Base Load Power Hub (BLPH)

Technical Specification, IDS and DDS for LV Switchgear

Document Number: 123A90-DDL-EL-SP-20023

Document Class: 2

01	11/06/2024	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

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

Revision / Change Log

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

HOLDS LIST

No.	Description
1	
2	
3	
4	

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

Table of contents

1. INTRODUCTION 6
   1.1. PROJECT OVERVIEW 6
      1.1.1. Project Location 6
      1.1.2. Project Concept 7
2. DOCUMENT SCOPE 8
   2.1. REFERENCES 9
   2.2. DEFINITIONS AND ABBREVIATIONS 9
3. GENERAL CONDITIONS 10
   3.1. LANGUAGE 10
4. APPLICABLE CODES AND STANDARDS 10
5. ENVIRONMENTAL AND OPERATING CONDITIONS 10
   5.1. ENVIRONMENTAL CONDITIONS 10
6. EQUIPMENT CHARACTERISTIC AND REQUIREMENTS 11
7. LV ELECTRICAL SYSTEM DESCRIPTION – SWITCHBOARD SG-200N1 11
8. IMESA MCC 12
   8.1. Bus-bar section 12
   8.2. Drawer Section 12
   8.3. Fixed Drawers 13
   8.4. Withdrawable drawers 13
   8.5. Cable Section 14
   8.6. Earthing 14
9. INTERLOCKS 14
   9.1. General interlocks for MNS SwitchBOARD 14
10. TAGGING PROCEDURE 14
11. EQUIPMENT IDENTIFICATION 15
12. INSPECTION AND TESTING 15

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

12.1. INSPECTIONS 15
12.2. TEST PROCEDURES 15
12.3. TESTS 16
13. SPARE PARTS 16
14. TRAINING 16
15. PAINTING 17
16. DOCUMENTATION 17
17. WARRANTY 18
17.1. MAKE GOOD 18
18. SUB-VENDOR 19
19. ANNEX I – Deviation List 19
20. Annex II – Supplementary Specification to IEC 61439-1 and IEC 61439-2 for LOW-Voltage Switchgear and Controlgear 20
21. ANNEX III – "Quality Requirements for LOW-Voltage Switchgear and Controlgear– Specification S-560Q" 21
22. ANNEX IV: "Information Requirements for LOW-Voltage Switchgear and Controlgear– Specification S-560L" 22

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

List of Figures

Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map 6
Figure 2 - Wind Park Details 7
Figure 3 – BLPH Concept 7

List of tables

Table 1 - Reference Documents 9
Table 2 - Definitions and Abbreviations 10

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

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.

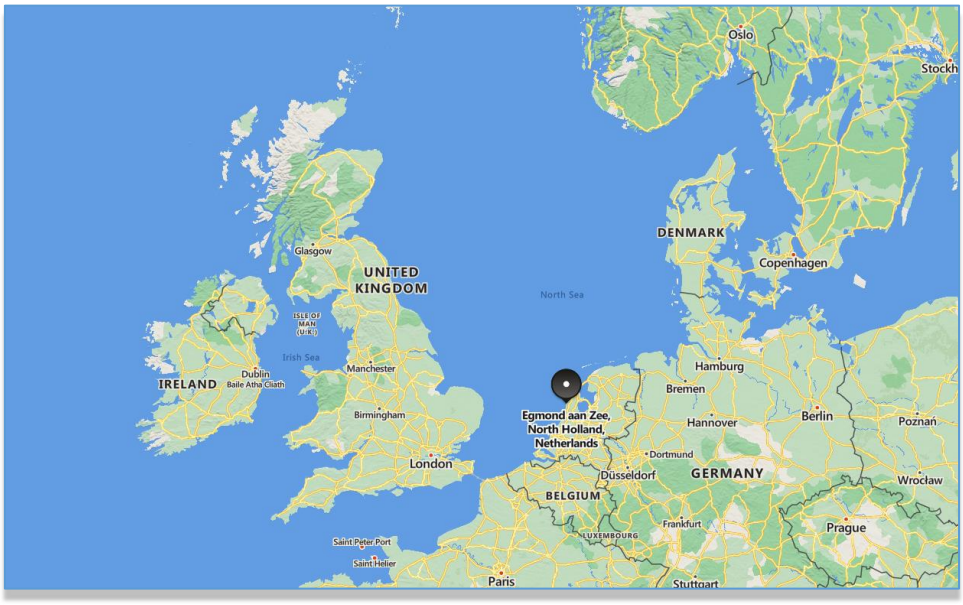


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

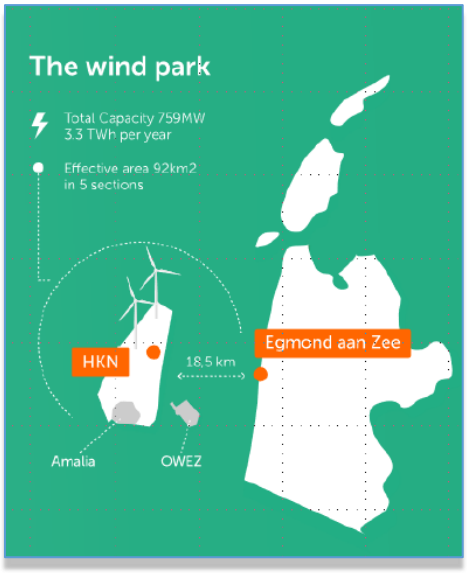


Figure 2 - Wind Park Details

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.

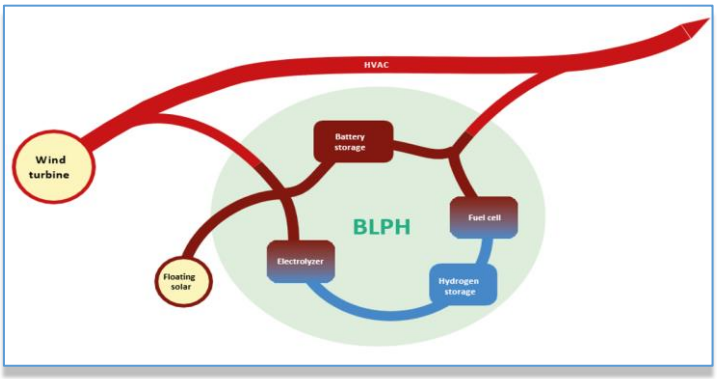


Figure 3 – BLPH Concept

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 400V LV Switchboard. 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 switchboard manufacturing shall follow the International Association of Oil and Gas Producers (IOGP) "Supplementary Specification to IEC 61439-1 and IEC 61439-2 for Low-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 Low-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 Low-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-20024	TDS - Low Voltage Switchgear
123A90-DDL-EL-DS-20051	TDS - Solar farm-In-Feed Power Isolator Panel
123A90-DDL-EL-DG-20014	Electrical Control, Protection and Metering Diagrams
123A90-DDL-EL-DG-20158	Overall Key Single Line Diagram
123A90-DDL-EL-DG-20159	Electrical Single Line Diagram LV System
123A90-DDL-EL-LIS-20164	Electrical Schedules (LV Switchgears)
S-560	Supplementary Specification to IEC 61439-1 and IEC 61439-2 for Low-voltage Switchgear and Controlgear
S-560Q	Quality Requirements for Low-voltage Switchgear and Controlgear (IEC) - IDS (Inspection Datasheet)
S-560L	Information Requirements for Low-voltage Switchgear - DDS (Document Datasheet)

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 61439-1 Low-voltage switchgear and control gear assemblies Part 1: General rules
- IEC 61439-2 Low-voltage switchgear and control gear assemblies - Part 2: Power switchgear and control gear assemblies.
- IEC TR 61641 Enclosed low-voltage switchgear and control gear assemblies – Guide for testing under conditions of arcing due to internal fault.
- IEC 60529 Degrees of protection provided by enclosures IP.
- IEC 61869-1 Instrument transformers – Part 1: General requirements.
- IEC 61293 Marking of electrical equipment with ratings related to electrical supply – Safety Requirements
- DEP 33.67.01.31 Low Voltage Switchgear and Control gear Assemblies (Adoption of IOGP S-560, Amendments/Supplements to IEC 61439-1 and IEC 61439-2

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.

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

AC/DC nominal supply voltage: ±10%,

Frequency: ±5%,

Temporary over-voltages (transient) in accordance with IEC 61439-2.

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. LV ELECTRICAL SYSTEM DESCRIPTION – SWITCHBOARD SG-200N1

The LV switchboard SG-200N1 is Metal Clad, Single Front, Busbar Rated for 2500A, 50KA for 1sec. (IP30 / Ambient design 35°C (max. 40°C) / Form 4B-type 5 / RAL 7035 / Top entry)

MCC panels consists of the following types:

- Incomer ACB Cubicle, from Transformer 1,6MVA ACB E4.2N 3200A, 3p (+N) with REF615 protection relay
- Feeder ACB Cubicle, to Electrolyser Auxiliary load ACB E1.2C 1250A, 4p with Ekip Hi Touch LSIG
- Intelligent DOL Motor Starter with MCCB & Universal Motor Controller type UMC100.3 3p. AC3 IEC Type 2 - (IE3 motor efficiency).
- Intelligent Hand operated MCCB Feeder with Ekip Dip LSIG
- Intelligent MCCB Feeder with contactor remotely controlled, with Ekip Hi Touch LSIG

8. IMESA MCC

This Low Voltage Switchboard is designed for the most demanding industrial plant requirements. The switchboard may be realized with fixed or withdrawable modular drawers in mixed or variable configurations, suitable for command, control and protection of small and medium power motors and for the distribution of power to various users.

The MCC switchboard consists of various coupled vertical compartments of standardised dimensions, which make up the mechanical structure of the switchboard and which house the main, secondary and auxiliary bus-bars for the distribution of electrical power.

The vertical compartments consist of prefabricated units realised in galvanised 2 mm steel plate to ensure maximum resistance against weather agents.

All the elements of the structure are riveted or bolted together.

The compartments require no access at the back and the switchboard can therefore be placed against a wall or back-to-back.

There are openings at the top and/or at the bottom of the switchboard for entry of the outgoing cables.

Each compartment consists of the following:

- bus-bar section
- drawer section
- cable section
- earthing

8.1. BUS-BAR SECTION

This section is at the back of the compartment and houses both the omnibus and vertical bus-bars.

The horizontal and vertical bus-bars are realised in electrolytic copper fixed by means of fibre glass reinforced plastic insulating supports, which are highly resistant to electric, mechanical and environmental stress.

The bars are totally segregated and can be reached only by removing the metal plates fixed with screws (only for MCC fixed).

This solution permits entry of the cables either from the top or from the bottom.

8.2. DRAWER SECTION

The drawer section is sub-divided, according to the configuration of the compartment, by means of passivated galvanised steel shelt sections, into varying numbers of modular cells that house the electric manoeuvre, protection and control equipment of the various electrical users.

The drawers may be in fixed or withdrawable version.

8.3. FIXED DRAWERS

Each drawer is segregated both with respect to the cable section and the bus-bar section by means of passivated galvanised steel sheet plate; all the segregations are modular.

One or more equipment holder plates of variable size and number supported by special cross arms also in passivated galvanised steel sheet plate that ensures proper earthing of the equipment holder plate, may be mounted in the drawer.

By drilling appropriate holes on the door, the controls and signallings relevant to the user of each drawer, may be shown on the front of the switchboard.

Three or four pole circuit-breakers or disconnecting switches are installed in the "incoming" or "outgoing"

feeder drawers; the control handle has a door lock and lockable device for open or closed position.

Specific removable insulating screens are installed in the compartments to prevent accidental contact with live parts.

8.4. WITHDRAWABLE DRAWERS

The withdrawable drawers consist of metal frames realised in passivated galvanised steel sheet plate in standardised modular dimensions that house the electric disconnecting, protection and control equipment of the various electric users.

The side, bottom and base walls are completely closed while the front door and the top compartment panel and uprights in the vertical compartment, ensure total segregation of the unit.

Each drawer is equipped with plug-in contacts for the entry and exit of the power and auxiliary circuits and the earthing contact.

The equipment – drawer unit inserted in the relevant section of the vertical compartment can be placed in the following positions:

DISCONNECTED – TEST – CONNECTED

Each position is shown by a specific mechanical indication.

The above positions are changed by means of an external removable, lockable lever with the drawer door closed.

Suitable safety locks prevent any incorrect manoeuvres by the operator.

An automatically controlled metal shutter permits shutting the window through which the incoming clamps pass, when the drawer is withdrawn, in order to ensure access when the switchboard is live. The sectional terminal (up to 24 poles) connector with sliding contact of the auxiliary circuits is positioned on the right of the compartment.

Each drawer is equipped with a panel on which the electric, command and control equipment (lamps, push-buttons, selectors, amperometers etc.) are mounted, as requested by the customer.

8.5. CABLE SECTION

This section is installed on the right of the compartment; access is from the front by means of a hinged door.

The section houses both the power and auxiliary cables of each user.

All the terminals are protected against accidental contact thereby permitting access to the cables of a user while the other terminals are live.

8.6. EARTHING

Earthing is ensured by a copper bus-bar of adequate cross-section running the full length of the switchboard.

A bus-bar in the outgoing cable section permits easy earthing of each user.

The withdrawable drawer is solidly earthed in each position.

9. INTERLOCKS

The interlock system must be implemented to ensure safety of operator, equipment, and system. The following are the conditions of interlocks.

9.1. GENERAL INTERLOCKS FOR MNS SWITCHBOARD

- Interlocks shall be provided to ensure safe working for the operating and maintenance personnel.
- Door of functional unit being opened unless the functional unit is isolated and locked-off.
- A withdrawable unit being withdrawn unless unit is isolated. It shall not be possible to close circuit breaker unless the unit is in either a service or test position.
- Any interlock capable of being defeated without the use of special tools for a particular safe purpose shall be provided with a padlocking facility.
- Movement of withdrawable modules from service to other positions or vice versa shall be prevented unless the main switch is OFF.
- Electrical interlocks shall be in line with SLD'S/Data sheet.
- Any other interlocks such as Key interlocking shall be as specified in the data sheets or SLD.

10. TAGGING PROCEDURE

All equipment shall be tagged as per the "Equipment and System Tag Numbering" Doc. No. 123A90-PML-DIG-PRO-00002.

For all the components which are part of the Main Item to be suppled, as applicable like: control & protection relays, current & voltage transformers, measurement instruments, cables, terminal blocks, lamps, pushbutton, heaters, etc, the manufacturer tagging procedure shall be submitted for approval prior the construction.

11. 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)

12. INSPECTION AND TESTING

12.1. INSPECTIONS

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.

12.2. TEST PROCEDURES

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

The VENDOR 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 panels 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 panel/instrument/component as minimum and as applicable:

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

Tests shall be carried out in compliance with the requirements of the IEC 61439-1 and IEC 61439-2

12.3. TESTS

All tests shall be as per IEC standards and as stated in the ANNEX III – "Quality Requirements for Low-Voltage Switchgear and Controlgear– Specification S-560Q.

13. 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.

14. 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.

15. 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.

16. 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 drawings shall include all necessary horizontal and vertical clearances to walls and roof and to the hook of the travelling crane which will be used for erection and subsequent maintenance of the switchgear.

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

- GA Drawings with section view & Foundation/wall fixing details
- Electrical schematic diagrams
- Electrical block diagrams
- Electrical connection diagrams
- Data sheets
- Calculations
- FAT/Painting/Packing Procedures
- Inspection Test Plan
- BOM
- Material and test certificates
- Result of testing
- Non-conformity list
- Hazardous Area Certificates (if applicable)
- Shipping conditions
- Installation Manual
- Commissioning procedures
- O&M Manuals

17. 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.

17.1. 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.

18. 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.

19. ANNEX I – DEVIATION LIST

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

20. ANNEX II – SUPPLEMENTARY SPECIFICATION TO IEC 61439-1 AND IEC 61439-2 FOR LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR

International Association of Oil & Gas Producers

SPECIFICATION

IOGP S-560

December 2022

Version 3.0

Supplementary Specification to IEC 61439-1 and IEC 61439-2 for Low-voltage Switchgear and Controlgear

JIP33 JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
3.0	December 2022	Third Edition
2.0	November 2016	Second Edition
1.0	June 2016	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).

Disclaimer

Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither IOGP nor any of its Members past present or future warrants its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms.

Please note that this publication is provided for informational purposes and adoption of any of its recommendations is at the discretion of the user. Except as explicitly stated otherwise, this publication must not be considered as a substitute for government policies or decisions or reference to the relevant legislation relating to information contained in it.

Where the publication contains a statement that it is to be used as an industry standard, IOGP and its Members past, present, and future expressly disclaim all liability in respect of all claims, losses or damages arising from the use or application of the information contained in this publication in any industrial application.

Any reference to third party names is for appropriate acknowledgement of their ownership and does not constitute a sponsorship or endorsement.

Copyright notice

The contents of these pages are © International Association of Oil & Gas Producers. Permission is given to reproduce this report in whole or in part provided (i) that the copyright of IOGP and (ii) the sources are acknowledged. All other rights are reserved. Any other use requires the prior written permission of IOGP.

These Terms and Conditions shall be governed by and construed in accordance with the laws of England and Wales. Disputes arising here from shall be exclusively subject to the jurisdiction of the courts of England and Wales.

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 third edition cancels and replaces the second edition published in November 2016.

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

Table of Contents

Foreword 1
Introduction 4
1 Scope 6
2 Normative references 6
3 Terms and definitions 8
3.1 General terms 8
4 Symbols and abbreviations 8
5 Interface characteristics 9
5.2 Voltage ratings 9
5.3 Current ratings 9
5.4 Rated diversity factor (RDF) 10
5.5 Rated frequency (f_n) 10
6 Information 10
6.1 Assembly designation marking 10
6.2 Documentation 11
6.3 Device and/or component identification 12
7 Service conditions 12
7.2 Special service conditions 12
8 Constructional requirements 12
8.2 Degree of protection provided by an assembly enclosure 12
8.4 Protection against electric shock 14
8.5 Incorporation of switching devices and components 14
8.6 Internal electrical circuits and connections 30
8.7 Cooling 32
8.8 Terminals for external cables 33
8.101 Internal separation of PSC-assemblies (IEC 61439-2) 34
8.102 PSC-assembly physical configuration 34
8.103 Enclosure space heaters 35
8.104 Provision for future development 36
8.105 Condition based monitoring 37
9 Performance requirements 37
9.3 Short-circuit protection and short-circuit withstand strength 37
10 Design verification 38
10.10 Temperature-rise 38
11 Routine verification 39
11.8 Mechanical operation (IEC 61439-2) 39
11.10 Wiring, operational performance and function 39

11.101 Electrical control and management system (ECMS) simulation test 39
Annex HH (informative) Integration with external systems....40
Bibliography....42

List of Tables

Table 16 – Accessible shutters labelling 13
Table 17 – Intelligent electronic device (IED) requirements....22
Table 18 – Minimum degrees of protection 27
Table 19 – Colour coding of status indicator 27
Table 20 – Identification of conductors and terminals 32

List of Figures

Figure HH.1 – Communications interface block diagram 41

Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of low voltage switchgear and control gear assemblies in accordance with IEC 61439-1, Edition 3, May 2020 and IEC 61439-2, Edition 3.0, July 2020, Corrigendum 1, 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-560: Supplementary Specification to IEC 61439-1 and IEC 61439-2 for Low-voltage Switchgear and Controlgear

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to IEC 61439-1 and IEC 61439-2, following the IEC 61439-1 and IEC 61439-2 clause structure. Clauses from IEC 61439-1 and IEC 61439-2 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to IEC 61439-1 or IEC 61439-2 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-560D: Procurement Data Sheet for Low-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-560L: Information Requirements for Low-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-560Q: Quality Requirements for Low-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 61439-1 and IEC 61439-2, 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 61439-1 and IEC 61439-2.

1 Scope

This specification covers fully withdrawable switchgear and controlgear of cubicle and multi-cubicle type assemblies for indoor installation. This specification also applies to fixed and withdrawable cubicle type assemblies and combinations thereof.

Add to subclause

This specification does not cover:

– low-voltage switchgear and controlgear assemblies installed outdoors;

– detailed user requirements for electrical control and management systems;

– explosion protected "Ex" switchgear for use in potentially explosive atmospheres;

– pillar type or construction site distribution equipment (addressed by IEC 61439-4 and IEC 61439-5);

– standalone lighting and small power distribution boards with rated current not exceeding 250 A (addressed by IEC 61439-3).

Add new subclause

1.1

This specification details the requirements for the design, materials, fabrication, inspection and testing of low-voltage power switchgear and controlgear assemblies. This specification amends and supplements IEC 61439-1:2020 and IEC 61439-2:2020, referring sequentially to the same clause numbers.

Add new subclause

1.2

Clauses of IEC 61439-1 and IEC 61439-2 that are not addressed within this specification remain fully applicable as written. Where there is no direct corresponding IEC 61439-1 or IEC 61439-2 clause, a new reference clause number has been added in this specification.

2 Normative references

Add to start of clause

The following publications are referred to in this document, the procurement data sheet (IOGP S-560D) or the IRS (IOGP S-560L) in such a way that some or all of their content constitutes requirements of this specification.

Add to clause

BS EN 61439-2, *Low-voltage switchgear and controlgear assemblies Power switchgear and controlgear assemblies*

IEC 60034-11, *Rotating electrical machines – Part 11: Thermal protection*

IEC 60051 (all parts), *Direct acting indicating analogue electrical-measuring instruments and their accessories*

IEC 60079-14:2013, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60092-101:2018, *Electrical installations in ships – Part 101: Definitions and 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 60664-1, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 60684, *Flexible insulating sleeving*

IEC 60688, *Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-4-1, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

IEC 60947-4-2, *Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – Semiconductor motor controllers, starters and soft-starters*

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

IEC 60947-5-5, *Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function*

IEC 60947-7-1, *Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors*

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

IEC 61511-1, *Functional safety – Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming 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 61892-3:2019, *Mobile and fixed offshore units – Electrical installations – Part 3: Equipment*

IEC 62052-11, *Electricity metering equipment – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62402, *Obsolescence management*

IEC TR 61641:2014, *Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault.*

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

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

3 Terms and definitions

3.1 General terms

Add new term 3.1.16

3.1.16
bus coupler
functional unit that contains a mechanical switching device which electrically connects together two bus sections

Add new term 3.1.17

3.1.17
bus section
line-up of sections connected together in service by a physically continuous main busbar

Add new term 3.1.18

3.1.18
insulatum terra
IT
(latin) electrical system earthing method with no connection or high impedance connection to earth

Add new term 3.1.19

3.1.19
secondary selective
substation configuration where two (or more) switchboard bus sections are connected together via a bus coupler(s) and when loss of supply on an incoming circuit occurs, service to the switchboard is maintained where the bus coupler(s) is normally closed and if the bus coupler(s) is normally open, service is restored through manual or automatic closure of the bus coupler device

4 Symbols and abbreviations

Add to clause

AC alternating current

ACB air circuit breaker

ASD adjustable speed drive

DC direct current

DMZ demilitarized zone

ECMS electrical control and management system

FAT factory acceptance test

HMI human machine interface

HRC high rupturing capacity

IED intelligent electronic device

I/O input/output

IT insulatum terra

LED light emitting diode

MCB miniature circuit breaker

MCCB moulded case circuit breaker

PMS power management system

PSC power switchgear and controlgear

PSS power semiconductor system

RCBO residual current circuit breaker with overcurrent protection

RCD residual current device

SIL safety instrumented level

THD total harmonic distortion

5 Interface characteristics

5.2 Voltage ratings

5.2.1 Rated voltage (U_n) (of the assembly)

Add to subclause

The PSC-assembly and ancillary components shall be rated for nominal supply voltage variations of ±10 %.

Add to subclause

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

5.2.4

Add to subclause

PSC-assemblies shall be type tested in accordance with IEC 60664-1 to provide a minimum coordinated insulation values in accordance with overvoltage category III as stated in Table G.1.

5.3 Current ratings

5.3.1 Rated current of an assembly (I_{nA})

Add to subclause

The rated current of a PSC-assembly main busbars and main circuits shall not depend on forced ventilation.

NOTE This does not preclude the use of forced cooling on individual outgoing circuits with high thermal influence such as functional units containing integral adjustable (variable) speed drive modules.

Add to subclause

Busbar connections within bus coupler sections and the bus coupler switching device shall have a rated current not less than that of the main busbars.

5.3.3 Group rated current of a main circuit (I_{ng})

Replace second paragraph with

Where the group rated current (I_{ng}) of a main circuit is less than the rated current (I_{nc}) of this circuit, the group rated current of the functional unit in its designated compartment position shall be marked on the functional unit.

Replace NOTE 2 with

NOTE 2 For a functional unit with a given Ing, the specific arrangement of assembly or section of an assembly can also be stated in terms of power at the given I_{ng}.

5.4 Rated diversity factor (RDF)

Add new subclause

5.4.101 Values of assumed loading

5.4.101.1

For temperature rise tests and temperature rise calculations, an assumed loading factor of 1,0 shall be applied for sections containing a single functional unit.

5.4.101.2

Spare equipped functional units shall have an assumed loading factor in accordance with Table 101.

5.4.101.3

Unequipped spaces shall have an assumed loading factor in accordance with Table 101 for representative circuits that occupy the space.

5.5 Rated frequency (f_n)

Replace second sentence of second paragraph with

The PSC-assembly and ancillary components shall be rated for nominal supply frequency variations of ±5 %.

6 Information

6.1 Assembly designation marking

Add new list item h)

h) rated peak withstand current;

Add new list item i)

i) short-time withstand current;

Add new list item j)

j) short-time withstand duration;

Add new list item k)

k) degree of protection (IP rating);

Add new list item l)

l) form of internal separation;

Add new list item m)

m) internal arc fault rating (permissible current and duration);

Add new list item n)

n) arcing class.

Add to subclause

The main nameplate or an adjacent label shall include the assembly identification (tag) number, purchase order number and year of assembly manufacture.

6.2 Documentation

6.2.1 Information relating to the assembly

Add to subclause

All documents excluding manufacturers catalogues and manuals shall state the assembly identification number, user's purchase order number and manufacturer's reference number.

6.2.2 Instructions for handling, installation, operation and maintenance

Add to subclause

When a secondary selective electrical interlock or mechanical interlock system is fitted, nameplates containing operational instructions shall be fixed on the front of the PSC-assembly near the point of operation.

Add to subclause

Assemblies supplied in multiple transport units shall be identified to facilitate reassembly at site.

Add to subclause

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

6.3 Device and/or component identification

Add to subclause

Informative labels shall have black characters on a white background.

Add to subclause

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

Add to subclause

The functional unit shall have circuit designation labels at the front of panel and main/auxiliary cable terminations.

Add to subclause

The functional unit shall contain the following information:

a) functional unit compartment number;

b) tag number of connected equipment;

c) service description of connected equipment;

d) motor kW or feeder current rating.

Add to subclause

Nameplates and identification tags shall be attached to the PSC-assembly with stainless steel 316 threaded fasteners.

7 Service conditions

7.2 Special service conditions

Replace list item l) with

l) voltage harmonics in the system with a total harmonic distortion exceeding 8 %;

8 Constructional requirements

8.2 Degree of protection provided by an assembly enclosure

8.2.1 Protection against mechanical impact (IK code)

Replace subclause with

PSC-assemblies shall have a degree of protection against mechanical impacts of at least IK07 in accordance with IEC 62262.

8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and water (IP code)

Replace first sentence of second paragraph with

After installation in accordance with the assembly manufacturer's instructions, the degree of protection of an enclosed assembly shall be at least IP3X.

8.2.3 Assembly with removable parts

Add to third paragraph

Shutters shall automatically open/cover main circuit contact apertures by the movement of the withdrawable unit.

Add to third paragraph

The actuation of shutters shall not be dependent on gravity.

Add new NOTE to third paragraph

NOTE Where the apertures inherently provide the degree of protection IP2X, shutters may be omitted.

Add to subclause

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

Add to subclause

Accessible shutters for main circuit compartments (e.g. air circuit breakers (ACBs) and larger moulded case circuit breakers (MCCBs)) shall be individually operated.

Add to subclause

Accessible busbar shutters and accessible incoming circuit shutters shall be padlockable in the closed position or located within a compartment with a padlockable compartment access door.

Add to subclause

For withdrawable parts, accessible shutters shall be identified in accordance with Table 16.

Add new Table 16

Table 16 – Accessible shutters labelling

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

8.4 Protection against electric shock

Add to subclause

Protection against electric shock shall be in accordance with IEC 60364-4-41.

8.4.2 Basic protection

8.4.2.3 Barriers or enclosures

Add after fourth paragraph

Air-insulated live parts inside enclosures or on the inside face of compartment doors that are accessible with the compartment door open shall be protected against electric shock with a degree of protection of at least IPXXB.

NOTE IPXXB is stipulated in accordance with IEC 60529 as distinct to the use of designation IP2X as the door is opened and the danger is now access to hazardous parts within. IPXXB provides finger "touch-safe" protection against contact to live parts equivalent to IP2X.

8.4.6 Operating and servicing conditions

8.4.6.2 Requirements related to accessibility in service by authorized persons

8.4.6.2.1 General

Add to first paragraph

Auxiliary and control supplies fed from power sources external to the PSC-assembly shall each be provided with a padlockable isolation facility.

Add to subclause

Live parts within enclosures and live parts mounted on the internal face of compartment doors that are accessible with the compartment door open shall be protected against electric shock with a degree of protection of at least IPXXB.

Add to subclause

Fuse-links and associated fuse carriers shall only be accessible when they are isolated or when protected against electric shock with a degree of protection of at least IPXXB during the replacement of fuse-links.

8.5 Incorporation of switching devices and components

8.5.2 Removable parts

Add to subclause

Heavier withdrawable functional units shall be located in the lower half of the assembly sections with the lighter units located in the upper half.

Add to subclause

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

Add to subclause

Stab-in connection fixed contact surfaces shall be protected against oxidation.

Add to subclause

If 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 functional units shall have the following positions:

a) connected – main circuit electrically connected, auxiliary circuits electrically connected;

b) test – main circuit electrically disconnected, auxiliary circuits electrically connected;

c) isolated – main circuit electrically disconnected, auxiliary circuits electrically disconnected;

d) removed – functional unit physically removed from the PSC-assembly.

NOTE When fitted, auxiliary circuits can also include any copper or fibre optic communication cables to the withdrawable functional unit.

Add to subclause

For withdrawable functional units fitted with intelligent electronic devices (IEDs) that have remote control interface, it shall be possible to test the input/output (I/O) available via the IED remote control interface while the functional unit is in the test position.

Add to first paragraph

The main circuit disconnect device of withdrawable functional units shall be mechanically interlocked to prevent opening and closing on to the distribution busbars with the door open.

Add to subclause

Physically identical withdrawable functional units shall be non-interchangeable with other units that have a different duty, circuit rating or control function.

Add to subclause

Withdrawable functional units of the same compartment dimensions that have an identical duty, circuit rating and control function shall be interchangeable.

Add to subclause

Electrical interlocks to external auxiliary circuits shall revert to a "fail safe" condition when a withdrawable function unit is withdrawn.

8.5.3 Selection of switching devices and components

Add to subclause

Outgoing circuits with rated current above 630 A shall be provided with withdrawable ACBs.

Add to subclause

Outgoing circuits with rated currents up to and including 630 A shall be protected with fuses or with circuit breakers.

Add to subclause

Lighting and small power feeders shall be provided with fuse-switch units or MCCBs.

Add to subclause

Switching devices shall simultaneously switch all phases and when present, simultaneously switch the neutral.

Add new subclause

8.5.3.101 Incoming and bus coupler units

8.5.3.101.1

Incoming main circuit and bus coupler functional units shall be located in separate vertical sections.

NOTE This does not preclude metering, auxiliary equipment or an outgoing functional unit being in the same vertical section as an incomer or bus coupler.

8.5.3.101.2

Main incoming circuit units and bus coupler units shall be provided with withdrawable ACBs or, if specified, switch-disconnectors.

8.5.3.101.3

Incoming main circuit and bus coupler functional unit switch-disconnectors shall have, as a minimum, utilization category AC-22 in accordance with IEC 60947-3.

8.5.3.101.4

Incoming main circuit and bus coupler functional unit switch-disconnectors shall have a short-time withstand current capacity at least equal to the main busbar rated short-time withstand current (I_{cw}) and duration.

8.5.3.101.5

For three-phase and neutral functional units, the neutral pole current rating shall be not less than that for the PSC-assembly neutral busbars.

Add new subclause

8.5.3.102 Isolating switching devices (disconnectors)

8.5.3.102.1

An isolating switching device shall be a mechanical switch, a disconnector fuse or a fuse disconnector.

8.5.3.102.2

Switches, disconnectors, switch-disconnectors and fuse combination units shall be in accordance with IEC 60947-3.

8.5.3.102.3

Switches, disconnectors, switch-disconnectors and fuse combination units used for switching mixed resistive and inductive loads shall have a utilization category AC-22.

8.5.3.102.4

Switches, disconnectors, switch-disconnectors and fuse combination units used for switching motor loads or highly inductive loads shall have a utilization category AC-23.

8.5.3.102.5

Switches, disconnectors, switch-disconnectors and fuse combination units shall be designated for frequent operation, utilization category suffix A of IEC 60947-3.

8.5.3.102.6

Disconnector-fuses and fuse-disconnectors shall have as a minimum utilization category AC-23B for uninterrupted duty.

8.5.3.102.7

Disconnector-fuse and fuse-disconnector rated short-circuit making capacity (I_{cm}) shall be at least equal to the busbar rated short-time withstand current (I_{pk}).

8.5.3.102.8

Switching mechanisms shall be of independent manual operating, air-break type with quick-snap action "make and break" features.

8.5.3.102.9

Switching mechanisms shall be accessible and operable from the front of the PSC-assembly without opening a cover.

8.5.3.102.10

Switching mechanisms shall have the "on" (I) and "off" (O) positions of the switches identified at the front of the switching device.

8.5.3.102.11

All switches used for isolating a circuit shall be padlockable in the "off" position.

Add new subclause

8.5.3.103 Circuit breakers

Add new subclause

8.5.3.103.1 General

Circuit breakers that are used in a main incomer or bus coupler or in feeders to sub-distribution switchboards shall have selectivity category B in accordance with IEC 60947-2.

Add new subclause

8.5.3.103.2 Air circuit breakers

8.5.3.103.2.1

Air circuit breaker operating mechanisms shall have a shunt trip coil release of energized-to-trip type.

8.5.3.103.2.2

Air circuit-breaker operating mechanisms shall have a closing release coil with an interlock to inhibit closing when a trip condition exists.

8.5.3.103.2.3

Air circuit-breaker operating mechanisms shall have an anti-pumping device.

8.5.3.103.2.4

Air circuit-breaker operating mechanisms shall have spring stored energy.

8.5.3.103.2.5

Air circuit-breaker operating mechanisms shall have a spring charging motor.

8.5.3.103.2.6

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

8.5.3.103.2.7

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

8.5.3.103.2.8

Air circuit-breaker operating mechanisms shall have an operations counter.

8.5.3.103.2.9

Air circuit breakers shall be provided with a manual mechanical trip facility with a transparent cover guard.

8.5.3.103.2.10

In addition to contacts required for design of control logic and indication, each air circuit breaker shall be provided with the specified number of normally open and normally closed auxiliary contacts wired to terminal blocks.

8.5.3.103.2.11

If specified, test blocks shall be installed on the air circuit breaker or associated instrument compartment door.

8.5.3.102.2.12

Test blocks shall allow for isolation of power monitoring and protective relay equipment inputs and outputs.

8.5.3.103.2.13

Test blocks shall be wired to provide three-phase (and neutral) bus voltage and three-phase (and neutral) currents.

Add new subclause

8.5.3.103.3 Moulded case circuit breakers

8.5.3.103.3.1

When remote tripping is specified, MCCB equipped outgoing feeder functional units that are not in combination with a contactor shall have a shunt trip facility.

8.5.3.103.3.2

MCCBs that are the main circuit switching and isolation device for outgoing functional units shall be operable while the compartment door or drawer is in the closed position.

8.5.3.103.3.3

MCCBs that are the main circuit isolation device for outgoing functional units shall be padlockable in the "off" position.

8.5.3.103.3.4

MCCB rated short-circuit making capacity (I_{cm}) shall be at least equal to the busbar rated peak withstand current (I_{pk}).

Add new subclause

8.5.3.104 Main circuit fuses

8.5.3.104.1

Fuses used for main circuit protection shall be high rupturing capacity (HRC) type, general purpose fuse links in accordance with IEC 60269-2.

8.5.3.104.2

Fuses used for main circuit protection shall be utilization category gG for non-motor feeders and utilization category aM/gM for motor starters.

8.5.3.104.3

Fuse holders shall have a degree of protection of at least IP2X.

8.5.3.104.4

Labels shall be located adjacent to main and auxiliary circuit fuses, confirming fuse ratings in accordance with circuit design.

Add new subclause

8.5.3.105 Motor starters and contactor feeders

8.5.3.105.1

Motor starters and contactor feeders shall be provided with fuse or MCCB protected electromagnetic contactors.

8.5.3.105.2

The short-circuit protection device for motor starters and contactor feeders shall provide Type 2 co-ordination.

8.5.3.105.3

Unlatched contactors shall be of under-voltage release type.

8.5.3.105.4

Latched contactor feeders shall have a manual mechanical trip facility with a guarded manual release.

8.5.3.105.5

Contactors, motor starters and associated protective devices shall be in accordance with to IEC 60947-4-1.

8.5.3.105.6

Contactors shall be rated for uninterrupted duty with at least class 12 intermittent duty, with a utilization category of at least AC-3 in accordance with IEC 60947-1.

8.5.3.105.7

Contactors feeding motors in plugging or inching service shall have a utilization category of AC-4.

8.5.3.105.8

Contactor no-load operating mechanical endurance shall not be less than 1 million cycles.

8.5.3.105.9

Emergency stop pushbuttons shall comply with IEC 60947-5-5.

8.5.3.105.10

Emergency stop pushbuttons shall be provided with a protective guard or shroud to prevent unintended operation.

8.5.3.105.11

The colour and marking of actuators shall be in accordance with IEC 60204-1.

8.5.3.105.12

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

8.5.3.105.13

The control power supply shall be connected to the outgoing side of the main circuit isolating device for contactors that have their control circuit source derived internally within each functional unit.

8.5.3.105.14

If a contactor control circuit source derived internally from within each bus section is specified, a control power transformer shall be provided for each busbar section with the supplies wired in parallel to the functional units.

8.5.3.105.15

If a contactor control power source external to the PSC-assembly is specified, a control power circuit shall be provided in each vertical section with the functional unit supplies wired in parallel.

8.5.3.105.16

Contactor functional units with control power transformers shall be provided with primary and secondary overcurrent protection.

8.5.3.105.17

Contactor control circuits shall be provided with fuse or miniature circuit breaker (MCB) protection within each functional unit.

8.5.3.105.18

When motor starter functional units have provision for motor space heater supply, the motor space heater circuits shall be energized when the main circuit switching device is open while in the connected position or test positions.

Add new subclause

8.5.3.106 Motor protection

8.5.3.106.1

Motor starter functional units shall be provided with thermal overload protection (ANSI 49) for each phase of the main circuit.

8.5.3.106.2

Bimetallic type motor overload relays shall be ambient temperature compensated.

8.5.3.106.3

Solid-state overload relays and microprocessor based digital multifunction motor protection relays shall be provided with adjustable overload characteristic over the range of IEC 60947-4-1 trip classes from 10 to 30.

8.5.3.106.4

Motor starter functional units shall be provided with instantaneous overcurrent protection (ANSI 50) and/or definite-time overcurrent protection (ANSI 51) for each phase of the main circuit.

8.5.3.106.5

On solidly earthed systems, motor starter functional units feeding motors rated equal to or greater than 30 kW shall be fitted with core balance current transformer actuated earth fault protection.

8.5.3.106.6

When earth fault protection is specified, it shall be manual reset only.

8.5.3.106.7

The protection devices in functional units supplying motors with type of protection "eb" shall be in accordance with IEC 60079-14:2013, 11.3.

8.5.3.106.8

Motor thermal protection units shall be in accordance with IEC 60034-11.

8.5.3.106.9

Contactors shall be selected in accordance with the associated HRC fuse earth fault breaking current.

8.5.3.106.10

If IEDs are provided, the additional functional requirements listed in Table 17 shall be fulfilled.

Add new Table 17

Table 17 – Intelligent electronic device (IED) requirements

	ANSI device code	IEC nomenclature	Motors < 110 kW	Motors ≥ 110 kW	Motors ≥ 185 kW
Locked rotor protection	51LR		O	X	X
Definite-time undercurrent protection	37	I<	O	O	O
Inverse-time unbalance protection based on negative phase-sequence current	46	I_2>	O	O	O
Motor start-up time supervision	48	$I_S^2\ t_S$		X	X
Cumulative start-up time counter and restart disable function	66	Σt_{si}		X	X
Lockout relay	86		O	X	X
Front-of-panel protection reset			O	O	O
Key X = required O = optional, fit when user specified					
NOTE For IED motor protection relays, protection reset should be via the local IED HMI, accessible with the front compartment door closed.					

8.5.3.106.11

Microprocessor based digital multifunction motor protection relays shall be provided with undervoltage ride-through and/or auto-restart functionality.

Add new subclause

8.5.3.107 Integrated adjustable speed drives and power semiconductor systems

8.5.3.107.1

ASDs and PSSs shall be in accordance with IEC 60947-4-2.

8.5.3.107.2

Adjustable speed drives and soft starters shall be provided with a programmer or operator interface that is accessible with the front compartment door closed.

8.5.3.107.3

For applications that require a reduced voltage starter, solid-state soft starter type unit shall be provided.

8.5.3.107.4

Adjustable speed drives and soft starter units shall include facilities for isolation and bypass if indicated on the project drawings.

Add new subclause

8.5.3.108 Current transformers

8.5.3.108.1

Current transformers shall be in accordance with IEC 61869-2.

8.5.3.108.2

Current transformer accuracy class shall be class 1 for measuring incoming devices.

8.5.3.108.3

Current transformer accuracy class shall be class 3 for measuring outgoing devices.

8.5.3.108.4

Current transformer accuracy class shall be class 5P for protective devices.

8.5.3.108.5

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

8.5.3.108.6

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

Add new subclause

8.5.3.109 Voltage transformers

8.5.3.109.1

Voltage transformers shall be in accordance with IEC 61869-3.

8.5.3.109.2

Voltage transformers shall be of dry insulation type with an earthed screen between the primary and secondary winding.

8.5.3.109.3

Voltage transformers shall be protected by MCBs or fuses on the primary side.

8.5.3.109.4

Voltage transformers shall be protected by MCBs on secondary windings.

8.5.3.109.5

Voltage transformer accuracy class shall be class 1,0 for measuring devices.

8.5.3.109.6

Voltage transformer accuracy class shall be class 3P for protective devices.

8.5.3.109.7

With the exception of unearthed (IT) systems with insulation monitoring, three-phase voltage transformers shall be provided with star connection and neutral earthed at one point on the secondary.

8.5.3.109.8

For unearthed (IT) systems with insulation monitoring, the voltage transformer on the primary side shall be connected line to line.

8.5.3.109.9

Voltage transformer secondary connections shall be wired to terminals for external wiring when remote metering is required.

8.5.3.109.10

Secondary circuits shall be equipped with terminals with measuring bushings.

8.5.3.109.11

When the voltage transformer secondary voltage is used for control or interlock, a MCB with signal contacts for trip indication shall be provided.

Add new subclause

8.5.3.110 Unearthed electrical supplies (IT)

8.5.3.110.1

Insulation monitoring and earth fault detection shall be provided for PSC-assemblies with unearthed (IT) electrical supplies.

8.5.3.110.2

Insulation monitoring and earth fault detection shall have continuous monitoring of insulation resistance of each bus section.

8.5.3.110.3

Insulation monitoring and earth fault detection shall have provision for audible and electronic alarm indication of low insulation resistance.

8.5.3.110.4

Insulation monitoring and earth fault detection shall have a communication interface for transmission of insulation resistance values and alarms to a remote supervisory system.

8.5.3.110.5

Insulation monitoring and earth fault detection systems shall provide automatic location of earth faults by the use of current transformers fitted in motor starters or feeders.

8.5.3.110.6

Insulation monitoring and earth fault detection shall have selectable insulation impedance ranges.

8.5.3.110.7

Insulation monitoring and earth fault detection shall have local display of system insulation resistance value at each PSC-assembly.

8.5.3.110.8

Insulation monitoring and earth fault detection systems shall be compatible with adjustable speed drive and power semiconductor systems.

Add new subclause

8.5.3.111 Automatic or manual transfer schemes

8.5.3.111.1

The transfer scheme shall be disabled if one or more transfer breakers are in the test, isolated or removed position.

8.5.3.111.2

Manual transfer schemes having no electrical interlocks, sync checks or controls shall have a key type interlock to achieve mechanical interlocking between circuit breaker operations.

8.5.3.111.3

The transfer scheme shall operate as indicated in the supplemental descriptions provided with the project drawings.

8.5.3.111.4

Transfer scheme logic shall be hardwired and/or software configured within devices integral to the PSC-assembly.

8.5.5 Accessibility

Add to subclause

The PSC-assembly height shall not exceed 2,5 m.

Add new subclause

8.5.5.101 Component accessibility

8.5.5.101.1

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

8.5.5.101.2

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

8.5.5.101.3

Removable covers shall be provided on main busbar compartments for access to busbar joint construction and maintenance activities.

8.5.5.101.4

Hinged doors shall open at least 95° on the vertical axis and not be obstructed by adjacent equipment or doors.

8.5.5.101.5

Door restraints shall be provided for securing hinged doors in the open position in the following cases:

a) when placed on floating offshore installations;

b) when located outdoors (exposed to wind);

c) when door is equipped with electrical components.

8.5.5.101.6

Doors required to be opened during normal operation shall have latches that are operated either by hand, captive screws using a flat-head screwdriver or similar means.

8.5.5.101.7

Hinged cable compartment doors shall be padlockable.

8.5.6 Barriers

8.5.6.1

Add to subclause

PSC-assemblies shall provide the following minimum degrees of protection in accordance with IEC 60529 and Table 18.

Add new Table 18

Table 18 – Minimum degrees of protection

Location	Minimum degree of protection
Between horizontal busbar compartments and any other compartment	IP 2X
Between incoming and bus-coupler sections	IP 2X
Between main busbar systems of two separate sections	IP 2X
Between panels	IP 2X
Between compartment of each functional unit and other compartments	IP XXB

8.5.8 Indicator lights and push-buttons

Add to subclause

Status colour coding of indicator components and colour human machine interface (HMI) screens shall be in accordance with Table 19.

NOTE Colour coding of status indicator does not apply to IEDs or protection relays with a suite of status LEDs which are all the same colour.

Add new Table 19

Table 19 – Colour coding of status indicator

Colour	Meaning	PSC-assembly application	
	Safety of persons or environment	ACB	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	Not applicable
White	No specific meaning assigned	Voltage indication (Heater On)	Motor heater on
NOTE Colours detailed in this table are in accordance with IEC 60073			

Add to subclause

Discrete indication lamps shall be LED types.

Add to subclause

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

Add new subclause

8.5.10 Auxiliary components

8.5.10.1 General

8.5.10.1.1

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

8.5.10.1.2

Control and auxiliary devices shall be mechanical duration class 1.

8.5.10.1.3

Control and auxiliary devices shall be rated for 120 cycles per hour (each relay).

8.5.10.1.4

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.

8.5.10.1.5

AC switching elements shall be utilization category AC-15.

8.5.10.1.6

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

8.5.10.1.7

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

8.5.10.1.8

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

8.5.10.2 Indicating and measuring devices

8.5.10.2.1 Analogue instruments

8.5.10.2.1.1

Analogue instruments shall be in accordance with relevant the parts of IEC 60051.

8.5.10.2.1.2

Analogue indicating instruments shall have a minimum accuracy class of 2,5.

8.5.10.2.1.3

Analogue instruments shall be flush mounted on the front of the PSC-assembly.

8.5.10.2.1.4

Analogue instruments shall display black characters on a white background identifying actual primary circuit values.

8.5.10.2.1.5

Analogue instruments shall be provided with pointer external zero adjustment facility.

8.5.10.2.1.6

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

8.5.10.2.1.7

Analogue ammeters and voltmeters shall have a deviation at the rated value of about 80 % of the full scale range.

8.5.10.2.1.8

Current transformer connected ammeter selector switches shall be "make before break" type.

8.5.10.2.1.9

Analogue voltmeters shall have a voltage selector switch equipped with an "off" position.

8.5.10.2.1.10

Voltmeters shall be operated from the voltage transformer secondary windings.

8.5.10.2.1.11

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

8.5.10.2.2 Digital instruments

8.5.10.2.2.1

Multi-functional digital measuring devices shall have a minimum accuracy class of 1,0.

8.5.10.2.2.2

Multi-functional digital measuring devices shall display current, voltage and power factor per phase together with instantaneous and a running total of kilowatt-hours.

8.5.10.2.3 Energy meters

8.5.10.2.3.1

If specified, energy meters shall be solid state meter type in accordance with IEC 62052-11.

8.5.10.2.3.2

Energy meters shall be rated for three-phase unbalanced load measurement.

8.5.10.2.3.3

If specified, energy meter test terminal blocks shall be provided on the panel front adjacent to the respective energy meter.

8.5.10.2.4 Transducers

Transducers shall be in accordance with IEC 60688.

8.5.101 Description of the types of electrical connections of functional units (IEC 61439-2)

Add to subclause

For withdrawable type functional units, the electrical connections shall be type W.W.W.

Add to subclause

For disconnectable type functional units, the electrical connections shall be type D.D.F.

Add new subclause

8.5.102 Operation

8.5.102.1

PSC-assemblies shall be rated for continuous operation at rated load under normal service conditions for at least 45 000 h (5 years) without planned maintenance that requires de-energization of the busbars.

8.5.102.2

Functional units shall be designed for continuous operation at full load under normal service conditions for at least 45 000 h (5 years) without planned maintenance.

8.6 Internal electrical circuits and connections

8.6.1 Main circuits

Add to first paragraph

Partitions shall be incorporated to prevent an internal arc occurrence in a bus section propagating to adjacent bus sections.

Add to subclause

Busbars shall be manufactured from hard drawn, high conductivity electrolytic copper.

Add to subclause

The main busbars shall be of the same cross sectional area throughout the entire length of the PSC-assembly to achieve the defined rated current.

Add to subclause

If specified, busbar insulating materials and busbar joint shrouds shall be of a flame retardant type in accordance with the relevant part of IEC 60684, non-hygroscopic and non-tracking.

Add to subclause

Where busbars are insulated, the insulation of the main busbar joints and interconnecting busbar joints shall be removable and replaceable for joint inspection.

Add to subclause

For PSC-assemblies incorporating a neutral busbar, if specified, each incoming stepdown transformer circuit shall be provided with an accessible removable link between the neutral busbar and the protective earth.

Add to subclause

Main circuit neutral/protective earthing links shall be removable without exposure to other live parts.

8.6.2 Auxiliary circuits

Add to subclause

Earthed poles shall be connected via a removable link.

Add to subclause

Auxiliary circuits powered from an external source shall be via auxiliary main switch contacts in accordance with the status of the main switching device.

Add new subclause

8.6.2.101 Interface with supervisory systems

8.6.2.101.1

Incoming auxiliary supplies shall be monitored with an alarm for loss of availability.

8.6.2.101.2

Discrete input signals to remote supervisory systems shall be a volt-free closed circuit signal to indicate the defined status parameter.

8.6.2.101.3

The PSC-assembly shall be provided with volt-free contacts wired to a terminal strip for sending the following alarm signals to a remote supervisory system or substation annunciator panel:

a) tripped on fault for each ACB;

b) protection / control supply failure for each bus section;

c) common trip alarm for each bus section of busbar, with individual motor starter fault controls wired together;

d) trip circuit healthy alarm;

e) relay watchdog alarm.

8.6.5 Identification of the conductors of main and auxiliary circuits

Add to subclause

The identification of the conductors of main and auxiliary circuits shall be by alphanumeric notation and/or graphical symbols in accordance with Table 20.

NOTE Conductor identification by colour is not mandatory but where colour is used, the purchaser should identify local/project colour requirements.

Add new Table 20

Table 20 – Identification of conductors and terminals

Designated conductor	Mandatory marking
AC conductors	
Phase 1	L1
Phase 2	L2
Phase 3	L3
Neutral	N
DC conductors	
Positive pole	(+)
Negative pole	(–)
NOTE Alphanumeric notations and symbols are in accordance with IEC 60445.	

Add new subclause

8.6.8 Earth bar

8.6.8.1

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

8.6.8.2

Dedicated termination points for all functional unit earthing and external earthing requirements shall be provided.

8.6.8.3

Earth bars shall incorporate spare M10 connection points at the bottom of outgoing cable compartments and incoming panels to facilitate external earth connections.

8.7 Cooling

8.7.1

Add new subclause

The PSC-assembly shall be naturally ventilated.

8.8 Terminals for external cables

Add to subclause

In the absence of user defined field cable information, guidance shall be taken from Table A.1 using the maximum cross-section values.

Add to subclause

Cable supports and bracing points spanning the entire height at intervals not exceeding 450 mm shall be incorporated in cable compartments.

Add to subclause

Terminals for the connection of external auxiliary control cables shall be provided with a minimum of 10 % spare unwired terminals without reducing the size of the field wiring allocated space.

Add to subclause

Power cable terminals shall be provided with phase separation screens.

Add to subclause

The largest functional unit compartments shall be located at the bottom of the PSC section with provision for direct entry and termination.

Add to subclause

Where single core cables enter the PSC-assembly, the associated gland plates or transit frames shall be fabricated using a non-magnetic metal.

Add to subclause

Gland plates and multi-cable transit frames shall be connected directly to the main protective earth.

Add new subclause

8.8.101 Terminals for control and auxiliaries

8.8.101.1

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

8.8.101.2

Terminals shall be of modular design in accordance with IEC 60947-7-1.

8.8.101.3

A maximum of two conductors shall be terminated on any one terminal.

8.8.101.4

Parallel connections shall be made using cross connection links approved by the terminal manufacturer.

8.8.101.5

Terminal blocks shall be grouped by function and operating voltage.

8.8.101.6

Terminal blocks shall be separated from other groups using barrier plates or earthed terminals.

8.8.101.7

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

8.8.101.8

Terminals associated with external sources of supply shall display a warning label.

8.8.101.9

Space for a minimum of 10 % spare terminals to be installed, shall be provided for future use.

8.8.101.10

Spare I/O contacts of protection/auxiliary relays shall be wired to terminal blocks and numbered.

8.8.101.11

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

8.8.101.12

Earthing links for control supplies and current transformers shall be removable.

8.8.101.13

Instrument circuits requiring dedicated earthing shall have separate instrument earth bars isolated from main earth bars.

8.8.101.14

When external cable conductors are terminated directly onto flat bar with cable lugs, the termination points shall have pre-drilled holes to the user defined diameters.

8.101 Internal separation of PSC-assemblies (IEC 61439-2)

Add to subclause

Internal separation shall be a minimum of Form 4a for ACB functional units and a minimum of Form 3b for all other functional units.

Add new subclause

8.102 PSC-assembly physical configuration

8.102.1

PSC-assemblies shall be fully enclosed and consist of multi-cubicle sections joined to form a rigid freestanding assembly for floor mounting.

8.102.2

Functional units with the greatest mass shall be in the lowest cubicles of the tier.

8.102.3

PSC-assemblies specified for marine installation shall be in accordance with IEC 60092-101:2018, Clause 4.

8.102.4

PSC-assemblies specified for offshore electrical installations shall be in accordance with IEC 61892-3:2019, 7.1 to 7.4.

Add new subclause

8.103 Enclosure space heaters

Add new subclause

8.103.1 Space heaters

8.103.1.1

If specified, PSC-assembly enclosure space heaters shall maintain the enclosure internal air temperature at least 5 K above the specified minimum ambient air temperature.

8.103.1.2

PSC-assembly enclosure space heaters shall incorporate a mechanical guard where the heater surface temperature exceeds 60 °C.

8.103.1.3

PSC-assembly enclosure space heaters shall have a degree of ingress protection of at least IP2X in accordance with IEC 60529.

8.103.1.4

Each vertical section space heater circuit shall be protected by a MCB with a 30 mA residual current device (RCD) or by a residual current circuit breaker with overcurrent protection (RCBO).

8.103.1.5

PSC-assembly enclosure space heaters shall be wired to an accessible terminal block for connection to an external power source.

Add new subclause

8.103.2 Space heater supply monitoring

8.103.2.1

If space heater supply monitoring is specified, each bus section heater supply shall have a front of panel indicating LED lamp and labelled "Heater supply on".

8.103.2.2

If space heater supply monitoring is specified, each bus section heater supply shall have a loss of supply actuated volt-free signal wired to an accessible terminal block.

Add new subclause

8.103.3 Space heater current monitoring

If space heater load current monitoring is specified, a control unit shall be provided.

8.103.3.1

The space heater control unit supply disconnect shall be a circuit breaker which is padlockable in the “off” position.

8.103.3.2

The space heater control unit shall have a control circuit that includes a momentary push button.

8.103.3.3

The space heater control unit momentary push button shall energize the space heaters, bypassing the thermostat/hygrostat to verify the operation of the space heaters.

8.103.3.4

The space heater control unit shall be provided with an ammeter.

8.103.3.5

The space heater control unit ammeter shall have an appropriately sized scale such that the failure of a single space heater element results in a visible change in ammeter reading.

8.103.3.6

The normal operating ampacity of a space heater circuit shall be inscribed on the ammeter nameplate.

Add new subclause

8.104 Provision for future development

8.104.1

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

8.104.2

Unequipped spaces shall be fitted with the internal components to enable the subsequent installation of a functional unit in that space while the PSC-assembly busbars are energized.

8.104.3

The PSC-assemblies shall have a design and post factory acceptance test (FAT) supported lifetime of at least 20 years under service conditions.

8.104.4

The manufacturer shall have an obsolescence management plan in accordance with a recognized system for all PSC-assembly components by example to IEC 62402.

8.104.5

Provided equipment shall be field proven for at least three years.

Add new subclause

8.105 Condition based monitoring

Add new subclause

8.105.1 General

8.105.1.1

Condition based monitoring systems shall provide real-time continuous monitoring.

8.105.1.2

Real time monitored condition parameters shall be displayed on a front of panel mounted HMI.

8.105.1.3

Continuous monitoring systems shall include communications interface(s) capable of conveying temperature data, status and alarming for each monitored point.

Add new subclause

8.105.2 Thermal monitoring

8.105.2.1

If specified, PSC-assemblies shall be equipped with factory-integrated continuous thermal monitoring technology.

8.105.2.2

Thermal monitoring shall include hotspot detection sensors for main incoming sections, i.e. main circuit breaker or lugs.

9 Performance requirements

9.3 Short-circuit protection and short-circuit withstand strength

9.3.1 General

Add to subclause

PSC-assemblies shall be designed, constructed and verification tested in accordance with IEC TR 61641 to provide personnel protection under arcing condition for restricted access authorized persons.

Add to subclause

The permissible short-circuit current under arcing conditions ($I_{p\ arc}$) value shall be at least equal to the specified rated short-time withstand current (I_{cw}) for a minimum arc fault duration of 0,3 s.

Add to subclause

PSC-assemblies with arcing class B or arcing class C classification, an arc fault within a functional unit shall be confined to that functional unit compartment.

Add to subclause

PSC-assemblies with arcing class B or arcing class C classification, an arc fault on a distribution busbar shall confine the arc to that section without propagating to the main busbars.

Add to subclause

Pressure-relief device or pressure-relief ducting, if required, shall be fully rated to withstand the forces associated with an arc fault within the PSC-assembly.

Add to subclause

If pressure-relief ducting with an outdoor exhaust vent is required, the exhaust ducting shall be provided with a wall penetration kit and exterior exhaust outlet equipped with environmental seals.

NOTE The wall penetration kit and exterior exhaust outlet can also require additional features to maintain the integrity of the wall or bulkhead being penetrated, such as fire rating or blast overpressure certification.

Add to subclause

Minimum room dimension requirements and other guidelines (e.g. pressure-relief flaps, arc ducts, exhaust vents) required to ensure the PSC-assembly arc fault protection for personnel safety and building integrity shall be provided.

Add to subclause

If specified, internal arc fault mitigation system shall be provided and integrated into the PSC-assembly in accordance with IEC TS 63107.

9.3.4 Co-ordination of protective devices

In third paragraph, replace "(e.g. by a warning label in the assembly or in the operating instructions, see 6.2)" with

by a warning label within the relevant functional unit compartments

10 Design verification

10.10 Temperature-rise

10.10.1 General

Add to subclause

For PSC-assemblies incorporating additional supervisory devices, the verification of temperature-rise shall include the in-service heat contribution from these additional components.

11 Routine verification

11.8 Mechanical operation (IEC 61439-2)

Replace second sentence of first paragraph with

Verification shall include the checking of interlocking and locking arrangements associated with removable and withdrawable parts, including the insertion interlocks of mechanically identical withdrawable functional units.

11.10 Wiring, operational performance and function

Add new subclause

11.10.1 Functional testing

Functional testing of the completed PSC-assembly shall include the following:

a) operation of all circuit breakers and switching devices, including any auto-transfer schemes;

b) electrical and mechanical interlocks;

c) control devices that are either hard wired or communicating over a network and, if applicable, local HMI;

d) current and voltage transformers or sensors;

NOTE Primary injection for current transformers is not required to comply with this requirement.

e) circuit breaker trip units, protective relays and metering devices;

f) indicator lights;

g) circuit breaker drawout and mechanical insertions, including operation of the shutter mechanism;

h) vertical section space heaters and thermostat/hygrostat if applicable;

i) continuous thermal monitoring system if applicable;

j) auxiliary equipment provided as part of the system design (e.g. interposing relay panel, mimic panel, remote racking equipment, and absence of voltage tester device);

k) high resistance earthing system, if applicable;

Add new subclause

11.101 Electrical control and management system (ECMS) simulation test

11.101.1

If specified, a simulation test shall be carried out between the remote HMI and electrical control devices on the PSC-assemblies and the specific functions.

11.101.2

The simulation test shall check and validate the ECMS and interfaces with interconnected electrical assemblies.

11.101.3

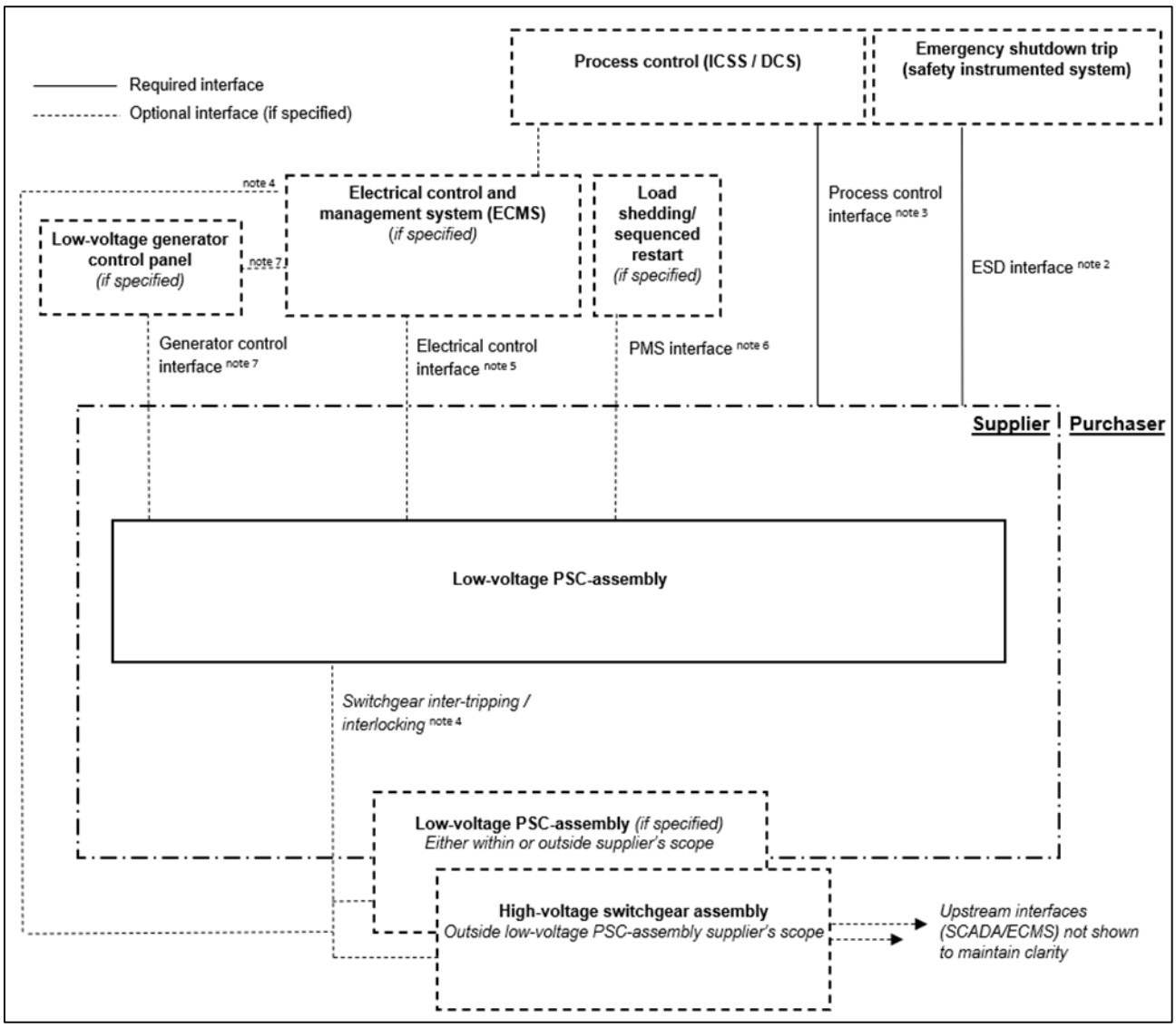
The ECMS simulation tests shall be carried out in accordance with the procedures, documentation and tools proposed by the ECMS provider.

Add new Annex HH

Annex HH
(informative)

Integration with external systems

Add new Figure HH.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 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 ECMS.

Note 4 Incoming circuit breaker intertripping/interlocking to either upstream high-voltage switchboards or interconnectors to adjacent low-voltage PSC-assemblies. The assumed default is hardwired from PSC-assembly to upstream or 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 PSC-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 in integral to the ECMS with communication via the electrical control interface or a standalone load shedding system acting directly on the PSC-assembly circuits, (e.g. hardwired discrete trips, load start inhibits and status monitoring).

Note 7 It is typically for emergency/essential switchboards, PSC-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 HH.1 – Communications interface block diagram

Bibliography

Add to Bibliography

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

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

IEC 62264-1, *Enterprise-control system integration – Part 1: Models and terminology*

IEC 62402 , *Obsolescence management*

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



21. ANNEX III – "QUALITY REQUIREMENTS FOR LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR– SPECIFICATION S-560Q"

International Association of Oil & Gas Producers

SPECIFICATION

IOGP S-560Q

December 2022

Version 3.0

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

JIP33 JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
3.0	December 2022	Third Edition
2.0	November 2016	Second Edition
1.0	June 2016	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).

Disclaimer

Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither IOGP nor any of its Members past present or future warrants its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms.

Please note that this publication is provided for informational purposes and adoption of any of its recommendations is at the discretion of the user. Except as explicitly stated otherwise, this publication must not be considered as a substitute for government policies or decisions or reference to the relevant legislation relating to information contained in it.

Where the publication contains a statement that it is to be used as an industry standard, IOGP and its Members past, present, and future expressly disclaim all liability in respect of all claims, losses or damages arising from the use or application of the information contained in this publication in any industrial application.

Any reference to third party names is for appropriate acknowledgement of their ownership and does not constitute a sponsorship or endorsement.

Copyright notice

The contents of these pages are © International Association of Oil & Gas Producers. Permission is given to reproduce this report in whole or in part provided (i) that the copyright of IOGP and (ii) the sources are acknowledged. All other rights are reserved. Any other use requires the prior written permission of IOGP.

These Terms and Conditions shall be governed by and construed in accordance with the laws of England and Wales. Disputes arising here from shall be exclusively subject to the jurisdiction of the courts of England and Wales.

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 third edition cancels and replaces the second edition published in November 2016.

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

Table of Contents

Foreword 1
Introduction 3
1 Scope 4
2 Normative references 4
3 Terms and definitions 4
4 Symbols and abbreviations 5
5 Quality requirements 5
5.1 Quality management system 5
5.2 Conformity assessment system (CAS) 5
6 Certification and traceability 6
7 Evidence — conformance records 6
Annex A (normative) Purchaser conformity assessment requirements 7

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 low-voltage switchgear and controlgear in accordance with IOGP S-560 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-560), the procurement data sheet (IOGP S-560D) and the information requirements specification (IOGP S-560L) 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 low-voltage switchgear and controlgear to IOGP S-560 including:

a) manufacturer 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-560 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-560, *Supplementary Specification to IEC 61439-1 and IEC 61439-2 for Low-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-560 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 manufacturer's/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 manufacturer 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 manufacturer 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 manufacturer'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 manufacturer 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 manufacturer 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

Manufacturer 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, air circuit breakers, 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	S	-
2	**Design and development activities**				
2.1	Type testing (if type test certificates are not available) (IOGP S-560 10.10.1, 10.11.1, 5.2.4)	H	H	H	H
2.2	Strength of materials and parts, resistance to corrosion, thermal stability, resistance of insulating materials to abnormal heat and fire due to internal electric effects, resistance to ultraviolet (UV) radiation, lifting, protection against mechanical impact (IK code), marking (IOGP S-560 10.2.1)	R	R	-	-
2.3	Temperature rise, verification by testing, by comparison with a reference design or by assessment (calculation) (IOGP S-560 10.10.1)	R	R	-	-
2.4	Short-circuit withstand strength (IOGP S-560 10.11.1)	R	R	-	-
2.5	Arc fault tests (IOGP S-560 9.3.1)	R	R	-	-
2.6	Electromagnetic compatibility (EMC) (IOGP S-560 10.12)	R	R	-	-
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-560 8.6.1, 8.5.3, 8.5.3.108.1, 8.5.3.109.1, 8.6.8.1)	S	S	S	-
4.2	Assembly routine verification				
4.2.1	Visual and dimensional checks (IOGP S-560 11.10)	H	W	S	-
4.2.2	Degree of protection against contact with hazardous live parts, ingress of solid foreign bodies and water of enclosures (IOGP S-560 8.2.2, 11.2, 8.103.1.3, 8.5.3.104.3, Table 18)	H	W	S	R
4.2.3	Clearances and creepage distances (IOGP S-560 5.2.4)	H	W	S	R
4.2.4	Protection against electric shock and integrity of protective circuits (IOGP S-560 8.4.2.3, 8.4.6.2.1, 11.4)	H	W	S	R

	PURCHASER ASSESSMENT ACTIVITIES *(continued)*	CAS			
		A	B	C	D
4.2.5	Incorporation of built-in components (IOGP S-560 11.5)	W	W	S	-
4.2.6	Internal electrical circuits and connections (IOGP S-560 11.6)	W	W	S	-
4.2.7	Terminals for external connections (IOGP S-560 11.7)	W	W	S	-
4.2.8	Mechanical operation (IOGP S-560 11.8, 6.2.2)	H	W	S	-
4.2.9	Dielectric properties (IOGP S-560 11.9)	H	W	S	R
4.2.10	Wiring, operational performance and function (IOGP S-560 11.10.1, 8.5.3.111.1, 8.5.3.111.2, 8.5.3.111.3)	H	W	S	R
4.3	Switchgear special tests (if included in scope as defined by the user in the data sheets)				
4.3.1	ECMS simulation test (IOGP S-560 11.101.2, 11.101.3)	H	W	S	R
5	**Release of product or service**				
5.1	Verify conformance to purchase order including as applicable				
5.1.1	Inspection of loose ship items, spares, special tools, as applicable	W	W	S	-
5.1.2	Handling, preservation and packaging (IOGP S-560 10.2.5.1, 6.2.2, 8.1.6)	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



22. ANNEX IV: "INFORMATION REQUIREMENTS FOR LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR– SPECIFICATION S-560L"

International Association of Oil & Gas Producers

SPECIFICATION
IOGP S-560L

December 2022
Version 3.0

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

JIP33
JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
3,0	December 2022	Third Edition
2,0	November 2016	Second Edition
1,0	June 2016	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).

Disclaimer

Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither IOGP nor any of its Members past present or future warrants its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms.
Please note that this publication is provided for informational purposes and adoption of any of its recommendations is at the discretion of the user. Except as explicitly stated otherwise, this publication must not be considered as a substitute for government policies or decisions or reference to the relevant legislation relating to information contained in it.
Where the publication contains a statement that it is to be used as an industry standard, IOGP and its Members past, present, and future expressly disclaim all liability in respect of all claims, losses or damages arising from the use or application of the information contained in this publication in any industrial application. Any reference to third party names is for appropriate acknowledgement of their ownership and does not constitute a sponsorship or endorsement.

Copyright notice

The contents of these pages are © International Association of Oil & Gas Producers. Permission is given to reproduce this report in whole or in part provided (i) that the copyright of IOGP and (ii) the sources are acknowledged. All other rights are reserved. Any other use requires the prior written permission of IOGP.
These Terms and Conditions shall be governed by and construed in accordance with the laws of England and Wales. Disputes arising here from shall be exclusively subject to the jurisdiction of the courts of England and Wales.

IOGP S-560L (3.0) Information Requirements for Low-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).

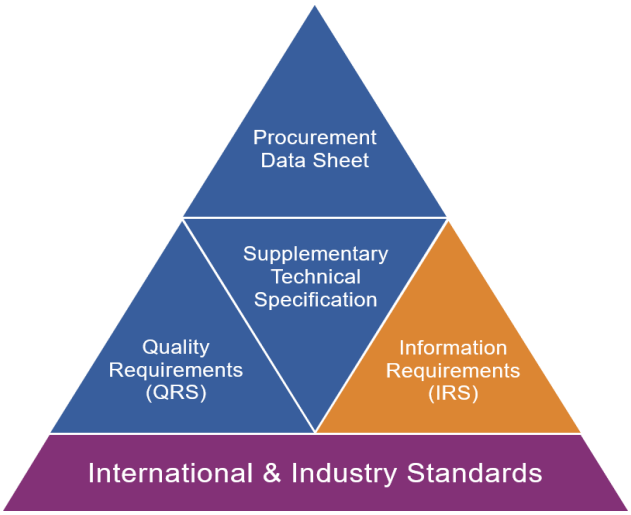
This third edition cancels and replaces the second edition published in November 2016. Due to technical writing requirements leading to extensive changes, this third edition should be treated as a new document.

IOGP S-560L (3.0) Information Requirements for Low-voltage Switchgear and Controlgear (IEC)

Introduction

The purpose of this information requirements specification (IRS) is to define information requirements for the procurement of low-voltage switchgear and controlgear in accordance with IOGP S-560 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-560), procurement data sheet (IOGP S-560D) and quality requirements specification (IOGP S-560Q) 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-560L (3.0) Information Requirements for Low-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 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-560L (3.0) Information Requirements for Low-voltage Switchgear and Controlgear (IEC)

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											
S560-IR-156	Supplier master information schedule		Information deliverables list	No	For Acceptance		-	-		-	
S560-IR-157	Delivery schedule		Delivery/production schedule	Yes	For Information		-	-		-	Preliminary with proposal
S560-IR-158	Progress report	Required for CAS A, CAS B, CAS C	Progress report	No	-		-	-		-	Guidance Note: CAS A: For Information, CAS B: For Information, CAS C: For Information, CAS D: - (N/A)
S560-IR-159	Quality plan	Required for CAS A, CAS B	Quality plan	-	-		-	-		-	Guidance Note: CAS A: For Acceptance (before start of manufacturing), CAS B: For Information, CAS C: - (N/A), CAS D: - (N/A)
S560-IR-161	Sub-supplier delivery schedule	Required for CAS A, CAS B	Delivery/production schedule	Yes	-		-	-		-	Guidance Note: CAS A: For Acceptance (before start of manufacturing), CAS B: For Information, CAS C: - (N/A), CAS D: - (N/A)
S560-IR-162	Inspection and test plan (ITP)		Inspection and test plan (ITP)	Yes	For Acceptance		-	-		-	Preliminary with proposal
S560-IR-163	Handling, lifting, shipping, storage and preservation procedure		Handling, shipping and storage procedure	No	For Information		-	-		-	
S560-IR-164	Non-conformance records		Non-conformance records	No	For Acceptance		-	-		-	
S560-IR-165	Concession requests		Concession request	No	For Acceptance		-	-		-	
S560-IR-166	Obsolescence management plan		Obsolescence management plan	Yes	For Information		-	-		-	Preliminary with proposal
S560-IR-167	IED configuration responsibilities	Where IEDs are included in scope	Authority matrix	Yes	For Information		-	-		-	Preliminary with proposal
Technical Information Deliverables											
S560-IR-168	Functional design specification		Functional design specification	Yes	For Information		-	-		-	
S560-IR-169	General arrangement details		General arrangement diagram	Yes	For Acceptance		-	-		-	Guidance Note: Preliminary with proposal. CAS A: For Acceptance (before start of manufacturing), CAS B: For Acceptance (before start of manufacturing), CAS C: For Acceptance (before start of manufacturing), CAS D: For Information
S560-IR-170	Foundation and installation details		Installation diagram	No	For Information		-	-		-	
S560-IR-209	Arc fault protection installation details		Installation manual	No	For Acceptance			No		-	
S560-IR-171	CT sizing calculations		Curves and burden calculations	No	For Information		-	-		-	
S560-IR-174	Utility load schedule		Utility consumption report	No	For Information		-	-		-	Preliminary with proposal Guidance Note: A preliminary value of AC and DC utility load is needed at proposal stage to enable Purchaser to design UPS sizing.
S560-IR-175	Heat dissipation calculation and loads		Heat dissipation calculation and loads	No	For Information		-	-		-	Preliminary with proposal Guidance Note: A preliminary value of switchgear heat dissipation is needed at proposal stage to enable design of substation HVAC plant sizing.
S560-IR-176	Connection diagram		Connection diagram	No	For Information		-	-		-	
S560-IR-177	Switchgear I/O schedule		Input, output list	No	For Information		-	-		-	
S560-IR-178	Functional logic diagram		Logic diagram	No	For Acceptance		-	-		-	
S560-IR-179	Switchgear single line diagram		Single line diagram	No	For Acceptance		-	-		-	
S560-IR-180	Circuit and wiring diagram		Wiring diagram	No	For Acceptance		-	-		-	
S560-IR-181	Inter-panel diagram		Connection diagram	No	For Information		-	-		-	
S560-IR-182	Probability of failure on demand reliability data	For I/O interfaces with ICSS/ESD systems	Reliability, availability, safety integrity level calculation	No	For Information		-	-		-	
S560-IR-183	IED interrogation and programming software	Where IEDs included in scope	Application software	No	For Information		-	-		-	
S560-IR-184	Relay IED configuration files	Where IEDs included in scope	Configuration file	No	For Information		-	-		-	
S560-IR-185	IEC 61850 configuration files	Where IEDs included in scope with IEC 61850 interface to remote systems	Configuration file	No	For Information		-	-		-	
S560-IR-203	Manufacturer data sheet		Manufacturer data sheet	Yes	For Acceptance		-	-		-	
S560-IR-207	Commissioning Instruction		Commissioning instruction	No	For Information		-	-		-	
S560-IR-186	Installation manual		Installation manual	No	For Information		-	-		-	
S560-IR-187	Maintenance manual		Maintenance manual	No	For Information		-	-		-	
S560-IR-188	Operating manual		Operating manual	No	For Information		-	-		-	
S560-IR-204	Special tools list		Special tools list	No	For Information		-	-		-	
S560-IR-189	Recommended spare part list (RSPL)		Spare part list	No	For Information		-	-		-	
S560-IR-191	Bill of materials		Bill of materials	No	For Information		-	-		-	
S560-IR-210	Sub-component routine test report		Test report	No	For Information			-		-	
S560-IR-192	Type test certificate		General certificate	No	For Information		-	-		-	
S560-IR-193	Lifting equipment test certificate	If lifting equipment included in scope	Lifting equipment test certificate	No	For Information		-	-		-	
S560-IR-194	Weight data sheet		Weight report	No	For Information		-	-		-	
S560-IR-195	ECMS simulation test procedure	If ECMS Simulation included in scope	Test procedure	No	For Acceptance		-	-		-	
S560-IR-196	ECMS simulation test report	Where IEDs included in scope	Test report	No	For Information		-	-		-	
S560-IR-197	Routine verification test (FAT) procedure		Factory acceptance test (FAT) procedure	No	For Acceptance		-	-		-	
S560-IR-198	Routine verification test (FAT) results		Factory acceptance test (FAT) records	No	For Acceptance		-	-		-	
S560-IR-200	Site acceptance test (SAT) procedure		Site acceptance test (SAT) procedure	No	For Acceptance		-	-		-	To incorporate site interfaces
S560-IR-201	Site acceptance test (SAT) report		Site acceptance test (SAT) records	No	For Acceptance		-	-		-	
S560-IR-206	Cyber security certification	Where specified	Cyber security documentation	No	For Information		-	-		-	
S560-IR-199	Certificate of conformity	Required for CAS A, CAS B, CAS C	Certificate of conformance	No	-		-	-		-	Marine class approval from an independent verification body

IOGP S-560L (3.0) Information Requirements for Low-voltage Switchgear and Controlgear (IEC)

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)			
Purchase Order Specific Information Requirements											

IOGP S-560L (3.0) Information Requirements for Low-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.
B	Requirement — Contains data, documents or models to be provided by suppliers, based on the industry standard or IOGP JIP33 specification.
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			
S560-IR-156	Supplier master information schedule	Schedule of specific information deliverables developed by the manufacturer and accepted by the user to meet the information requirements defined in the agreed Information Requirements Specification (IRS). The schedule typically defines; a) information deliverable type, title/description b) unique identification (code/number) in the manufacturer's format unless agreed otherwise in the contract. c) planned submission arrangements including; purpose, formats, timing, frequency Arrangements for managing submissions, tracking progress and updating the schedule during the execution of the contract scope will be in accordance with contractual agreements.	6.2.1	PDF	CFIHOS-70000099
S560-IR-157	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
S560-IR-158	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
S560-IR-159	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	
S560-IR-161	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
S560-IR-162	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
S560-IR-163	Handling, lifting, shipping, storage and preservation 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 and lifting 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, e. drawings shall be provided indicating size of shipping splits, center of gravity, weight, identification, and packing list of contents. NOTE: Copies of applicable lifting procedures are included in the delivery documentation which accompanies shipments of equipment.	6.2.2, 10.2.5.1	PDF	CFIHOS-70000154
S560-IR-164	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
S560-IR-165	Concession requests	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
S560-IR-166	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.	8.104.4	PDF	
S560-IR-167	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.	8.5.3.106.10	PDF	CFIHOS-70000023
		Technical Information Deliverables			
S560-IR-168	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.	6.2.2	PDF	CFIHOS-70000244
S560-IR-169	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.	8.5.2	PDF	CFIHOS-70000153
S560-IR-170	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.	8.102.1	PDF	CFIHOS-70000119
S560-IR-209	Arc fault protection installation details	Minimum room clearance dimensions, overpressure calculations and other installation guidelines (e.g. the arrangement of the pressure relief flaps, arc ducts, exhaust vents, if any) and the method of fixing the assembly as in service to the floor and the walls as appropriate.	9.3.1	PDF	CFIHOS-70000181
S560-IR-171	CT sizing calculations	Calculations to size the current transformers, e.g. burden and accuracy class and the magnetization (knee-point) curves of the class PX current transformers.	8.5.3.108.1	PDF	
S560-IR-174	Utility load schedule	Summarizes the normal and transient DC and AC utility loads of the switchgear for the purpose of sizing external power provision.	6.2.2	PDF	
S560-IR-175	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	8.7.1	PDF	
S560-IR-176	Connection diagram	Drawing providing information about the external physical connections per functional unit including hydraulic, pneumatic and electrical connections.	8.8.101.1	PDF	CFIHOS-70000055
S560-IR-177	Switchgear I/O schedule	Schedule of tags identifying either IED programmable addresses and/or discrete hardwired signal interfaces for all functional units within the switchgear and control gear assembly.	6.2.2	PDF	CFIHOS-70000179
S560-IR-178	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.	6.2.2	PDF	CFIHOS-70000248
S560-IR-179	Switchgear single line diagram	Drawing detailing major items of equipment, including protection devices per functional unit using IEC 60617 standard symbols and/or IEEE C37.2 device function numbers per switchgear and controlgear assembly.	6.2.2	PDF	CFIHOS-70000371
S560-IR-180	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.	8.5.3.111.4	PDF	CFIHOS-70000268
S560-IR-181	Inter-panel 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.	6.2.2	PDF	CFIHOS-70000055
S560-IR-182	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.	8.5.10.1.8	PDF	CFIHOS-70000312
S560-IR-183	IED interrogation and programming software	Software required to access and program the relays and programmable devices in the PSC-assembly.	6.2.2	Native	CFIHOS-70000012
S560-IR-184	Relay IED configuration files	Relay and programmable configuration devices files (native files and PDF)	8.5.3.111.4	Native	
S560-IR-185	IEC 61850 configuration files	Substation Configuration Description (SCD) or Configured IED Description (CID) files	6.2.2	Native	
S560-IR-203	Manufacturer data sheet	To include confirmation of compliance with S-560D by providing actual values of switchgear specification and all other information in accordance with IEC 61439-1:2020, Annex C, and IEC 61439-2:2021,Annex AA.	6.2.2	PDF	CFIHOS-70000416
S560-IR-207	Commissioning Instruction	Instruction providing information on the commissioning of the product. Instructions for commissioning are provided especially for large and highly complex products and for large industrial installations. The purpose of such instructions is to provide the user with the information needed for initial setting-up of the product. These instructions should contain information on how to download the configuration program, software operating instructions, identify the specific checks / tests to be performed before connection to the power system before first operation. NOTE: Unless otherwise agreed, can be delivered as part of manufacturers' standard Installation, operation and maintenance manual or as a standalone document	6.2.2	PDF	CFIHOS-70000396
S560-IR-186	Installation manual	The manufacturer's standard information manual. This document includes sufficient information to install the equipment.	6.2.2	PDF	CFIHOS-70000181

IOGP S-560L (3.0) Information Requirements for Low-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.
B	Requirement — Contains data, documents or models to be provided by suppliers, based on the industry standard or IOGP JIP33 specification.
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**
S560-IR-187	Maintenance manual	The manufacturer's standard maintenance manual. This document includes sufficient information to maintain the equipment. 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.	6.2.2	PDF	CFIHOS-70000206
S560-IR-188	Operating manual	The manufacturer's standard operating manual. This document includes sufficient information to operate the equipment. This document includes sufficient information for troubleshooting.	6.2.2	PDF	CFIHOS-70000228
S560-IR-204	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).	6.2.2	PDF	
S560-IR-189	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.	6.2.2	PDF	CFIHOS-70000374
S560-IR-191	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.	6.2.2	PDF	CFIHOS-70000028
S560-IR-210	Sub-component routine test report	Test reports detailing the results of routine tests in accordance with the relevant IEC for individual sub-components such as voltage transformers, current transformers and air circuit breakers.	6.2.2	PDF	
S560-IR-192	Type test certificate	Documentation providing objective evidence that the supplied equipment is compliant to the relevant standards, providing the equipment designation, manufacturer, the testing authority name and address, the specific year and edition of the IEC used to perform the verifications and a summary of the proving type tests performed.	9.3.1	PDF	CFIHOS-70000239
S560-IR-193	Lifting equipment test certificate	Lifting equipment test certificate in relation switchgear load certified hoist	6.2.2	PDF	CFIHOS-70000432
S560-IR-194	Weight data sheet	Document with weight of individual shipping sections	6.2.2	PDF	CFIHOS-70000359
S560-IR-195	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.	11.101.3	PDF	CFIHOS-70000332
S560-IR-196	ECMS simulation test report	Results from the execution of ECMS simulation test procedure including communication interfaces with integrated control and safety systems.	11.101.1	PDF	
S560-IR-197	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. Where virtual attendance is proposed, provisions to accommodate this may be included.	11,1	PDF	CFIHOS-70000427
S560-IR-198	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 retesting.	11,1	PDF	CFIHOS-70000429
S560-IR-200	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.	6.2.2	PDF	CFIHOS-70000428
S560-IR-201	Site acceptance test (SAT) report	Site acceptance test report including discrete functional unit and overall assembly, electrical, mechanical, protection relay and IED tests.	6.2.2	PDF	CFIHOS-70000430
S560-IR-206	Cyber security certification	Certification confirming compliance with IEC 62243-4-2 for industrial automation and control system components.	6.2.2	-	
S560-IR-199	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	8.2.1, 8.4.1, 8.5.10.2.4.1, 8.6.1, 9.3.1, 8.102.3, 8.102.4, 8.5.10.1.1, 8.5.10.2.1.11, 8.5.10.2.1.6, 8.5.3.102.2, 8.5.3.104.1, 8.5.3.105.12, 8.5.3.105.5, 8.5.3.106.8, 8.5.3.107.1, 8.5.3.108.1, 8.8.101.2	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

