface connections • Weight of assemblies, equipment and components • Centre of gravity • Withdrawal/installation and maintenance space. • Installation and mounting details • Lifting arrangement The drawing to reference to main specifications and standards.	11,3	PDF	CFIHOS-70000119
S620-IR-81	Current transformer sizing calculations	Calculations to size the CT's, e.g. burden and accuracy class.	6.110.2	PDF	
S620-IR-82	Current transformer characteristics	The magnetization and transient characteristics of the current transformers.	6.110.2	PDF	
S620-IR-83	High-voltage protective devices characteristics and ratings	Time-current characteristics of high-voltage protection devices provided with the switchgear and controlgear assembly, e.g. motor-starter fuse and protection relay curves.	6.113.5	PDF	
S620-IR-84	Utility load schedule	Summarises the normal and transient DC and AC utility loads of the switchgear for the purpose of sizing external power provision.	11,1	PDF	
S620-IR-85	Heat dissipation calculation and loads	This document contains the calculation by the manufacturer to arrive at the heat load produced by the switchgear to enable HVAC sizing and includes load factors and type of load provided to the manufacturer to produce accurate calculation		PDF	
S620-IR-86	Connection diagram	Drawing providing information about the external physical connections per functional unit including hydraulic, pneumatic and electrical connections.	6.114.2.1	PDF	CFIHOS-70000055
S620-IR-87	Switchgear I/O schedule	Schedule of tags identifying IED programmable addresses and hardwired signal interfaces for all functional units within the switchgear and control gear assembly.	11,1	PDF	CFIHOS-70000179
S620-IR-88	Functional logic diagram	Control logic embedded in IEDs (e.g. protection relays) that is developed by the manufacturer to implement the requirements of the user diagrams and associated protection relay settings.	6.115.2.2, 6.116.1.5, E.3.1.1, E.3.1.2, E.3.3.1, E.3.3.2, E.3.3.5, E.3.3.6	PDF	CFIHOS-70000248
S620-IR-89	Switchgear single line diagram	Drawing detailing major items of equipment, including protection devices per functional unit using IEC 60617 standard symbols and/or ANSI C37.2 device function numbers per switchgear and controlgear assembly.		PDF	CFIHOS-70000371
S620-IR-126	Gas compartment diagram	A pictorial representation of the main elements and functions of the gas system illustrating compartmentalization, locations of pressure relief discs/ rupture disc, location of the valves, SF6 gauges etc.	6.103.2.2	-	CFIHOS-70000371
S620-IR-128	Arc duct or gas duct arrangement drawing	An overall representation of the switchgear ducting arrangement, showing how ionized gasses are safely evacuated.	7.105.6	-	
S620-IR-90	Circuit and wiring diagram	Drawing detailing in schematic form the functional unit in respect of electrical and instrument circuit connections based on the principles in IEC 61082-1, Preparation of documents used in electrotechnology – Part 1: Rules. The circuit(s) to be shown to the extent necessary for the understanding of the circuit(s) functions and how the components are interconnected. The drawing includes details of all device hardwired connections within the functional unit and external interfaces to terminal blocks. Hardwired connections internal to the functional unit, devices and external interface terminal blocks are to be identified as per manufacturers standard.	6.10, 6.3.101, 6.108.2.15, 6.109.11, 6.109.15, 6.110.6, 6.110.7, 6.112.2.4, 6.112.4.1, 6.112.4.2, 6.114.2.7, 8.6.3, 8.6.4, E.3.1.6	PDF	CFIHOS-70000268
S620-IR-91	Inter-panel wiring diagram	Wiring diagram detailing the control and auxiliary interfaces between functional units within the switchgear and controlgear assembly. The wiring diagram identifies functional unit inter-connection and field run connections to be made during assembly of transport units.		PDF	CFIHOS-70000055
S620-IR-125	Inter-panel logic diagram	A representation of circuit breaker, disconnector, and switch relationships, with respect to interlocking, intertripping and blocking actions, taking into account switchgear status and monitoring (such as gas level). Where an executive action is taken by the internal switchgear control system, without a command from an external system, this will be included. This can be provided in the form of a matrix.	6.3.105.3	PDF	CFIHOS-70000248
S620-IR-92	Probability of failure on demand reliability data	Identifies reliability input data for functional unit and protection relay probability of failure on demand (PFD) to enable user to perform functional safety requirements assessments to IEC 61511-1.	6.115.1	PDF	CFIHOS-70000312
S620-IR-93	IED interrogation and programming software	Software and special communication media required to access and program the relays and programmable devices in the high-voltage switchgear.	6.113.1	Native	CFIHOS-70000012
S620-IR-94	Relay IED configuration files	Relay and programmable configuration devices files (native files and PDF)	6.113.1	Native	
S620-IR-95	IEC 61850 configuration files	Substation Configuration Description (SCD) or Configured IED Description (CID) files	6.113.1	Native	
S620-IR-123	Manufacturer data sheet	To include confirmation of compliance with S-620D by providing actual values of switchgear specification and all other information in accordance with IEC 62271-1:2021, 10, and IEC 62271-200:2021,10.	10,3	PDF	CFIHOS-70000416
S620-IR-96	Installation manual	The manufacturer's standard information manual. This document includes sufficient information to install the equipment. It is acknowledged this may be provided as part of an overall IOM manual.	11,3	PDF	CFIHOS-70000181
S620-IR-110	Maintenance manual	The manufacturer's standard maintenance manual. This document includes sufficient information to maintain the equipment. It is acknowledged this may be provided as part of an overall IOM manual. If required a supplementary sheet can be added identifying components that are not suitable for 5 years continuous operation without inspection or replacement under the user specified service conditions. This will include maintainance of assembly subcomponents.	6.116.1.3	-	CFIHOS-70000206

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Col A	Col B	Col C	Col D	Col E	Col F
Code	**Requirement**	**Description**	**Reference**	**Format**	**CFIHOS Document Type Code**
S620-IR-111	Operating manual	The manufacturer's standard operating manual. This document includes information to operate the assembly and subcomponents. This document includes sufficient information for troubleshooting. It is acknowledged this may be provided as part of an overall IOM manual.	6.109.12, 6.109.13, 6.109.14, 6.116.4, E.3.1.5	-	CFIHOS-70000228
S620-IR-97	Recommended spare part list (RSPL)	Identified products which may require replacement are listed in a spare parts list identified and described so that the necessary spare, the whole item or parts can be obtained. The spare parts list includes: - reference to project documentation (e.g. drawing number and position number); - the manufacturer's catalogue/unique and unambiguous parts number; - for standardized parts: the real manufacturer's name and catalogue/unique and unambiguous parts number. - reference to tag (where applicable) The list includes equipment manufacturer's recommendation for commissioning and two years operational spares.	11,1	PDF	CFIHOS-70000374
S620-IR-124	Special tools list	The special tools list identifies special tool and equipment necessary for handling, installation, dismantling, operation and maintenance of the switchgear, including circuit breaker operating handles, earthing switch operating handles and software interrogation cables, earthing truck (where specified), lifting hoist (where specified) and circuit breaker trolley (where specified).	11.6.1	PDF	
S620-IR-98	Chemical inventory and material safety data sheets	A structured form containing information on the safety, health and environmental protection aspects of the chemical, including protective measures and emergency actions. Safety Data Sheets (SDS) to be in accordance with local/national regulations and in the official operating language of the plant, or in English if accepted by local authorities. A collection of SDS to be delivered to User for chemicals delivered as part of equipment, as first fill or used for preservation before operation. Exceptions are • grease • fat • surface preservatives • coatings • oils in volume per equipment below 10 litres. The report includes one SDS per unique chemical trade name. The report to include a cross reference table with each unique chemical trade name, equipment tag number(s) and SDS file name.	13	PDF	CFIHOS-70000416
S620-IR-99	Bill of materials	A list of parts, components and sub-assemblies for equipment with part numbers, item numbers, quantities, material designations and references to specifications including sub-suppliers and associated purchase orders. To include OEM part numbers for components not manufactured by the supplier.	11.6.1, 11.6.3, E.4.1.1	PDF	CFIHOS-70000028
S620-IR-100	Type test certificate	A document providing objective evidence that the equipment is compliant to relevant standards. To include equipment designation, manufacturer, testing authority name and address, specific year and edition of the IEC used to perform verification and a summary of the proving tests performed.	6.16, 6.108.2.1, 6.108.4.2, 6.108.4.3, 6.110.5	PDF	CFIHOS-70000239
S620-IR-101	Lifting equipment test certificate	Lifting equipment test certificate in relation switchgear load certified hoist	11,3	PDF	CFIHOS-70000432
S620-IR-102	Weight data sheet	Document with weight of individual shipping sections	11,3	PDF	CFIHOS-70000359
S620-IR-103	ECMS simulation test procedure	User-agreed functional test procedure of the ECMS or its parts using the parameter set for the planned application including communication interfaces with integrated control and safety systems.		PDF	CFIHOS-70000332
S620-IR-104	ECMS simulation test report	Results from the execution of ECMS simulation test procedure including communication interfaces with integrated control and safety systems.		PDF	
S620-IR-105	Routine verification test (FAT) procedure	Procedure documenting the manufacturers recommended testing activities and acceptance criteria according to applicable standards, specifications and requirements, to document the condition of the equipment as tested from factory. Procedure to define test set-up and test equipment.	8.102, 8.6.1, 8.6.2, 8.6.3, 8.6.4, E.3.1.3, E.3.4	PDF	CFIHOS-70000427
S620-IR-106	Routine verification test (FAT) results	This document records and documents all results from the activities performed in accordance with the FAT procedure. Include any observation rework or retesting.	8.102, 8.6.1, 8.6.2, 8.6.3, 8.6.4, E.3.1.3, E.3.4	PDF	CFIHOS-70000429
S620-IR-108	Site acceptance test (SAT) procedure	Procedure documenting the manufacturers recommended site tests including discrete functional unit and overall assembly, electrical, mechanical, protection relay and IEDs.	8,104	PDF	CFIHOS-70000428
S620-IR-109	Site acceptance test (SAT) report	Site acceptance test report including discrete functional unit and overall assembly, electrical, mechanical, protection relay and IED tests.	8,104	PDF	CFIHOS-70000430
S620-IR-127	Cyber security certification	Certification confirming compliance with IEC 62243-4-2 for industrial automation and control system components.	6.4.6	-	
S620-IR-107	Certificate of conformity	The manufacture's or other party's confirmation that the product is designed, manufactured and tested as specified. To be delivered according to applicable authorities requirements. An example is marine class approval of the switchgear	6.101, 6.108.4.1, 6.108.4.4, 6.108.4.5, 6.109.1, 6.109.2, 6.109.3, 6.109.4, 6.109.5, 6.109.6, 6.110.1, 6.110.2, 6.110.3, 6.110.4, 6.111.1, 6.112.1.1, 6.112.2.3, 6.112.2.6, 6.112.2.8, 6.112.3, 6.112.4.1, 6.113.1, 6.113.5, 6.114.2.9, 6.115.1, 6.115.2.1, 6.4.4.3	PDF	CFIHOS-70000013
Purchase Order Specific Information Requirements					

Registered Office
City Tower
Level 14
40 Basinghall Street
London EC2V 5DE
United Kingdom

T +44 (0)20 3763 9700
reception@iogp.org

Brussels Office
Avenue de Tervuren 188A
B-1150 Brussels
Belgium

T +32 (0)2 790 7762
reception-europe@iogp.org

Houston Office
15377 Memorial Drive
Suite 250
Houston, TX 77079
USA

T +1 (713) 261 0411
reception-americas@iogp.org

www.iogp.org

