Base Load Power Hub (BLPH)

Technical Specification, IDS and DDS for Power Transformers

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01	02/05/2024	Accepted for Construction (AFC)	L. Bosio	A. Madaschi	D. Lo Sterzo
00	22/08/2023	Issue for Review (IFR)	D. Vaccariello	C. Giunchi	M. Dossena
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

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

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

1.1.1 Project Location

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

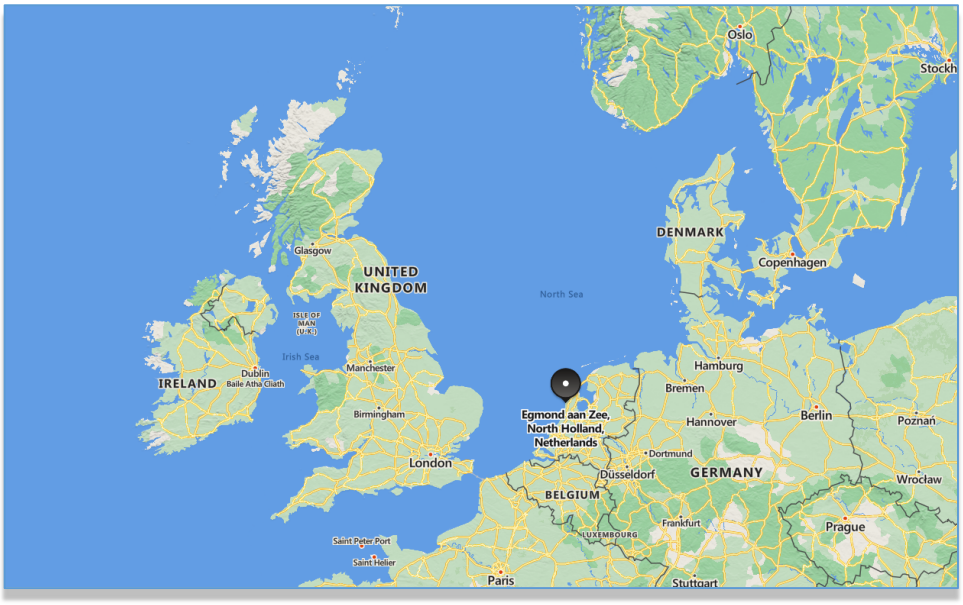


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

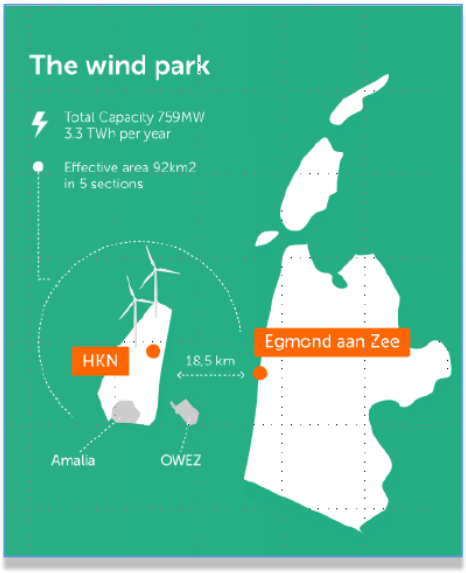


Figure 2 - Wind Park Details

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

1.1.2 Project Concept

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

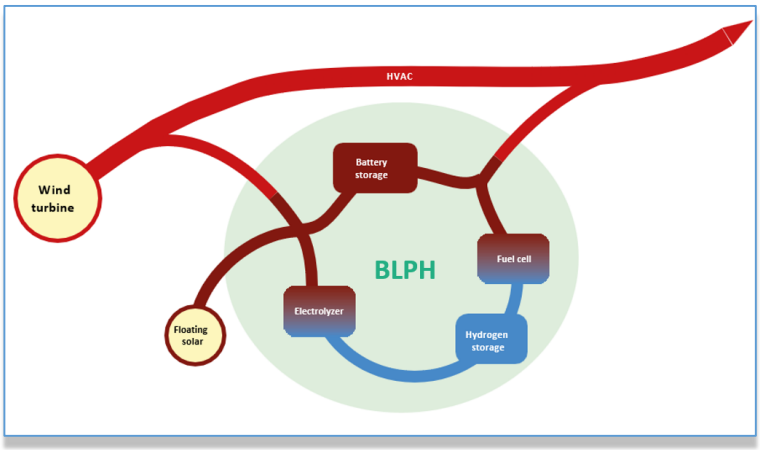


Figure 3 – BLPH Concept

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

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

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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 Power Transformers. Technical requirements of this specification are based upon considerations to performance, and functionality.

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 3.

The Transformer manufacturing shall follow the International Association of Oil and Gas Producers (IOGP) "Supplementary Specification to IEC 60076-1 Transformers – S720" 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 for Transformers – Specification S-720Q" 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 Transformers - Specification S-720L", 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-DG-20015	Electrical Single Line Diagram HV & MV Systems
123A90-DDL-EL-DS-20002	Technical Data Sheet (TDS) for 66/6.9 kV Power Transformers
123A90-DDL-EL-DS-20003	Technical Data Sheet (TDS) for 6.6/0.42 kV Power Transformers
123A90-DDL-EL-DS-20004	Technical Data Sheet (TDS) for 6.6/0.8 kV Power Transformers
S720	Supplementary Specification to IEC 60076-1 Transformers
S-720Q	Quality Requirements for Transformers – Specification (IDS)
S-720L	Information Requirements for Transformers – Specification (DDS)
123A90-PML-DIG-PRO-00002	Equipment and System Tag Numbering

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:	Individual, firm or manufacturer that provide Materials/Equipment to COMPANY in accordance with this specification and terms of the Purchase Order.
IOGP:	International Association of Oil and Gas Producers
IRS:	Information Requirements Specification
MVA.	Megavolt Ampere (apparent power)
KNAF:	Non-mineral Oil Natural / Air Forced (with cooling fans)
KNAN:	Non-mineral Oil Natural / Air Natural (without cooling fans)
QRS:	Quality Requirements Specification
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 60076-1 Power Transformers – General
- IEC 60076-2 Power Transformers - Temperature Rise
- IEC 60076-3 Power Transformers - Insulation Levels and Dielectric Tests
- IEC 60076-4 Power Transformers - Tapping and Connections
- IEC 60076-5 Power Transformers - Ability to Withstand Short Circuit
- IEC 60076-8 Power Transformers - Application Guide
- IEC 60076-10 Power Transformers - Determination of Sound Level
- IEC 60137 Bushing for AC Voltages above 1000V
- IEC 60156 Method for the Determination of the Electric Strength of Insulating Oils
- IEC 60214 On-load Tap Changer
- IEC 60296 Specification for Unused Mineral Insulating Oils for Transformers and Switchgear
- IEC 60354 Loading guide for oil-immersed transformers
- IEC 60422 Mineral insulating oils in electrical equipment – Supervision and maintenance guidance
- IEC 60529 Degree of Protection provided by Enclosures (IP Code)
- IEC 60628 Gassing of insulating liquids under electrical stress and ionization
- IEC 60079 Electrical Apparatus for Explosive Gas Atmosphere
- IEC 60529 Degree of Protection provided by Enclosures (IP Code)

5 ENVIRONMENTAL AND OPERATING CONDITIONS

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

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5.1 ELECTRICAL SYSTEM

The A.C. main power supply characteristics (e.g. voltage, frequency, neutral grounding method, voltage and frequency variation) shall be defined in the relevant data sheet.

5.2 VOLTAGE AND FREQUENCY VARIATIONS

Transformers will be suitable for continuous operation at rated power at the specified ambient conditions with the following combined conditions of voltage and frequency without exceeding the insulation over temperature limits.

Voltage	Frequency
105 %	95 %
110%	100%
95 %	105 %
90%	100%

6 EQUIPMENT CHARACTERISTIC AND REQUIREMENTS

Transformers up to 4MVA shall be hermetically sealed oil filled transformer. Transformers rated greater than 4MVA shall be Conservator with Bladder type. Cooling shall normally be KNAN. However, where KNAF is required 20% redundancy shall be provided for cooling fans.

Oil type shall be:

- Biodegradable
- Synthetic (with reduced ignitability and flame retardant characteristics) e.g. silicon fluid.

Windings shall be copper.

The design of transformers will be based on continuous and reliable service, safety of personnel and equipment, ease of maintenance of equipment and ease of interchangeability of equipment (as applicable).

The transformers, equipment and accessories will be selected, designed and manufactured taking into account the site conditions specified on the Technical Data Sheet.

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

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

Different materials may be offered as an alternative, and they shall meet or exceed the specified requirements. A technical justification for these changes will be submitted with the Quotation. All

modifications will be evaluated before acceptance by the CONTRACTOR and updated in Specifications and Technical Data Sheets.

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

7 TECHNICAL CHARACTERISTIC

7.1 NORMAL TEMPERATURE-RISE LIMITS

Insulating materials in the range Class as stated in the data sheet inclusive may be used in accordance with the temperature rises stated in IEC 60076-2.

7.2 RATED POWER

Transformers will not exceed the temperature rise limits during continuous running at the rated power with the tapping regulated on the minimum voltage value (maximum current).

Rated power will be relevant to natural air cooling and natural oil circulation for KNAN transformer and to fan-forced air cooling and natural oil circulation for KNAF transformer. In this case all electrical and mechanical parts of the transformer shall be designed on the basis of the KNAF rating (including bushings and tap changers). Type of transformer, KNAN or KNAF, shall be indicated on Technical Data Sheet.

In case of KNAF transformer type, all supports and accessories necessary for installation of electrical fans and their control panel will be provided.

7.3 RATED VOLTAGE

Rated voltages are those measured at no-load.

7.4 SHORT CIRCUIT IMPEDANCE

The short circuit impedance shall be as per IEC 60076-5, unless otherwise specified in the Data Sheet.

7.5 ABILITY TO WITHSTAND SHORT CIRCUIT

Transformers shall be designed and manufactured to withstand the thermal and dynamic stresses caused by short circuit conditions. Transformer maximum stresses shall be calculated by the Vendor on the basis of:

- Short circuit current value specified on Technical Data Sheet.

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- Short circuit apparent power of the system specified on Technical Data Sheet.
- If the short circuit apparent power of the system is not specified on the Technical Data Sheet, the value given on table II of IEC 60076-5 shall be used.

7.6 NOISE LEVEL

The noise level, indicated as average sound pressure at 1 meter from the transformer surface and measured in dB (A), will not exceed the limits specified in the IEC 60076-10.

7.7 INSULATION LEVEL OF TRANSFORMER WINDING

All winding ends connected to terminals shall have the same insulation level both if the transformer is direct or indirect connected to earth (uniform insulation) as per IEC 60076-3.

8 CONSTRUCTION CHARACTERISTIC

8.1 BASE AND TANK

The transformers shall be sized and shall have a rated power standardized according to the Normative References IEC as much as possible.

The transformer tanks shall be constructed of welded steel sheets. The tank shall be mounted on plain wheels. The diameter of plain wheels shall be enough to allow the transformer's positioning on commercial U shapes of adequate width.

Tank wheels shall roll in both directions. Four reinforced plates, fixed to the bottom, shall support the heads of hoisting jacks.

The tank cover shall be designed to prevent the accumulation of oil and/or rainwater.

8.2 WINDINGS

Unless otherwise stated on the Data Sheets, the windings shall be made of electrolytic copper according to the IEC Rules.

The windings shall be fixed in such a way as to withstand the thermal and dynamic stress caused by a short-circuit at the terminals of the secondary winding of the duration of 2 seconds without permanent deformation caused by short-circuit at the terminals of the secondary winding.

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8.3 COOLING SYSTEM

Transformers shall normally be oil-immersed and natural cooling type (KNAN). Insulating oil shall be PCB free. Transformers will have radiator batteries over 1600 kVA;. Oil-tube radiators are allowed for sizes up to 1600 kVA.

Oil tube radiator shall be welded directly to the tank. Radiator batteries shall be flanged. When required, provisions shall be made for future operation with forced air ventilation (by adding electrical fans) to increase rated power as follows:

KNAN Rating	KNAF Rating
up to 2499 kVA	115 %
up to 10 MVA	125 %
above 10 MVA	133 %

In case of transformer operating with forced air ventilation, mechanical and electrical parts shall be designed on the basis of KNAF rating (including bushing and tap changer).

When a forced air ventilation system is required on Technical Data Sheet, it will include:

- Electrical fans with blades protected by galvanized steel wire screen and relevant 3 phase TEFC induction motors.
- Weather and dust-proof control panel (IP 55), including:
  - Fan motor starters, each equipped with circuit breaker, contactor and thermal relay
  - Terminal strips for power, control and signal circuits

8.4 CORE AND WINDINGS

The core shall consist of grain oriented magnetic plates according to the IEC 60404 Publications low losses perfectly insulated and suitably clamped to one another to prevent vibration and noise. The clamping bolts of each pack shall be carefully insulated to reduce losses and avoid hot points.

8.5 TAP CHANGER

Unless otherwise specified on the Technical Data Sheet, the medium voltage winding shall be equipped with No load Tap Changer.

Control shall be external and operable at no voltage. Tap changer shall be complete with a position indicator and provided with a locking device. It shall not be possible to stop the changer in an intermediate position between two different taps.

8.6 BUSHING AND TERMINAL BOXES

Low Voltage bushings shall be flat throughway providing a direct connection to bus ducts or cables.

Sufficient space shall be provided in order to install CT's for differential protection when required.

When two, or more, conductors have to be connected per phase, the design shall encompass the necessary provisions to ensure a straight connection of the conductors. This can be done by extending the existing bar or by installing an additional bar suitable for the continuous rated current, and able to withstand the prospective short circuit current.

Bushing and insulator shall be of a high quality, high-strength, non-hygroscopic and non-tracking material capable of withstanding rough handling during transport, erection or maintenance.

Bushing and insulator shall be fully rated for the system voltages. These shall withstand the highest short circuit current near to the transformer for duration of at least 2 seconds, considering an infinite source as power supply.

For outdoor installation, bushing shall be made of porcelain or composite material (fiber glass/epoxy resin) suitable for ambient condition indicated in the Data Sheet.

Bushing shall be suitable to withstand the stresses due to the short circuit. Bushing entrance distance shall be adequate to the atmosphere present in the ambient of installation. External connections to the transformer's terminals may be:

- Busduct
- Cable

Terminals (neutral included) of each winding shall always be housed in a IP55 box. The box shall provide with an opening for inspection and maintenance and shall be sized in order to allow easy connections of cables and easy maintenance. The penetration walls for single core cables shall be of a non-magnetic material. All the windings shall be marked with symbols corresponding to the wiring diagram referred to on the nameplate; such symbols shall comply with the normative references.

Terminals and connecting boxes shall be arranged as follows:

- Bus Duct: Terminal box shall be equipped with a flange to be bolted to the duct's flange. Connection between transformer terminals and bus duct terminals shall be made through insulated copper flexible bars. Flexible bars section shall be as minimum equal to the bus duct phase section. Unless otherwise specified on the Technical Data Sheet, terminal boxes shall be equipped with Space Heater controlled by thermostat.

- Cable: The connecting boxes shall allow removal of the cable without damaging its. The box shall be designed in order to allow direct vertical rise of the cables coming from below. Cables shall terminate vertically in the compartment and shall be connected to the transformer bushing by means of copper bars (included in supply) which shall cross the insulating plate and shall be adequately supported to withstand the dynamic stresses of the short circuits. The above-mentioned copper bars shall be bolted to the bushing terminals. Inside boxes shall be provided a grounding terminal suitable for screen and/or armour cable grounding connection. Unless otherwise specified on the Technical Data Sheet, terminal boxes shall be equipped with Space Heater controlled by thermostat.

8.7 AUXILIARY TERMINAL AND CONTROL PANEL

All measuring controls, alarms and auxiliary circuits shall be terminated to the control panel terminal strip.

The connection diagram shall be indelibly marked on the terminal face of the cover.

Terminals shall be suitable for external connections; external connections directly to component terminals are not accepted. Only one conductor from external cable shall be terminated in each terminal.

Control panel degree of protection shall be IP55.

8.8 NEUTRAL GROUNDING TRANSFORMER

If specified in the Technical Data Sheet, a ring-type current transformer for use with grounded start points shall be provided. The current transformer shall be properly supported and fixed before the bifurcation point for earthing of the neutral.

The secondary of the current transformer shall be wired to the control Panel or dedicated junction box, provided with short-circuitable terminal blocks.

8.9 PROTECTION AGAINST CORROSION

Transformer will be painted in accordance to Manufacturer standard. However the painting must be suitable for the specified ambient conditions and in particular must be oil, grease, acid and salt corrosion resistant.

8.10 ACCESSORIES

Unless otherwise specified on the Technical Data Sheet, the following accessories shall be provided:

- Oil conservator (only for unsealed tank transformers) equipped with:

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- Air breather and dryer
- Oil filler cup
- Conservator oil drain plug
- Oil level gauge
- Double float Buchholz relay (only for transformers with conservator) equipped with alarm and tripping contacts. The Buchholz relay shall be installed on a removable length of pipe positioned between tank and conservator.
- Overpressure relay (only for sealed type transformers). All Contacts shall be voltage free of the changeover type, hermetically sealed and suitable for 220 VDC (min 2A).
- Dial type oil thermometer equipped with max temperature indicator. The thermometer shall also be equipped with two contacts (one for alarm, one for trip).
- Oil filler cup (if not provided on the conservator).
- Tank oil drain valve with integral oil sampler.
- Two filter press connections installed, respectively, at tank top and bottom.
- Oil sampler (if not provided with the drain valve) installed not higher than 30 mms from tank bottom.
- Safety explosion device designed to operate at a static pressure lower than the specific hydraulic test pressure and installed in the upper part of the tank.
- Two grounding bolts shall be provided for the transformer tank grounding connections. The grounding bolts will be marked with the grounding symbol.
- An additional grounding clamp will be provided for each transformer part electrically isolated from the tank (e.g. radiator batteries).
- Block and drain valves to remove radiator batteries when the latter are provided for cooling system.
- Lugs to allow the hoisting of the whole transformer and/or its extractable part.
- Name plate
- Rate plate
- Terminal marking plate

8.11 ANTI-CONDENSATION HEATERS

Heaters suitably rated to prevent condensation shall be provided within the enclosure and control panel. The heater's voltage supply shall be as specified in the Data Sheet.

The heaters shall be protected by a fuse and neutral link and controlled by a thermostat.

9 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 relays, measurement instruments, cables, terminal blocks, heaters, etc, the manufacturer tagging procedure shall be submitted for approval prior the construction.

10 EQUIPMENT IDENTIFICATION

Corrosion-resistant identification plate shall be fixed by means of rivets or screws to the transformer side. The inscriptions shall be engraved on one or more nameplates.

The inscriptions shall be black on light background. The serial number shall always be different, even when the transformers are identical.

The plate shall, as a minimum, carry the following information including those ones by para 5.1 of IEC 60076-1 the following data will be shown:

- The Vendor's/Contractor's name or trademark.
- Transformer item.
- Type of protection, i.e, the IP number (e.g. IP 55).
- Temperature rise.
- Weight of the transformer (transportation mass).
- Weight of the heaviest part.
- Insulation levels.
- Indication of the winding which is fitted with tapping.
- Table giving the tapping voltage, power and current for each tap position.
- Short circuit impedance for the extreme tap positions.

11 INSPECTION AND TESTING

11.1 INSPECTION

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

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

11.2 TEST PROCEDURE

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

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

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

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

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

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

Tests shall be carried out in compliance with the requirements of the IEC 60076-1 standard.

11.3 TESTS

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

11.3.1 Routing Test

The Routing test shall be carried out on all transformers in accordance with the applicable IEC international standard.

11.3.2 Type Test

Unless otherwise specified the manufacturer will provide the type test certificate, only, according to the applicable IEC international standard.

11.4 INSPECTION AND TEST PLAN

ITP(s) shall be provided by VENDOR for CONTRACTOR approval.

The ITP(s) shall be issued by VENDOR in compliance with the Inspection and Test requirement listed in the Material Requisition and to any additional inspections not specifically mentioned in the Material Requisition but considered necessary as standard by VENDOR.

Prior to start any fabrication activities a Pre-Inspection Meeting (PIM) shall be performed at VENDOR workshop in order to discuss and fix all quality control related issues.

The ITP(s) shall be structured in a sequential manner, including the following requirements against each activity to be carried out:

- Applicable procedure.
- Applicable Codes & Standards or Specifications.
- Acceptance criteria.
- Records to be issued.
- Definition of Quality Surveillance Points (as defined below) of the involved CONTRACTOR's and COMPANY's representatives.

Following the first issue, CONTRACTOR will review the ITP(s) with H/W/M/C points to inform VENDOR on the requested quality Surveillance during equipment manufacturing and following inspection / testing activities.

VENDOR shall allow free access to the manufacturing plants for CONTRACTOR's and COMPANYs' inspectors (if any), expeditors or other nominated representatives.

The ITP shall be supplied to the CONTRACTOR for review and approval.

11.5 SPECIAL TOOLS

All special tools required for erection, pre-commissioning, commissioning and start-up, operation and maintenance activities shall be provided by VENDOR as part of the supply.

VENDOR shall provide a detailed special tools list for CONTRACTOR review and reference.

Lifting beam (or any package lifting kit) required for transportation and site erection of the equipment shall be provided by VENDOR.

For every type of transformer making part of a single supply, two series of keys and special tools for fitting and maintenance shall be supplied.

Any equipment necessary to perform the Pre-Commisioning and Commisioning activities shall be provided by the VENDOR as part of the supply and shall not be returnable.

12 SPARE PARTS

VENDOR shall include in its quotation a priced list of spare parts suggested for the period of commissioning, start-up and final performance / acceptance test.

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.

13 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 transformer 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 transformer to be supplied.

14 PAINTING

The following minimum requirements for painting, packing and shipment shall be met.

Transformer will be painted in accordance to Manufacturer standard. However the painting must be suitable for the specified ambient conditions and in particular must be oil, grease, acid and salt corrosion resistant.

15 DOCUMENTATION

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

This section covers the documentation required for 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 transformer and cable arrangements, clearances, mounting of structures on the foundations, structure details and loadings to demonstrate to how the transformer and cables will fit in the installation area. 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 transformer.

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:

- Detailed Drawings of the equipment including accessories.
- Foundation Lay-out
- Electrical connection diagrams
- Data sheets
- Calculations (if applicable)
- Test Procedures
- Material and test certificates
- Result of testing
- Nonconformity list

- Shipping conditions
- Installation / Operations Manual
- Commissioning procedures
- Maintenance Manual

15.1 CIVIL REQUIREMENT

Vendor shall provide all loads on foundation (Shears, Moment, Vertical Load) for the equipment included in the scope of supply.

Vendor shall specify the dimensions required for the rails (width, height, length, distance) and the position/loads of ancillaries if any.

16 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 25 years Design Life.

16.1 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.

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17 ANNEX I: VENDOR DEVIATIONS LIST

VENDOR shall list in its proposal any deviation and/or clarification to this specification and applicable code and standards referenced at clause 4.

Any further deviation not listed by VENDOR in its proposal and pointed-out during work execution shall not be accepted by CONTRACTOR.

As guideline the deviation list should be filled-in by VENDOR following the hereunder table

Document Number / Title	Rev	Paragraph Reference	Deviation

Each deviation shall be technically explained and justified.

The final agreed deviation list with CONTRACTOR reply will be part of the documentation for PO as Attachment of this Technical Supply Specification.

18 ANNEX II: "Supplementary Specification to IEC 60076-1 Transformers – S720"

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International Association of Oil & Gas Producers

SPECIFICATION
S-720

December
2020

Supplementary Specification to IEC 60076-1 Transformers

JIP33
JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
1.0	December 2020	Issued for Use

Acknowledgements

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

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Foreword

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

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

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

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2014).

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Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of transformers in accordance with IEC 60076-1, Edition 3, 2011-04, Power Transformers 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 data sheet, quality requirements specification (QRS) and information requirements specification (IRS) as follows.

IOGP S-720: Supplementary Specification to IEC 60076-1 Transformers

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to IEC 60076-1, following the IEC 60076-1 clause structure. Clauses from IEC 60076-1 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to IEC 60076-1 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-720D: Data Sheet for Transformers

The data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The 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 data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-720Q: Quality Requirements for Transformers

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.

IOGP S-720L: Information Requirements for Transformers

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.

The terminology used within this specification and the supporting data sheet, QRS and IRS follows that of IEC 60076-1 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

The 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 (data sheet, QRS, IRS);

d) this specification;

e) IEC 60076-1.

1 Scope

Replace clause with

Add new subclause

1.1 General

This specification amends and supplements IEC 60076-1 and associated parts of IEC 60076 referenced in IEC 60076-1 for the design, manufacture and testing of three-phase and single-phase power transformers, including auto-transformers.

Add new subclause

1.2 Transformers included in scope

Included in the scope of this specification are the following types of transformers:

– liquid filled transformers equipped with a breather and a conservator;

– sealed type liquid filled transformers;

– dry type transformers;

– liquid filled and air core reactors;

– converter transformers;

– transformers having no windings exceeding 1 000 V for industrial applications.

For categories of power transformers and reactors which have their own IEC standards, this specification is applicable only when it is specifically called up by cross reference in the other standards. Such standards exist for:

– reactors in general (IEC 60076-6);

– dry-type transformers (IEC 60076-11);

– converter transformers for industrial applications (IEC 61378-1).

Add new subclause

1.3 Transformers excluded from scope

Excluded from the scope of this specification are the following types of transformers:

– single-phase transformers with rated power less than 1 kVA and three-phase transformers less than 5 kVA;

– instrument transformers;

– traction transformers mounted on rolling stock;

– starting transformers;

– testing transformers;

– welding transformers;

– mining transformers;

– transformers for deep water (submerged) applications.

Where IEC standards do not exist for such categories of transformers, this specification may still be applicable either as a whole or in part.

2 Normative references

Add to clause

IEC 60034-1, *Rotating electrical machines – Part 1: rating and performance*

IEC 60076-6, *Power transformers – Part 6: Reactors*

IEC 60076-14, *Power transformers – Part 14: Liquid-immersed power transformers using high-temperature insulation materials*

IEC TS 60076-20, *Power transformers – Part 20: Energy efficiency*

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC TR 60616, *Terminal and tapping markings for power transformers*

IEC TS 60815-1, *Selection and dimensioning of high voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles*

IEC 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2:Generic standards – Immunity standard for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Emission standard for industrial environments*

IEC 61099, *Insulating liquids – Specifications for unused synthetic organic esters for electrical purposes*

IEC 61378-1, *Converter transformers – Part 1: Transformers for industrial applications*

IEC 61869-2, *Instrument transformers – Part 1: Current transformers*

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

IEC 62535, *Insulating liquids – Test method for detection of potentially corrosive sulphur in used and unused insulating oil*

3 Terms and definitions

Add new term

3.13.4
phase segregated terminal box
a terminal box so designed that phase segregation is provided by earthed metallic barriers forming completely distinct individual phase compartments so as to restrict any electrical breakdown to an earth fault

[SOURCE: IEC 60050-411, 41-35, modified - note deleted]

4 Service conditions

4.2 Normal service conditions

f) Installation environment

Replace fourth paragraph with

Environmental conditions within the following definitions according to IEC 60721-3-4:

– climatic conditions (K);

– special climatic conditions (Z);

– biological conditions (B);

– chemically active substances (C);

– mechanically active substances (S);

– mechanical conditions (M).

Add to subclause

The transformer shall be designed for 90 % maximum relative humidity.

Add to subclause

The design of transformers for outdoor operation shall incorporate operation without a protective shelter.

Add to subclause

Humidity changes caused by short term cyclic ambient temperature variations shall not compromise the performance of the transformer.

Add to subclause

The installation environment shall apply to the transformer and ancillaries, for example motors, components and accessories.

Add new subclause g)

g) Hazardous area

Transformers and reactors in hazardous areas shall comply with the applicable requirements of IEC 60079.

Add new subclause h)

h) Dry type transformers and reactors

Climatic, environmental and fire behaviour classes shall be in accordance with IEC 60076-11, Clause 12.

Add new subclause i)

i) Offshore locations

Transformers installed in offshore locations shall be provided in accordance with IEC 61892-3.

5 Rating and general requirements

5.1 Rated power

5.1.1 General

Add to subclause

A transformer feeding a group of motors shall maintain operational performance following:

– infrequent restarting loads of up to 1,8 times the rated current of the transformer;

– five restarts in succession at five second intervals.

Add to subclause

Motor unit transformers supplying individual motors shall maintain operational performance following:

– three successive motor starts and a further two successive starts after a cooling-off period of 30 minutes;

– 3 000 starts per year or greater.

Add to subclause

Transformers within the scope of IEC TS 60076-20 shall comply with the energy efficiency requirements in accordance with IEC TS 60076-20 level 2.

Add to subclause

Transformers shall have a design lifetime of at least 25 years operating at rated output under the specified service conditions.

Add to subclause

The design of transformers shall be for continuous operation at full load for at least 45 000 hours without maintenance which requires the transformer to be de-energized.

NOTE Reduction in continuous operation time due to the OLTC maintenance interval based on operational count is allowed.

5.2 Cooling mode

Add to subclause

When specified, the provision for future installation of cooling fans without hot work, for example grinding and welding, shall be provided.

5.7 Additional information required for enquiry

5.7.3 Sound level

Add to second paragraph

The maximum sound pressure level of the transformer at rated load with forced cooling fans in operation shall be provided.

Add to subclause

Compliance with sound power limit shall be achieved without the use of a sound attenuation enclosure.

5.7.4 Transport

Add new subclause

5.7.4.3 Mechanical handling

5.7.4.3.1

Jacking pads shall be provided for transformers with an assembled mass of 2 000 kg or greater.

5.7.4.3.2

Lifting and jacking points shall be mounted on tanks, enclosures and frames.

5.7.4.3.3

Location of the lifting and jacking points shall not lead to damage of the transformer enclosure and frame.

5.7.4.3.4

The location of lifting and jacking points shall be identified on the general arrangement drawing and marked on the tank, enclosure or frame.

5.7.4.3.5

Transformers and associated cooling equipment, when transported separately, shall have lifting lugs to facilitate transportation and assembly at site.

5.7.4.3.6

Assemblies or equipment parts weighing more than 25 kg shall have provisions for lifting.

5.7.4.3.7

Shipping restraints, for example transport blocks, bindings shall be marked for the purpose of removal.

5.7.4.3.8

Loose parts and components with moving parts at risk of damage during shipment shall be securely blocked and braced.

NOTE Blocking is intended to prevent lateral movement and bracing is intended to prevent vertical movement.

5.7.4.3.9

Transformers and radiators, if transported without insulating liquid, shall be inerted in nitrogen or with clean dry air.

5.7.4.3.10

When transported inerted, transformers and associated cooling equipment shall be equipped with devices to enable the internal pressure to be measured.

5.7.4.3.11

Openings shall be protected by metal covers to prevent damage during transportation.

5.8 Components and materials

Add to subclause

Insulating liquids shall comply with IEC 61099 for synthetic organic esters, with IEC 60836 for silicon oil.

Add to subclause

Insulating liquids shall not contain or be contaminated with polychlorinated biphenyls.

Add to subclause

All materials, including gaskets and sealants, shall be free from asbestos, mercury, ceramic fibre and chlorofluorocarbons.

8 Rating plates

8.2 Information to be given in all cases

Add before list item a)

The following information shall be included on the rating plate:

Add new list item q)

q) Supplier's purchase order number.

Add new list item r)

r) Transformer's tag number.

8.3 Additional information to be given when applicable

Add new list item l)

l) Tank design pressure for sealed type transformers with a gas cushion.

Add new list item m)

m) A plate with an overview of the cooling circuit, including valves, check valves, pumps and sensors, and the indication for direction of flow in case of liquid filled transformers with circulating pumps for the cooling circuit.

9 Safety, environmental and other requirements

9.2 Dimensioning of neutral connection

Add to subclause

The low voltage neutral terminal of polyphase liquid immersed distribution transformers shall be rated for 50 % or greater of the phase current.

9.3 Liquid preservation system

Add to subclause

Desiccant used in the breather shall be non-carcinogenic and regenerative type.

Add to subclause

Sealed-tank transformers with a permanent nitrogen cushion shall not require nitrogen pressure adjustment at site.

9.5 Centre of gravity marking

Add to subclause

The centre of gravity shall be indicated on the general arrangement drawings.

Add new subclause

9.6 Construction requirements

9.6.1 General

9.6.1.1

Where specified, liquid immersed transformers and reactors shall be provided with relief valve type pressure relief devices with mechanical operation indicator.

9.6.1.2

Pressure relief devices shall be provided with a trip contact.

9.6.1.3

Where specified, pressure relief devices shall be provided with a facility for directing emissions of liquid from the relief device in the direction away from the transformer.

9.6.1.4

Indicating instruments shall be accessible for maintenance without obstruction.

9.6.1.5

Indicating instruments shall be readable from ground level.

9.6.1.6

For the following applications, enclosures shall offer the specified degree of protection in accordance with IEC 60529:

– Indoor- IP41, IP2X with the enclosure doors open;

– Outdoor - IP56.

9.6.1.7

Access panels shall be provided for liquid immersed transformers and reactors for allowing maintenance of internal components, for example internals of cable boxes, OLTC contacts, main power bushings and current transformers.

9.6.1.8

Liquid immersed transformers and reactors shall be provided with a sampling orifice fitted with a valve for condition monitoring of the liquid for each fluid compartment.

NOTE It is allowed to combine sampling orifice with the draining orifice.

9.6.2 Tanks and radiators

9.6.2.1

Sample valves shall be fitted with a chained screwed plug.

9.6.2.2

For liquid immersed transformers and reactors, devices fixed to the tank or tank lid shall be flanged.

9.6.2.3

Removable radiators shall have:

– isolating valves on tank and radiator sides; and

– vent and drain orifices fitted with screw plugs.

9.6.3 Conservators

9.6.3.1

Conservators shall be removable for transportation.

9.6.3.2

Conservators shall be provided with the following:

– a level indicator;

– a filling hole with screwed plug;

– a combined filter and drain valve;

– a detachable end plate for cleaning access;

– a lockable isolating valve;

– a dehydrating breather;

– a standpipe to prevent sludge from entering the tank.

9.6.3.3

The liquid level indicator on the conservator shall be provided with minimum and maximum level markings.

9.6.3.4

Transformers and reactors with conservators shall be provided with a Buchholz relay.

9.6.3.5

The Buchholz relay shall be provided with:

– alarm and trip contacts;

– an air relief valve;

– flanges and valves to isolate the relay without draining the insulating liquid.

9.6.3.6

Breathers shall be accessible from ground level.

9.6.3.7

Breathers shall be protected from mechanical damage.

9.6.4 Valves

9.6.4.1 Valves

Valves shall be provided with permanently marked position indication for open and closed positions.

9.6.4.2

Devices, except thermowells, fixed to the tank of liquid immersed transformers and reactors shall have a lockable isolation valve.

9.6.5 Windings and tappings

Winding interconnections inside the transformer shall be brazed or crimped.

9.6.6 Earthing

9.6.6.1

Metal parts of the core, frame, tank, cable boxes and internal earthing bars or studs shall be interconnected for earthing on the tank earthing boss.

9.6.6.2

Liquid immersed transformers and reactors shall be provided with accessible core and frame earth connections with removable links to provide access for maintenance and commissioning when filled with liquid.

9.6.6.3

Two sets of earthing terminals or earthing pads for termination of the earth strip or earth cable of the size specified shall be provided on the tank of the transformer.

9.6.7 Cooling

9.6.7.1

When forced cooling is specified, the associated control cubicle shall be mounted on the transformer.

9.6.7.2

For liquid immersed transformers and reactors equipped with a liquid to water heat exchanger, the heat exchanger shall be double wall design.

9.6.7.3

For liquid immersed transformers and reactors equipped with a liquid to water heat exchanger, a leakage monitoring system with alarm contact shall be provided.

9.6.7.4

Materials exposed to cooling water in heat exchangers shall be protected against corrosion caused by exposure to the cooling water.

9.6.7.5

Dry type transformers equipped with a water to air heat exchanger, shall be provided with monitoring of leakage from the heat exchanger inside the enclosure of the transformer.

9.6.7.6

Dry type transformers equipped with a water to air heat exchanger, shall be provided with moisture sensors in the air flow circuit to detect leakage.

9.6.7.7

Condensation shall not accumulate in the heat exchanger air circuits.

9.6.7.8

Cooling air ducts and cooling fan protective covers shall be provided with IP2X protection.

9.6.8 Temperature measurement

9.6.8.1

A thermowell shall be provided at the top of the tank to measure the top liquid temperature.

9.6.8.2

The top liquid indicator shall be a dial-type and calibrated in degrees Celsius.

9.6.8.3

The liquid and winding temperature indicators shall be fitted with two adjustable setting contacts for remote alarm and trip purposes.

9.6.8.4

The liquid and winding temperature indicators shall be fitted with a hand-reset pointer to register the highest temperature attained.

9.6.8.5

Winding temperature measurement shall be thermally compensated type.

9.6.8.6

Thermistors shall be positive temperature coefficient (PTC) type.

9.6.8.7

Winding temperature measurement thermistors and resistance elements shall be supplied with the auxiliary equipment necessary to initiate remote alarms/trips via voltage-free changeover contacts.

9.6.8.8

A minimum of two winding temperature measurement thermistors or resistance elements shall be provided per phase.

9.6.9 Cable connecting boxes

9.6.9.1

Cable connecting boxes shall be made of steel.

9.6.9.2

The dimensions of the cable connecting boxes shall be designed for air-insulated connections including:

– clearances;

– creepage distances.

9.6.9.3

When specified, HV and LV cable connecting boxes shall be separate for:

– the HV side of the transformer;

– the LV side of the transformer;

– the auxiliary circuits of the transformer, for example direct measuring alarm/trip devices and current transformer (CT) secondaries;

– forced cooling installation, if installed;

– the on-load tap changer, if installed;

– the neutral connection for transformers with HV secondary voltages.

9.6.9.4

The cover of cable boxes shall be secured by means of captive bolts or screws.

9.6.9.5

Where specified, transformers installed outdoors shall incorporate metal canopies over cable connecting boxes.

9.6.9.6

The canopy shall have an overhang of at least 50 mm on each side.

9.6.9.7

The canopy shall be sloped to prevent accumulation of water.

9.6.9.8

An air space of at least 50 mm above the top cover shall be provided for ventilation.

9.6.9.9 Main cable connecting box

9.6.9.9.1

Main cable connecting boxes shall be designed to minimize bending requirements for single core or multicore cable conductors.

9.6.9.9.2

If two or more parallel conductors are connected, straight conductors, for example copper bars or flags, shall be provided to permit the cable conductors to be separately terminated.

9.6.9.9.3

Connections shall be sized to carry the maximum continuous current and the prospective through-fault currents.

9.6.9.9.4

Test certificates or calculations for main cable connecting boxes shall state their short circuit withstand capability.

9.6.9.9.5

Main cable connecting boxes shall have accessible removable links for dielectric testing of cables.

9.6.9.9.6

Copper earthing bars shall be provided for the earthing of the protective screen and/or armour inside the cable connecting box for cables.

9.6.9.9.7

When site conditions require a method of preventing condensation in main cable boxes, a method shall be proposed.

9.6.10 Cable terminations

9.6.10.1 Gland plates

9.6.10.1.1

Cable boxes shall be provided with undrilled gland plates.

9.6.10.1.2

Gland plates shall be separate from those used for the interconnecting cables of the on-skid auxiliary equipment.

9.6.10.1.3

For single core conductors, gland plates of main cable connecting boxes shall be constructed from a non-magnetic material.

9.6.10.2 Bushings

9.6.10.2.1

Bushings inside cable boxes shall comply with site pollution severity class c in accordance with IEC TS 60815-1.

9.6.10.2.2

For outdoor transformers and reactors, exposed bushings shall comply with site pollution severity class e in accordance with IEC TS 60815-1.

9.6.10.2.3

Bushings shall withstand mechanical loading arising from the cable termination.

9.6.10.3 Liquid filled cable box

9.6.10.3.1

The liquid filled cable box shall be equipped with a liquid sampling/drain valve and a vent plug.

9.6.10.3.2

Where specified, a pressure relief device with trip contacts shall be fitted to a liquid filled cable box.

9.6.11 Terminals

9.6.11.1 Main terminals

9.6.11.1.1

Main terminals shall be suitable for the cables specified.

9.6.11.1.2

Cable clamping arrangements shall be provided in accordance with the cables specified.

9.6.11.1.3

Clearly and indelibly marked terminals shall be provided to identify the phase connections in accordance with the connection diagram on the rating plate.

9.6.11.1.4

Main cable terminations shall be sized in accordance with the specified cable types and sizes.

9.6.11.2 Auxiliary terminals

9.6.11.2.1

Auxiliary terminal blocks shall be provided with individual terminals for each external cable core.

9.6.11.2.2

Auxiliary terminals shall be modular, finger-proof, non-loosening, wedge type.

9.6.11.2.3

Auxiliary terminal blocks shall be grouped by function (analog and digital signals) and operating voltage.

9.6.11.2.4

Barrier plates shall separate each group of auxiliary terminals.

9.6.11.2.5

Auxiliary terminals shall be clearly and indelibly marked in accordance with the auxiliary wiring diagrams and IEC TR 60616.

9.6.11.2.6

Measuring instrument and signal cabling shall be routed to a terminal box located on the outside of the enclosure.

9.6.12 Cable supports and clamps

9.6.12.1

Cable supports and clamps for the main cables shall be provided within 500 mm of the bottom of the cable box gland plate.

9.6.12.2

Spacing between supports/clamps for the main cables shall not exceed 500 mm.

9.6.13 Surge arresters

When specified, transformers shall be equipped with surge arresters complying with IEC 60099-4.

9.6.14 Auxiliary wiring

9.6.14.1

Conductors shall be stranded copper with a cross-section of at least 1,5 mm^2.

9.6.14.2

Auxiliary wiring and cabling shall be provided with ferrules.

9.6.14.3

Auxiliary cables shall be wire braided or wire armoured.

9.6.15 Motors

9.6.15.1 Electric motors

All motors shall have a minimum degree of protection of IP55, in accordance with IEC 60529.

9.6.15.2

The motor insulation system shall be thermal class 155 (F) in accordance with IEC 60085 without exceeding thermal class 130 (B) temperature limits at the motor rated output at maximum ambient air temperature.

9.6.16 Current transformers

9.6.16.1

When specified, current transformers shall be in accordance with IEC 61869-2.

9.6.16.2

Secondary terminals of current transformers shall be wired to a terminal block in the transformer auxiliary cable connecting box.

9.6.16.3

One side of the secondary winding of each current transformer circuit shall be earthed at the terminal block.

9.6.16.4

Current transformer secondary winding terminals shall be provided with short-circuiting links.

9.6.16.5

The current transformer for the neutral-earth connection shall be located in a separate terminal box for HV and in the main terminal box for LV.

9.6.17 Tap changers

9.6.17.1 De-energized tap-changer (DETC)

9.6.17.1.1

Manually operated de-energized tap-changers shall have a tapping range of ± 5 % in steps of 2,5 %.

9.6.17.1.2

Manually operated de-energized tap changers shall be provided with a steel operating handle.

9.6.17.1.3

Manually operated de-energized tap-changers shall be pad lockable in each position.

9.6.17.1.4

Manually operated de-energized tap-changers shall allow operation without the use of tools.

9.6.17.1.5

Manually operated de-energized tap-changers shall have a handle to operate all phases simultaneously.

9.6.17.1.6

Manually operated de-energized tap-changers for dry type transformers shall have bolted links.

9.6.17.2 On-load tap-changer (OLTC)

9.6.17.2.1

The diverter switch oil compartment shall be connected to a separate conservator or segregated section of the main conservator of the transformer.

9.6.17.2.2

Provisions shall be made for equalizing the vacuum in main tank and OLTC tank.

9.6.17.2.3 Diverter switch oil compartment

9.6.17.2.3.1

The diverter switch oil compartment shall have an oil sampling connection at bottom of the compartment.

9.6.17.2.3.2

The diverter switch oil compartment shall have a filling/filter connection valve and one drain/filter connection valve.

9.6.17.2.3.3

The diverter switch oil compartment shall have a dehydrating breather.

9.6.17.2.3.4

The diverter switch oil compartment shall have a liquid-flow controlled relay.

9.6.17.2.4 Motor drive mechanism

9.6.17.2.4.1

The motor drive mechanism shall have direction of rotation protection.

9.6.17.2.4.2

The motor drive mechanism shall have a lockable isolating switch.

9.6.17.2.4.3

The motor drive mechanism shall have local control facilities.

9.6.17.2.4.4

The motor drive mechanism shall have individual fault indications with two sets of common single-pole double-throw, dry-type contacts.

9.6.17.3 Remote control panel for on-load tap changer

9.6.17.3.1

The degree of protection shall be in accordance with general requirements specified in 9.6.1.

9.6.17.3.2

The master/follower method of controlling two or more transformers operating in parallel shall be applied.

9.6.17.3.3

The tap changer shall be controllable from the remote control panel.

9.6.17.3.4

The remote control panel shall be provided with an automatic, solid-state voltage regulator relay with the following provisions:

– an adjustable set point;

– selectable time characteristics;

– under-voltage and over-current blocking;

– a tap position indicator;

– tap change in progress indication;

– tap changer fault indication.

9.6.17.3.5

The remote control panel shall be provided with an anti-condensation heater.

9.6.18 Surface preparation, galvanizing and finishing

9.6.18.1

The supplier's standard paint system applied to the transformer shall provide protection against the climatic conditions specified in 4.2 f).

9.6.18.2

The finish of the internal walls of the tank, covers, connecting boxes and cooling systems shall protect against the effects of corrosion and the influence of the insulating liquid used in the transformer.

9.6.18.3

The tank and radiator material along with the fixing hardware shall have surface treatment in accordance with the category of corrosivity specified.

9.6.19 Markings

Transformers and their accessories shall be clearly marked to facilitate assembly and erection at site.

Add new subclause

9.7 Operating manual

9.7.1

The co-relation between nitrogen pressure and top liquid temperature shall be included in the operating manual.

9.7.2

A table indicating liquid levels at different top liquid temperatures shall be included in the operating manual.

11 Tests

11.1 General requirements for routine, type and special tests

11.1.2 Routine tests

11.1.2.1 Routine tests for all transformers

Add before list item a)

The following routine tests shall be performed:

Add new list item k)

k) Measurement for the dissipation factor (tan δ) of the insulation system capacitances.

Add new list item l)

l) Measurement for the d.c. insulation resistance each winding to earth and between windings.

Add new list item m)

m) Measurement for the dissolved gasses in dielectric liquid.

Add new list item n)

n) Visual and functional check of the various components and accessories of the transformer.

11.1.4 Special Tests

Add new list item q)

q) For a transformer feeding a single motor where there is no short-circuit type test certificate for an identical transformer, the following sequential tests shall be conducted:

1) three simulated transformer/motor on-load start tests with a current corresponding to the motor starting current and the transformer at its normal operating temperature;

2) measurement of reactance at normal operating temperature;

3) measurement of reactance after the simulated starts.

On-load start test duration shall be equal to the running-up time of the motor.

The measured reactance value shall not deviate by more than 2 % from the value prior to testing.

12 Electromagnetic compatibility (EMC)

Add to clause

Accessories shall conform to IEC 61000-6-2 and IEC 61000-6-4 for industrial type installations, for both immunity and emissions.

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



19 ANNEX III: "Quality Requirements for Transformers – Specification S-720Q"

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International Association of Oil & Gas Producers

SPECIFICATION
S-720Q

December
2020

Quality Requirements for Transformers

JIP33
JOINT INDUSTRY PROGRAMME

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Foreword

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

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

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

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2014).

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Introduction

The purpose of this quality requirements specification (QRS) is to define quality management requirements for the procurement of transformers in accordance with IOGP S-720 for application in the petroleum and natural gas industries.

The QRS includes definition of a conformity assessment system (CAS) which specifies standardized customer interventions against quality management activities at four different levels. The applicable CAS level is specified by the customer in the equipment data sheet or purchase order.

This QRS shall be used in conjunction with the supplementary requirements specification IOGP S-720, the information requirements specification IOGP S-720L and the equipment data sheet IOGP S-720D which together comprise the full set of specification documents. The introduction section in the supplementary requirements 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 transformers to IOGP S-720 Supplementary Specification to IEC 60076-1 Transformers including:

a) supplier quality management system requirements;

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

c) traceability requirements;

d) evidence of conformance;

e) factory acceptance.

2 Normative references

For the purpose of this document, the documents referenced in S-720 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-720, *Supplementary Specification to IEC 60076-1 Power Transformers*

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-720 and ISO 9000 (normative to ISO 9001) and the following shall apply.

3.1 Conformity assessment

Demonstration that requirements relating to a product, process, system, person or body are fulfilled.

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

NOTE 2 Assessment activities may be undertaken at a supplier/sub-supplier's premises, virtually by video link, desktop sharing, etc. or by review of information formally submitted for acceptance or for information.

3.2 Conformity assessment system (CAS)

Systems providing different levels of assessment of the supplier's control activities by the customer (second party) or independent body (third party) based on evaluation of the supplier's capability to conform to the product or service specification and obligatory requirements.

NOTE CAS A reflects the highest risk and associated extent of verification. CAS D is the lowest.

3.3 Conformity assessment - Hold point (H)

Point in the chain of activities beyond which an activity shall not proceed without the approval of the customer or customer's representative.

3.4 Conformity assessment - Witness point (W)

Point in the chain of activities that the supplier shall notify the customer or customer's representative before proceeding. The operation or process may proceed without witness if the customer does not attend after the agreed notice period.

3.5 Conformity assessment - Surveillance (S)

Observation, monitoring or review by the customer or customer's representative of an activity, operation, process, product or associated information.

3.6 Conformity assessment - Review (R)

Review of the supplier's information to verify conformance to requirements.

NOTE Information review requirements are managed on a surveillance basis and as such do not impose schedule constraints, unless specified as hold points in Annex A or as conditions specified in the associated IRS.

4 Symbols and abbreviations

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

CAS conformity assessment system

IRS information requirements specification

QRS quality requirements specification (this document)

5 Quality requirements

5.1 Quality management system

The supplier shall demonstrate that the quality management arrangements established for the supply of products and services conform to ISO 9001, ISO 29001, API Specification Q1 or an equivalent quality management system standard.

5.2 Conformance assessment

5.2.1

Quality plans and inspection and test plans developed as outputs to operational planning and control shall define the specific controls to be implemented by the supplier to ensure conformance with the specified requirements.

5.2.2

Controls shall address both internally and externally sourced processes products and services.

5.2.3

Quality plans and inspection and test plans shall include provision for the customer conformity assessment system (CAS) as specified in the data sheet IOGP S-720D. See Annex A.

5.2.4

Supplier performance in meeting the requirements will 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.

NOTE 1 For industrial proven solutions CAS level D is specified unless risk assessment indicates that a more stringent CAS level is required.

NOTE 2 Irrespective of conformity assessment requirements defined by the customer, either, by reference to standard or specification requirements or in the scope, the supplier remains responsible for operational planning and control and demonstration of the conformity of products and services with the requirements. See ISO 9001, 8.1 and 8.2.

6 Certification and traceability

Material certification and traceability shall be maintained in accordance with Annex B.

7 Control of nonconforming products and services

Nonconformance with specified requirements identified by or to the supplier shall be corrected such that the specified requirements are satisfied or the customer's acceptance of the nonconformance agreed in accordance with purchase order conditions. See ISO 9001, 8.2.3, 8.2.4, 8.5.6 and 8.7.

8 Evidence (conformance records)

Plans, procedures, methods and resultant records shall be provided 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 as per ISO 9001, 8.1 and ISO 10005 (IOGP S-720, 11.1.1)	H	R	-	-
1.2	Inspection and test planning as per ISO 9001, 8.1 and ISO 10005 (IOGP S-720, 11.1.1)	H	R	R	R
1.3	Pre-Inspection/Pre-production planning (IOGP S-720, 11.1.4)	H	-	-	-
2	**Design and development activities**				
2.1	Design and development planning				
2.1.1	Alignment of general arrangement diagram for the transformer (IOGP S-720, A.1.1 a) to x))	H	H	H	H
2.2	Manufacturing process				
2.2.1	Verification of iron core assembly for the transformer (IOGP S-720, 11.1.4)	W	W	S	-
2.2.2	Verification of winding assembly for the transformer (IOGP S-720, 11.1.4)	W	W	S	-
3	**Control of external supply**				
3.1	Verification and review of external supplied items such as steel for core and tank, winding conductors and insulation, radiators, tap changers, accessories, insulating liquid, etc. (IOGP S-720, 11.1.1)	W	S	-	-
4	**Production and service provision**				
4.1	Sub-assembly				
4.1.1	Core and winding pre tanking inspection (IOGP S-720, 11.1.4)	W	S	-	-
4.2	Inspection and testing				
4.2.1	Routine testing (IOGP S-720, 5.7, 5.8, 7.1.5, 8.1, 8.2, 8.3, 9.1, 9.2, 9.6, 11.1, 11.2.1, 11.2.2, 11.2.3, 11.3, 11.4, 11.5, 11.7, 11.8)	W	W	W	R
4.2.2	Performance of type tests, in absence of certificate (IOGP S-720,11.1, 6.6)	W	W	W	W
4.2.3	Performance of special tests, if specified (IOGP S-720, 11.1.4, 11.1.1, 11.10, 11.11, 11.6, 11.9)	W	W	W	W

5	Release of product or service				
5.1	Verify conformance to purchase order				
5.1.1	Witness the handling, preservation and packaging of the transformer before release (IOGP S-720, 9.3)	W	W	S	-
5.1.2	Verify the final documentation as per IOGP S-720L	H	H	W	S
5.1.3	Final inspection and equipment release (IOGP S-720, 11.1.1)	H	H	-	-

H is hold point, W is witness point, S is surveillance and R is review.
Note: Definitions for these terms are provided in Section 3 of this document.

Annex B
(normative)
Certification traceability and requirements

Item		Certificate Type	Traceability level	Additional Requirements
Transformer	Core and windings	3.1	Level II	
	Remaining materials	2.2	Level III	

Explanatory notes

Inspection certificates shall be provided in accordance with ISO 10474 or EN 10204.

Traceability

A. **Level I - Full Traceability** - Material is uniquely identified and its history tracked from manufacture through stockists (where applicable) to the supplier and to actual position on the equipment with specific location defined on a material placement record (the traceability to a specific location only applies to skids / packaged equipment, not to bulks).

B. **Level II - Type Traceability** - The supplier maintains a system to identify material throughout manufacture, with traceability to a material certificate.

C. **Level III - Compliance Traceability** - The supplier maintains a system of traceability that enables a declaration of compliance to be issued by the supplier.

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



20 ANNEX IV: "Information Requirements for Transformers - Specification S-720L"

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International Association of Oil & Gas Producers

SPECIFICATION
S-720L

December
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Information Requirements for Transformers

JIP33
JOINT INDUSTRY PROGRAMME

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

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S-720L Information Requirements for Transformers

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.

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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.

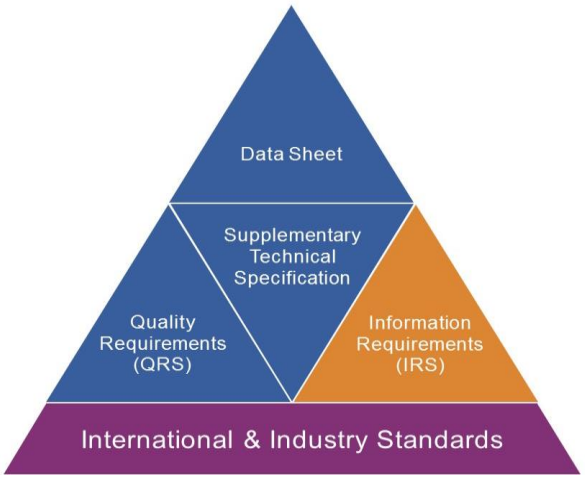
The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2014).

S-720L Information Requirements for Transformers

Introduction

The purpose of this information requirements specification (IRS) is to define information requirements for the procurement of transformers in accordance with IOGP S-720 for application in the petroleum and natural gas industries. This document defines the information requirements, including format, timing and purpose, for information to be provided by the vendor. 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 supplementary requirements specification IOGP S-720, quality requirements specification IOGP S-720Q and equipment data sheet IOGP S-720D which together comprise the full set of specification documents. The Introduction section in the supplementary requirements 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

S-720L Information Requirements for Transformers

Supplier Instructions

In response to Invitation To Tender (ITT)

Tenderers to submit information as defined in column E - 'Submit At Proposal' in 'Requirements' sheet, in accordance with ITT instructions

On award of contract

Specified Information requirements shall be submitted in accordance with contract information submission instructions.
Suppliers to prepare and submit 'Supplier Master Information Schedule' (SMIS) incorporating information requirements in accordance with columns F - 'First Issue Post Purchase Order' in 'Requirements' sheet.
Supplier to demonstrate compliance with each information requirement either by providing document number cross reference to the Requirement in 'Supplier Master Information Schedule' (SMIS) and, if specified in the Contract, using column J 'Fulfilled by Document Number(s)' in the IRS Requirements Sheet.

On completion of scope

Supplier to validate that the information delivered meets the IRS requirements either through cross reference to the deliverable type in a as-built version of the 'Supplier Master Information Schedule' SMIS and, if specified in the Contract, by providing an as-built version of the IRS with column J 'Fulfilled by Document Number(s)' in Requirement sheet populated with the specific document numbers issued to the Purchaser.

IRS Structure Contents

1 'Front & Preliminaries' Tab

The 'Front & Preliminaries ' tab includes an IOGP Front sheet for the IRS followed by Acknowledgements, a Disclaimer, Copyright Notice, Foreword and Introduction

2 'Supplier Instructions' Tab

This 'Supplier Instructions' tab provides instructions that Suppliers are to follow in response to this IRS.

3 'Requirements' Tab

The 'Requirements' tab lists the suite of information requirements that are to be supplied during tendering and following award of the purchase order to deliver the purchase order scope.
The information requirements are grouped under three broad categories;
Management information requirements:
Key information requirements relating to planning, managing, assuring and reporting the execution of the technical scope. Note: Information requirements relating to contractual and administrative terms and conditions or regulatory obligations are to be supplied in accordance with the applicable purchase order or regulation.
Technical information requirements:
Technical information developed by the supplier or their sub suppliers, during the design and development, acquisition, manufacture, assembly and testing of the contracted scope.
Purchase Order Specific Information Requirements:
Information requirements specified by individual owners-operators in addition to those specified by IOGP-JIP33 to meet specific operational, project or legislative requirements.
Note: Information requirements relating to contractual and administrative terms and conditions or regulatory obligations are to be supplied in accordance with the applicable purchase order or regulation.
"The 'Requirements' tab includes columns A to L, including Column A for the relevant requirement code and Column B for the Requirement for the different Information Requirements (Data, Documents and/or Models) to be provided by suppliers, based on the parent standard, IOGP Specification or the specified parent industry Standard.
Condition Invoking Revoking Requirement Column C is included to allow any specific conditions to be identified that may require a additional deliverable(s).
Typical Deliverable Column D is provided for 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.
Column E includes Submission Requirements (Yes or No) at Proposal, while columns F, G & H identify Issue Purpose (For Information or For Acceptance) and Durations (Period or Weeks/Months) for First Issue of the particular deliverable Post Purchase Order.
Required As Built, Fulfilled by Document Number(s), Translation Required and Remarks columns I, J, K & L are also included. Definitions for each column are contained in the rows above the columns: Abbreviations used for various submission requirements in Column H are shown in table 3.1 below:

Abbreviation	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 3.1 - Information Submission Abbreviations

4 'Definitions' Tab

The 'Definitions' tab includes several columns A to F, including Column A for the relevant Code & Column B for the Requirement for the different Information (Data, Documents and/or Models) Requirements to be provided by Suppliers, all copied from the 'Requirements' tab.
Column C includes a full description of the Information Requirement based on the Parent Standard, IOGP Specification or an Industry Standard.
Column D gives a reference to the Parent Standard, IOGP Specification or an Industry Standard that the Information requirement is identified in.
Column E identifies the Requirement format as listed in Table 9.1 below.
Column F relates the CFIHOS discipline document type that could be used to classify the document having this IRS content.
Definitions for each column are contained in the rows above the columns:

5 Abbreviations and definitions

The following abbreviations, terms and definitions have been used in the various tabs 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 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 Company and/or Contractor on project; may alternatively be referred to as "Vendor", "Seller" or “Manufacturer”.

6 CFIHOS

The Information Requirements are also classified according to document classification published in v1.4 of Capital Facilities Information Hand Over Specification (CFIHOS). The objective of CFIHOS is to create a common information standards across the process industries. Further information on CFIHOS can be found at:
https://www.jip36-cfihos.org/about/

7 Document Metadata

Typical Metadata for Information Deliverables to be provided by Suppliers is shown in Table 7.1 below

Property_Name	Definition
document number	The unique identifier for the Document according to the Owner/Operator Document numbering scheme.
revision code	A code used to identify the content of a document at a certain point in time according to the Owner/Operator Document Revision Coding scheme. It is used to track the evolution of a document during its lifecycle and is applied at time of release from Originator to reflect the document is frozen.
document title	Describes in a short and concise manner the content of the document. Remark: The title of the document usually appears on the front page of the document or in title block.
revision date	The date of the document revision.
originator company	Identifies the name of the Company who has generated the Document.
author	Author(s) of the current revision of the document. This should be an individual name, not a role, i.e. Initials and last name, not just initials
approved by	Name or UserID of the person who has approved the current revision of the document as per the document management approval workflow. This should be an individual name, not a role, i.e. Initials and last name, not just initials.
file name	The unique name of the electronic file (including the file extension).
originator document number	The unique identifier for the Document according to originator which doesn't necessarily conform to the Owner/Operator's document numbering scheme. Remark: One potential use is to allow Owner/Operator to identify duplicate documents provided by multiple subcontractors but from the same OEM.
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. Remark: One potential use is to allow Owner/Operator to identify duplicate documents provided by multiple subcontractors but from the same OEM.
document status code	A code used to indicate the life cycle status of the document. A code which identifies the state of the document within the publication lifecycle process. A document is classified by a single state, which changes as the document advances through this lifecycle.
language	Indicates the language that the document is written in.
discipline document type short code	Classifies the Document with a Discipline_Document_Type.
project code	A unique code used to identify the Project.
document comment	Indicates any additional Comment / Explanation for a Document Revision.
plant code	Identifies the Plant that the document is related to. This is a smaller subdivision than 'Site' but larger than 'Unit' or 'Area.'
export control classification	Indicate the Export Control Rule applicable for the Document (e.g., ECCN, EAR).
transmittal number	A unique transmittal identifier generated by the document control system of the company sending the transmittal.
security classification	Indicates internal Owner-Operator access restriction applicable for the Document.

Table 7.1 - Supplier Deliverable Metadata

Copyright SC Approval

8 Deliverable Formats

The format of the relevant Information Deliverable to be submitted by Supplier for Buyer/Contractor is to be as described in table 8.1 below. Where required to be 'As Built', deliverables are to be updated and handed over in the native format.

Format	Description
Hard Copy	Should be be electronically developed, but in particular and exceptional circumstances, say for legal reasons, may need to be handed over in printed paper format
Native	To be electronically developed and must be retained in the original application software format, with no embedded or linked files.
Portable Document Format (PDF)	To be electronically developed and must be in Optical Character Recognition (OCR) format which is text searchable & indexed. Embedded graphics in Joint Photographic Experts Groups(JPEG), Graphics Interchange Format (GIF) (suitably compressed) or Tagged Image File Format (TIFF) formats may be allowed but by exception only and with Purchaser's written approval.
Intelligent Vector (CAD)	Intelligent vector drawing Like CAD
Multi media (Film)	Multi media Like Film, Micro fiche, Video, Sound
Raster Image (Bitmap)	Raster Image like a bitmap
Structured Data (MS Apps)	Structured Data Like CSV file, MS-access, MS-Excel, Application Database
Technical Publication (Text)	Technical publication or Text

Table 8.1 – Deliverable Formats

S-720L Information Requirements for Transformers

Requirements

Column	Heading - Details and requirements
A	**Code** - a unique identifier for the Information Requirement assigned by IOGP JIP33 DigitalTool
B	**Requirement** - a short description of the Information Requirement based on the description in the Parent Standard, IOGP Specification or an Industry Standard Information Requirement Title.
C	**Condition Invoking Requirement** - describes special condition(s) under which the Information Requirement is required; e.g.. service offshore and weight greater than 1 tonne means information is required. NB: 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 With Proposal** - Yes or No, where 'Yes' means the Information Requirement is required to be submitted with Suppliers 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 Purchase Order placement.
I	**Required As Built** - Yes or No, where 'Yes' means the Information Requirement is required to be 'As Built' on completion or delivery of equipment or 'No' is not required 'As Built'
J	**Fulfilled by Information Deliverable Number(s)** - identifies which Information Requirement(s) listed in the Supplier Master Information Schedule (SMIS) addresses the Purchasers requirements. NB; it should be noted that one Information Deliverable can fulfil more than one Information Requirement.
K	**Translation Required** -Yes or No, where 'Yes' means the Information Requirement should be translated into a language(s) (to be advised) other than English and 'No' means to be provided in English
L	**Remarks** - may include bid clarification questions & decisions (specify author & date)

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											
S720-IR-1	Supplier master information schedule		Information Deliverables List	No	For Acceptance		WAO	No		No	
S720-IR-2	Delivery schedule		Delivery/Production Schedule	Yes	For Information		WAO	No		No	
S720-IR-3	Progress report		Progress Report	No	For Information		WAO (Monthly)	No		No	
S720-IR-4	Quality plan	Required for CAS A and B	Quality Plan	-	-		-	-	-	-	
S720-IR-6	Inspection and test plan for complete package		Inspection and Test Plan (ITP)	No	For Information		WAO	No		No	
S720-IR-7	Handling, shipping, storage and preservation procedure		Handling, shipping and storage procedure	No	For Information		WPTD	No		No	
S720-IR-8	Non-conformance records		Nonconformance History	Yes	For Acceptance		WAO	No		No	
S720-IR-9	Concession requests		Concession request	No	For Acceptance		WAO	No		No	
S720-IR-43	Consolidated Spare Parts List		Consolidated Spare Parts List	No	For Information		WPTD	No		No	
S720-IR-62	Deviation list		Deviation list	Yes	For Acceptance		WAO	No		No	
Technical Information Deliverables											
S720-IR-19	IOGP S-720D Datasheet		Manufacturer Datasheet	Yes	For Acceptance		WAO	Yes		No	
S720-IR-28	General Arrangement Diagram		General Arrangement Diagram	Yes	For Acceptance		WAO	Yes		No	
S720-IR-29	Name Plate Drawing		Name Plate Drawing	No	For Information		WAO	Yes		No	
S720-IR-32	Total cost of ownership (TCO) calculation		Design calculation	Yes	For Information		WAO	No		No	
S720-IR-51	Lifetime calculation		Lifetime calculation	No	For Information		WAO	No		No	
S720-IR-34	Hazardous Area Certificate (Type)	For zone 1 and 2 applications only.	Hazardous Area Certificate (Type)	No	For Acceptance		WAO	No		No	
S720-IR-40	Foundation Loading Diagram		Foundation Loading Diagram	No	For Information		WAO	Yes		No	
S720-IR-41	Termination Diagram		Termination Diagram	No	For Information		WAO	Yes		No	
S720-IR-42	Wiring Diagram		Wiring Diagram	No	For Information		WAO	Yes		No	
S720-IR-27	Type Test Report		Type Test Report	Yes	For Information		WAT	No		No	
S720-IR-35	Routine test procedure	For CAS A and CAS B only	Routine test procedure	No	-		-	-		-	
S720-IR-37	Factory Acceptance Test (FAT) Procedure		Factory Acceptance Test (FAT) Procedure	No	For Acceptance		WPTT	No		No	
S720-IR-45	Site Acceptance Test (SAT) Procedure	If SAT is required	Site Acceptance Test (SAT) Procedure	No	For Acceptance		WPTD	No		No	
S720-IR-46	Factory Acceptance Test (FAT) Records		Factory Acceptance Test (FAT) Records	No	For Acceptance		WAT	No		No	
S720-IR-47	Site Acceptance Test (SAT) Records		Site Acceptance Test (SAT) Records	No	For Acceptance		WAT	No		No	
S720-IR-48	Utility Consumption Report		Utility Consumption Report	No	For Information		WAO	No		No	
S720-IR-49	Painting And Coating Procedure		Painting And Coating Procedure	No	For Acceptance		WAO	No		No	
S720-IR-53	Certificate Of Conformance		Certificate Of Conformance	No	For Acceptance		WAO	No		No	
S720-IR-54	Operating Manual		Operating Manual	No	For Information		WPTD	No		No	Operating Manual index, if required, should be provided in first revision of the document. When index agreed, Operating manual content shall be provided in subsequent revision of the document.

S-720L Information Requirements for Transformers

JIP33 JOINT INDUSTRY PROGRAMME

Requirements

Column	Heading - Details and requirements
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B	**Requirement** - a short description of the Information Requirement based on the description in the Parent Standard, IOGP Specification or an Industry Standard Information Requirement Title.
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E	**Submit With Proposal** - Yes or No, where 'Yes' means the Information Requirement is required to be submitted with Suppliers 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 Purchase Order placement.
I	**Required As Built** - Yes or No, where 'Yes' means the Information Requirement is required to be 'As Built' on completion or delivery of equipment or 'No' is not required 'As Built'
J	**Fulfilled by Information Deliverable Number(s)** - identifies which Information Requirement(s) listed in the Supplier Master Information Schedule (SMIS) addresses the Purchasers requirements. NB; it should be noted that one Information Deliverable can fulfil more than one Information Requirement.
K	**Translation Required** -Yes or No, where 'Yes' means the Information Requirement should be translated into a language(s) (to be advised) other than English and 'No' means to be provided in English
L	**Remarks** - may include bid clarification questions & decisions (specify author & date)

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)			
S720-IR-55	Manufacturer Record Book (MRB)		Manufacturer Record Book (MRB)	No	For Information		WPTD	Yes		No	Manufacturer Record Book index, if required, shall be provided in first revision of the document. When index agreed, Manufacturer Record Book content shall be provided in subsequent revision of the document.
S720-IR-57	Installation Manual		Installation Manual	No	For Information		WPTD	No		No	Installation Manual index, if required, should be provided in first revision of the document. When index agreed, Installation manual content shall be provided in subsequent revision of the document.
S720-IR-58	Maintenance Manual		Maintenance Manual	No	For Information		WPTD	No		No	Maintenance Manual index, if required, should be provided in first revision of the document. When index agreed, Maintenance manual content shall be provided in subsequent revision of the document.
S720-IR-59	Cooling circuit Diagram		Connection Diagram	No	For Information		WAO	Yes		No	
S720-IR-60	Load loss Calculation		Design Calculation	No	For Acceptance		WAO	No		No	
S720-IR-61	No-load loss calculation		No-load loss calculation	No	For Acceptance		WAO	No		No	

S-720L Information Requirements for Transformers

Requirements

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D	**Typical Deliverable** - Purchaser to advise the short description of the Information Deliverable that would typically include this Information Requirement
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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 Purchase Order placement.
I	**Required As Built** - Yes or No, where 'Yes' means the Information Requirement is required to be 'As Built' on completion or delivery of equipment or 'No' is not required 'As Built'
J	**Fulfilled by Information Deliverable Number(s)** - identifies which Information Requirement(s) listed in the Supplier Master Information Schedule (SMIS) addresses the Purchasers requirements. NB; it should be noted that one Information Deliverable can fulfil more than one Information Requirement.
K	**Translation Required** -Yes or No, where 'Yes' means the Information Requirement should be translated into a language(s) (to be advised) other than English and 'No' means to be provided in English
L	**Remarks** - may include bid clarification questions & decisions (specify author & date)

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											

S-720L Information Requirements for Transformers

Definitions

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D	**Reference** - reference to the Parent Standard, IOGP Specification or Industry Standard that the Information Deliverable is identified in.
E	**Format** - defines the required format of the relevant Information Requirement to be submitted by Supplier for Purchaser/Contractor for information and acceptance as shown in Table 9.1 of Instructions Tab and selected from pick list.
F	**CFIHOS Discipline Document Type Code** - the CFIHOS discipline document type that could be 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 Discipline Document Type Code**
Contract Management Information Deliverables					
S720-IR-1	Supplier master information schedule	Schedule of specific information deliverables developed by the [Vendor] and accepted by the [Purchaser] 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 [Vendor'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.		Native	CFIHOS-70000099
S720-IR-2	Delivery schedule	Schedule depicting, as applicable to the service or product scope, design, supply, manufacture, inspection, testing and delivery activities to be executed by [vendor/sub-vendors]. 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 sub-vendor) e. information deliverable submission dates identifying any execution activity dependencies Once agreed, changes to planned dates are subject to agreement by [purchaser]. Progress against planned dates is measured and the schedule updated and reported to the [purchaser] in accordance with contract reporting agreements. ** Schedule development tools, formats and submission protocols follow the [vendor's] standard practice unless otherwise agreed in the contract.		PDF	CFIHOS-70000298
S720-IR-3	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
S720-IR-4	Quality plan	Plan specifying the actions, responsibilities and associated resources to be applied by the [vendor], and when applicable [sub-vendors] or [manufacturers], to deliver the services or procured item(s) in conformance with the agreed requirements. ISO 9001 Clause 8.1, ISO 29001 and ISO 10005 may be used to inform the development of quality plans for specific applications, processes or products. [API Spec Q2 may be used to inform the development of Service Quality Plans]		PDF	
S720-IR-6	Inspection and test plan for complete package	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 [vendor], [purchaser] and independent conformity assessment activities. ISO 9001 Clause 8.1 and ISO 10005 may be used to inform the development of inspection and test plans for specific processes and products. Pre-inspection and pre-production planning shall be included. This shall consist of a tabular presentation of a pre-inspection or pre-production plan. It is typically used for a type of quality control **inspection** conducted before the **production** process begins to assess the quantity and quality of the raw materials and components, and whether they are in conformity with product specifications.	11.1.2.1, 11.1.4, 11.1.2.2, 11.1.3.a, 11.1.3.b, 11.1.3.c, 11.1.3.d, 11.1.3.e, 11.1.4.a, 11.1.4.b, 11.1.4.c, 11.1.4.d, 11.1.4.e, 11.1.4.f, 11.1.4.g, 11.1.4.h, 11.1.4.i, 11.1.4.j, 11.1.4.k, 11.1.4.l, 11.1.4.m, 11.1.4.n, 11.1.4.o, 11.1.4.p	PDF	CFIHOS-70000180
S720-IR-7	Handling, 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 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	5.7.4.1, 5.7.4.2, 5.7.4.3.11, 5.7.4.3.7, 5.7.4.3.8, 5.7.4.3.9, 9.6.19	PDF	CFIHOS-70000154
S720-IR-8	Non-conformance records	Details of non-conformances raised by or to the [vendor/sub-vendors] against technical requirements prior to or during the delivery of the products or services. Non-conformance is managed by the [vendor] in accordance with ISO 9001 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 non-conforming condition are subject to agreement by the [purchaser] in accordance with the concession management protocols defined in the Contract.		PDF	CFIHOS-70000226

S-720L Information Requirements for Transformers

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E	**Format** - defines the required format of the relevant Information Requirement to be submitted by Supplier for Purchaser/Contractor for information and acceptance as shown in Table 9.1 of Instructions Tab and selected from pick list.
F	**CFIHOS Discipline Document Type Code** - the CFIHOS discipline document type that could be 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 Discipline Document Type Code**
S720-IR-9	Concession requests	Formal submission seeking [purchaser] 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, [purchaser] directions, agreed action status provided with progress reports and at contract closeout		PDF	CFIHOS-70000389
S720-IR-43	Consolidated Spare Parts List	A consolidated spare parts list generated to support execution of project purchasing for the purpose of commissioning, start-up, maintenance support, etc.		Native	CFIHOS-70000420
S720-IR-62	Deviation list	Statement of deviations to the technical specification, data sheet, QRS and IRS.	12.0, 4.2.f, 5.1.1, 5.8, 5.8, 9.3, 11.1.1, 5.3, 5.4.3, 5.4.3, 5.4.3, 5.5, 5.7.4.2, 6.4.3, 9.6.1.6, 9.6.10.2.3 , 9.6.15.1, 9.6.15.2 , 9.6.16.1, 9.6.17.3.1, 9.6.17.3.2, 9.6.5, 9.6.7.4	PDF	

S-720L Information Requirements for Transformers

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Col A	Col B	Col C	Col D	Col E	Col F
Code	**Requirement**	**Description**	**Reference**	**Format**	**CFIHOS Discipline Document Type Code**
		Technical Information Deliverables			
S720-IR-19	IOGP S-720D Datasheet	Document providing information on technical data and characteristics about material, products or systems and their environment for proper implementation. This document provides structured data form containing part number/model, design information, operational data and limitations of the equipment. Document shall provide information on technical data and characteristics about material, products or systems and their environment for proper implementation.	4.1, 4.2 a) to e), 4.2 f, 4.2 g, 4.2 h, 4.2 i, 4.2.f, 5.1.1, 5.2, 5.7.3, 5.7.4.1, 5.8, 9.2, 11.1.3.a, 11.1.3.b, 11.1.3.c, 11.1.3.d, 11.1.3.e, 11.1.4.a, 11.1.4.b, 11.1.4.c, 11.1.4.e, 11.1.4.f, 11.1.4.g, 11.1.4.i, 11.1.4.j, 11.1.4.k, 11.1.4.l, 11.1.4.m, 11.1.4.o, 5.1.2, 5.1.3, 5.1.4, 5.4.3, 5.6, 5.7.2, 5.7.3, 5.7.4.2, 6.1, 6.2.a, 6.2.b, 6.2.c, 6.3, 6.4.1, 6.4.2.a, 6.4.2.b, 6.4.3.a, 6.4.3.b, 6.4.3.c, 6.4.3.e, 6.5, 6.6.b, 7.1.1, 9.1.2, 9.1.2. Note, 9.3, 9.4, 9.6.1.1, 9.6.1.2, 9.6.1.3, 9.6.10.3.2, 9.6.11.1.4, 9.6.13, 9.6.17.2.2, 9.6.17.3.5, 9.6.18.1, 9.6.18.3, 9.6.3.4, 9.6.3.5, 9.6.6.2, 9.6.6.3, 9.6.9.5, 9.6.9.9.7, A.1.1 a) to x), A.1.2 a) to t), B.4, Table 1	Native	CFIHOS-70000416
S720-IR-28	General Arrangement Diagram	A drawing showing overall dimensions, critical interface dimensions, part references and weight of assemblies, equipment and components. The drawing shall contain reference to main specifications and standards For equipment / components the drawing may include cross sectional views. Document may contain the following information: • Main dimensions • Interface connections • Weight • Centre of gravity • Withdrawal/installation and maintenance space. • Installation and mounting details • Lifting arrangement Foundation loading diagram may be included as part of this document.	8.3 m, 5.7.4.3.1, 5.7.4.3.10, 5.7.4.3.11, 5.7.4.3.2, 5.7.4.3.3, 5.7.4.3.4, 5.7.4.3.5, 5.7.4.3.6, 5.7.4.3.7, 5.7.4.3.8, 9.1.2, 9.5, 9.6.1.7, 9.6.10.2.1, 9.6.10.2.2, 9.6.10.3.1, 9.6.10.3.2, 9.6.7.2, 9.6.7.3, 9.6.7.5, 9.6.7.6, 9.6.7.7, 9.6.8.6, 9.6.8.7, 9.6.8.8, 9.6.9.3, 9.6.9.9.1	PDF	CFIHOS-70000153
S720-IR-29	Name Plate Drawing	A drawing that depicts the contents and information provided on the rating plate.	(8.2 a to p), (8.2 q), (8.2 r), (8.3 l), 5.4.1(Para 2), 8.2(Para 1), 9.6.17.1.1	PDF	
S720-IR-32	Total cost of ownership (TCO) calculation	Document providing information about the cost of ownership of the transformer over the lifetime considering the guaranteed load and no-load losses.	A.1.2 a) to t)	PDF	CFIHOS-70000086
S720-IR-51	Lifetime calculation	Document providing lifetime calculation for transformer based on supplier's recommended maintenance and operating requirements. Calculation shall be done in accordance with IEC 60076-12	5.1.1	PDF	
S720-IR-34	Hazardous Area Certificate (Type)	Attestation issued by a notifying body certifying that a type test has satisfied the specified standards; e.g. ATEX, BASEEFA, PTB, UL, CSA, NEMA, EX, etc. Examples of ratings include Intrinsically Safe & Explosion Proof. To include any special requirements for safe use, barrier/isolator to be used, etc.	4.2 g	PDF	CFIHOS-70000160
S720-IR-40	Foundation Loading Diagram	A diagram detailing static and dynamic forces or movements acting on foundations or other load bearing supports, anchor bolt details, lengths and pre-tensioning. May include Civil Structural for loads imposed, and Civil Foundations for foundation design. Also see Foundation Design Diagram, specifically for construction details	A.1.2 a) to t)	PDF	CFIHOS-70000151
S720-IR-41	Termination Diagram	A diagram for equipment, panels, junction boxes, etc. identifies all connections and cable terminations at input/output rails. Required for removal/hook up purposes and modifications. To include vendor interfaces.	9.6.11.2.1, 9.6.11.2.2, 9.6.11.2.3, 9.6.11.2.4, 9.6.11.2.5	PDF	CFIHOS-70000330

S-720L Information Requirements for Transformers

Definitions

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E	**Format** - defines the required format of the relevant Information Requirement to be submitted by Supplier for Purchaser/Contractor for information and acceptance as shown in Table 9.1 of Instructions Tab and selected from pick list.
F	**CFIHOS Discipline Document Type Code** - the CFIHOS discipline document type that could be 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 Discipline Document Type Code**
S720-IR-42	Wiring Diagram	Description: Diagram providing information on the circuitry of an object. Mandatory content of information: – Graphical symbols representing the objects; – Graphical symbols representing the connections among objects; – Reference designations; – Terminal designations; – Signal level conventions (applicable to logic signals). – Information necessary to trace paths and circuits (signal designations, location references) – Supplementary information necessary for the understanding of functions Optional content of information: – Technical data; – Reference to other documents; – Information about wiring performance; – Cable and cable core identification.	9.6.11.2.1, 9.6.11.2.2, 9.6.11.2.3, 9.6.11.2.4, 9.6.11.2.5, 9.6.17.2.4.4, 9.6.17.3.3, 9.6.17.3.4, 9.6.8.8	PDF	CFIHOS-70000268
S720-IR-27	Type Test Report	The results of test performed to provide evidence that the design meets the requirements of the functional specification (See ISO 13880:1999). (When specified, type test shall be independently verified by a third part and supported by a Certificate of Conformance.)	11.1.4.q, 11.1.1, 11.1.3.a, 11.1.3.b, 11.1.3.c, 11.1.3.d, 11.1.3.e, 5.1.4, 9.3 (Note), 9.6.9.9.3, 9.6.9.9.4, Table 1	PDF	
S720-IR-35	Routine test 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.	11.1.2.1.k) to m), 11.1.1, 11.1.2.1.a) to j), 11.1.2.2, 11.5(Note 2), Annex E	-	
S720-IR-37	Factory Acceptance Test (FAT) Procedure	The FAT procedure will be used to ensure a common understanding of performed testing and acceptance criteria. This document shall include all testing activities and their acceptance criteria according to applicable standards, specifications and requirements,. to document the condition of the equipment as tested from factory. Test set-up and test equipment is shall be defined. Suppliers standard (routine) test procedures should be used as far as possible	11.1.4	PDF	
S720-IR-45	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.	11.1.4	PDF	
S720-IR-46	Factory Acceptance Test (FAT) Records	The FAT report will be used to verify that the equipment has been tested according to FAT procedure. The FAT report will be used for acceptance of the equipment delivery This document shall include all testing activities and their acceptance criteria according, , in accordance with the FAT procedure, to applicable standards, specifications and requirements,. to document the condition of the equipment as tested from factory. Test set-up and test equipment is shall be defined.	11.1.4, Table 1	PDF	
S720-IR-47	Site Acceptance Test (SAT) Records	Records demonstrating results of site tests including discrete functional unit and overall assembly, electrical, mechanical, protection relay and IEDs.	11.1.4	PDF	
S720-IR-48	Utility Consumption Report	Document providing power consumption of cooling fans, cooling fans power and control cabinet, OLTC and remote tap changer control cabinet where applicable	A.1.1 a) to x)	PDF	
S720-IR-49	Painting And Coating Procedure	Verification of suppliers compliance with surface protection and coating requirements. This document provides the coating procedures, detailed work processes and defined requirements to surface treatment. It also provides for application and quality controls to be met for wet paint, powder coating, or metallic coatings. The document includes reference to applied standards and the information about revision of the applied standard.	9.6.18.1, 9.6.18.2	PDF	CFIHOS-70000384
S720-IR-53	Certificate Of Conformance	A statement of conformity where attestation is performed by the person or body that is independent of the person or organization that provides the object, and of user interests in that object. Certificate to provide conformance to local regulations.	12	PDF	CFIHOS-70000013
S720-IR-54	Operating Manual	Description of methods of operating a piece of equipment or process unit, including but not limited to instructions, procedures, drawings, tables, etc. for the operation -stop, start, and emergency shutdown. Including operational limits, function testing, possible interruptions, corrective actions, hazards and corrective measures to be taken. NOTE: Unless otherwise agreed, can be delivered as part of manufacturer's standard Installation, operation and maintenance manual or as a stand alone document.	9.7.1, 9.7.2	PDF	CFIHOS-70000228
S720-IR-55	Manufacturer Record Book (MRB)	Detailed information/description for the documents to be included in MRB as agreed between Purchaser and Vendor: Shall include but not be limited to documents Recording Compliance With Statutory and/or Local Regulations, and inspection and testing results / reports for all the testing (e.g. Mill tests on Material, production test coupon results, NDE, NDE personnel qualification, impact test, Heat treatment, leak testing etc.) carried out at Vendor/Sub-Vendor shop and at mill.	A.1.1 a) to x), A.1.2 a) to t)	PDF	
S720-IR-57	Installation Manual	Description of methods of installing a piece of equipment. Installation refers to the mounting, setting, erection, etc. NOTE: Unless otherwise agreed, can be delivered as part of manufacturer's standard Installation, operation and maintenance manual or as a stand alone document.	A.1.1 a) to x), A.1.2 a) to t)	PDF	CFIHOS-70000181

S-720L Information Requirements for Transformers

Definitions

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Col A	Col B	Col C	Col D	Col E	Col F
Code	**Requirement**	**Description**	**Reference**	**Format**	**CFIHOS Discipline Document Type Code**
S720-IR-58	Maintenance Manual	Description of methods of maintaining a specific piece of equipment. Typically originates from the equipment or package supplier. NOTE: Unless otherwise agreed, can be delivered as part of manufacturer's standard Installation, operation and maintenance manual or as a stand alone document.	5.1.1, A.1.1 a) to x), A.1.2 a) to t)	PDF	CFIHOS-70000206
S720-IR-59	Cooling circuit Diagram	Diagram for interconnection of valves, check valves, cooling pumps, heat exchanger, measuring instruments, direction of flow etc.	9.6.7.1	PDF	CFIHOS-70000055
S720-IR-60	Load loss Calculation	Load loss calculation at principal tapping shall be submitted by supplier. The same shall be used for verifying the measured load loss during inspection.	11,4	PDF	CFIHOS-70000086
S720-IR-61	No-load loss calculation	No-load loss calculation at principal tapping shall be submitted by supplier. The same shall be used for verifying the measured no load loss during inspection	11,5	PDF	
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

