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Supplementary Specification to PIP ELSAP04 for AC Uninterruptible Power Supply (UPS) System

Public Review Draft

Revision history

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Acknowledgements

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

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Foreword

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

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

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

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

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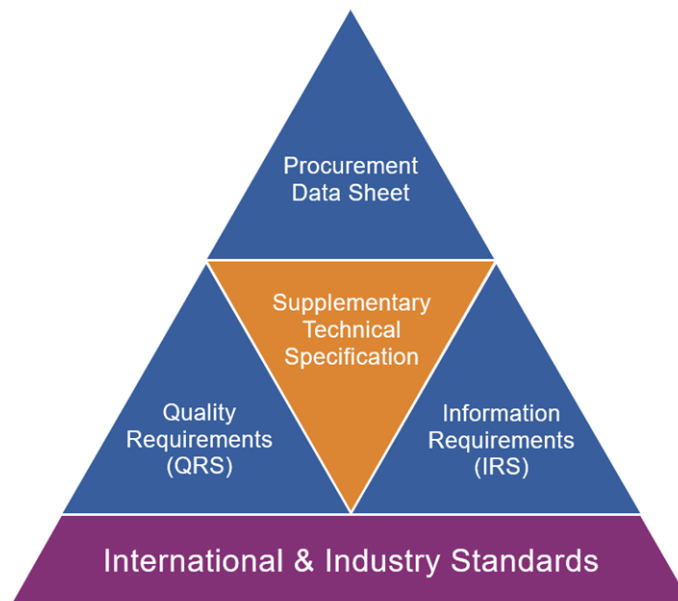
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Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of uninterruptible power supply (UPS) systems for North American projects in accordance with PIP ELSAP04, Complete Revision September 2020, Technical Correction September 2021, Uninterruptible Power Supply (UPS) System Specification, for application in the petroleum and natural gas industries.

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



JIP33 Specification for Procurement Documents Supplementary Technical Specification

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

IOGP S-734: Supplementary Specification to PIP ELSAP04 AC Uninterruptible Power Supply (UPS) System

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to PIP ELSAP04, following the PIP ELSAP04 clause structure. Clauses from PIP ELSAP04 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to PIP ELSAP04 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-734D: Procurement Data Sheet for AC Uninterruptible Power Supply (UPS) System (PIP)

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

IOGP S-734L: Information Requirements for AC Uninterruptible Power Supply (UPS) System (PIP)

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

IOGP S-734Q: Quality requirements for AC Uninterruptible Power Supply (UPS) System (PIP)

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

The terminology used within this specification and the supporting procurement data sheet, IRS and QRS follows that of PIP ELSAP04 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

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

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

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser defined requirements (procurement data sheet, IRS, QRS);
- d) this specification;
- e) PIP ELSAP04.

1 Scope

Replace all instances of "PIP ELSAP04-D Data Sheet" with

IOGP S-734D

2 References

2.2 Industry Codes and Standards

Add to section

46 CFR 111, *Title 46—Shipping, Chapter I—Department of Coast Guard, Subchapter J—Electrical Engineering, Part 111—Electrical Systems—General Requirements.*

ABS MODU, *Publication Number 6 Part 4*

ASCE/SEI 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

CSA C22.1, *Canadian Electrical Code, Part I, Safety Standard for Electrical Installations*

CSA C22.2 No. 29, *Panelboards and enclosed panelboards*

CSA C22.2 No. 107.3, *Uninterruptible power systems*

IEC 60623, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Vented nickel-cadmium prismatic rechargeable single cells*

IEC 60896-11, *Stationary lead-acid batteries – Part 11: Vented types – General requirements and methods of tests*

IEC 60896-22, *Stationary lead-acid batteries – Part 22: Valve regulated types – Requirements*

IEC 62040-2, *Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements*

IEC 62259, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Nickel-cadmium prismatic secondary single cells with partial gas recombination*

IEC 62620, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications*

IEEE 519, *IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems*

IEEE 1184, *IEEE Guide for Batteries for Uninterruptible Power Supply Systems*

NFPA 70, *National Electrical Code*

3 Definitions

electrical control and management system (ECMS): A system that automatically controls the power system through instrumentation and control devices.

emergency shutdown (ESD): An automatic protection system that acts to shut down the plant if it enters a potentially dangerous state.

fire and gas system (FGS): A system that monitors for fire, gas, smoke and heat and initiates actions to suppress and isolate the detected threats while simultaneously generating audio and visual alarms.

process control system (PCS): An overall site integrated process automation, control and/or monitoring system.

safety instrumented system (SIS): A system that is an independent protection layer to shut down a system or a part of it if a hazardous condition is detected.

touch-safe (finger safe): Protected from inadvertent contact by a finger using covers, recessing of terminals or the size of openings.

Note: Touch-safe and similar terms such as finger safe are widely used to describe products but are not defined by industry standards. Touch-safe is generally equivalent to IP 2X or IPXXB per ANSI/IEC 60529 and IEC 61439-1.

4 Requirements

4.1.3

Replace section with

The UPS shall be listed or certified by a nationally recognized testing laboratory (NRTL) for the United States or accredited certification organization (ACO) for Canada.

Note: Applications for this equipment in other countries may have additional requirements for certification (e.g., UL 1778 for US applications).

4.1.4

Add new section

4.1.4.1

The operational life of the UPS and its components at the rated load shall be in accordance with Table 3.

Add new Table 3

Table 3. Operating Life of the UPS and its Components

Components	Minimum Operation Life (Years)
Rectifier unit, inverter unit and static switch unit	20
Cooling fans	5
AC and DC capacitors	7
Input and output isolation transformer	20
Bypass transformer	20

Add new section

4.1.4.2

The UPS shall have a reliability integrity level 1 (RIL-1) in accordance with IEC 62040-3, Annex K.

Add new section

4.1.4.3

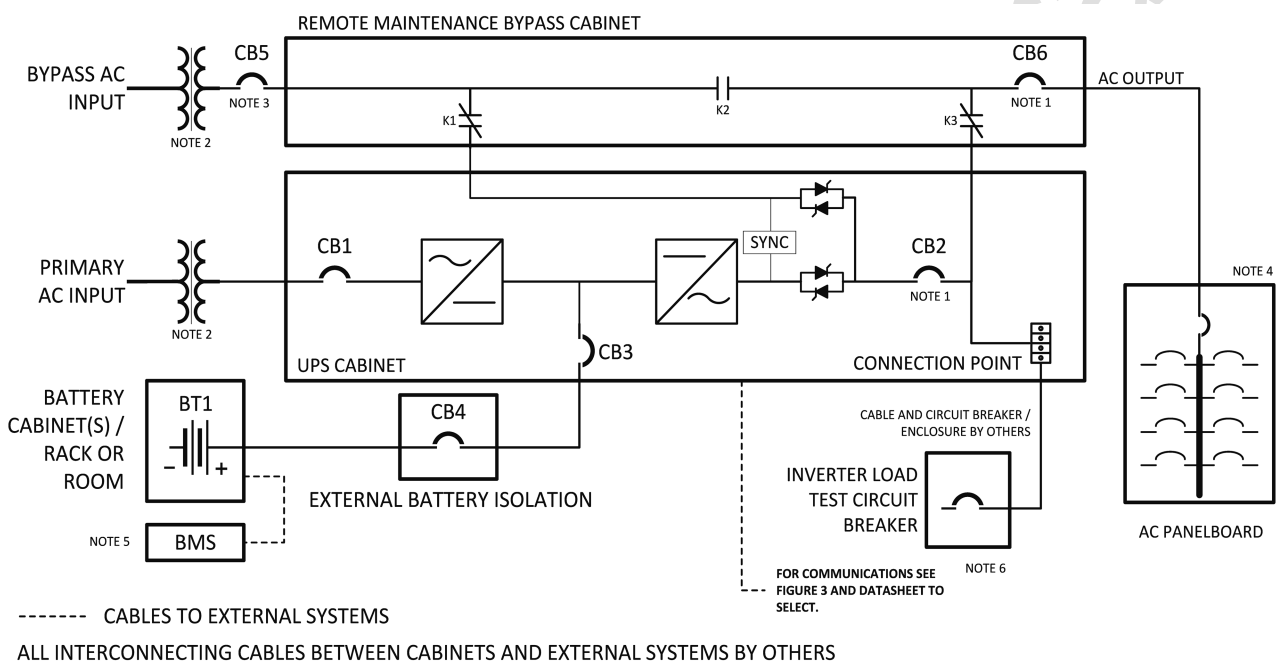
An obsolescence management plan in accordance with an industry recognized system (e.g., IEC 62402) shall be provided for AC UPS assembly components.

4.1.5

Replace first sentence with

Typical UPS configurations are shown in Figure 1 and Figure 2.

Replace Figure 1 with



NOTE This figure is used to assist with the specification of the UPS and associated equipment. Refer to the manufacturer's literature for specific components and configuration.

NOTE 1 Circuit breaker located in UPS (CB2) and/or bypass cabinet (CB6).

NOTE 2 Optional isolation transformer(s) located external or internal to associated cabinet.

NOTE 3 CB5 located external or internal to bypass cabinet.

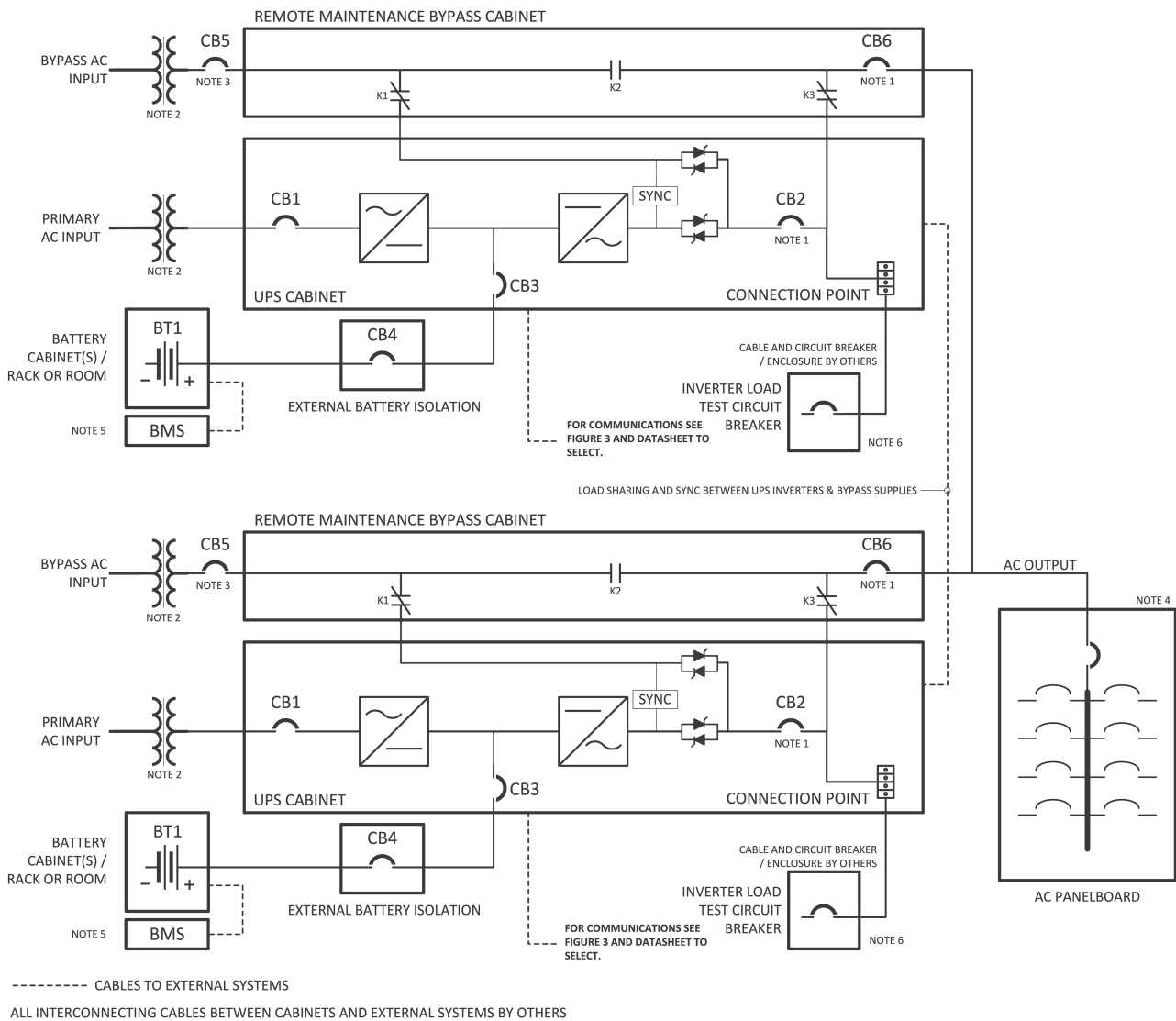
NOTE 4 Panelboard optional, see data sheet.

NOTE 5 BMS Battery monitoring/management system. See Figure 3 for details.

NOTE 6 Test CB located and supplied by others and external to UPS. Terminals to land test cable(s) provided by the supplier and located in the UPS cabinet.

Figure 1. Single UPS

Add new Figure 2



NOTE This figure is used to assist with the specification of the UPS and associated equipment. Refer to the manufacturer's literature for specific components and configuration.

NOTE 1 Circuit breaker located in UPS (CB2) and/or bypass cabinet (CB6).

NOTE 2 Optional isolation transformer(s) located external or internal to associated cabinet.

NOTE 3 CB5 located external or internal to bypass cabinet.

NOTE 4 Panelboard optional, see data sheet.

NOTE 5 BMS Battery monitoring/management system. See Figure 3 for details.

NOTE 6 Test CB located and supplied by others and external to UPS. Terminals to land test cable(s) provided by the supplier and located in the UPS cabinet.

Figure 2. Duplicate (Paralleled) UPS

4.1.20

Replace section with

A ground bus shall be provided inside each cabinet and inside the remote maintenance bypass switch (RMBS) enclosure.

Add new section

4.1.24

If a distribution panelboard is specified, the UPS and panelboard incorporating the main and branch circuit breakers shall provide a selective coordinated system (i.e., fully coordinated system) with the UPS inverter and bypass source.

Add new section

4.1.25

Equipment and wiring methods external to the UPS shall be in accordance with the applicable installation codes and regulations.

Add new section

4.1.26

If specified, UPS assemblies to be installed on floating offshore installations in United States Coast Guard (USCG) and American Bureau of Shipping (ABS) jurisdictions shall comply with 46 CFR 111 and ABS MODU Publication Number 6 Part 4, respectively.

Note: Additional guidance and information for USCG and ABS requirements for UPS installed on floating facilities in US territorial waters can be found in API RP 14F / API RP FZ.

4.2 Site Conditions

4.2.5

Replace section with

The UPS shall be designed for an electrically unclassified area.

Add new section

4.2.6

If a seismic design is specified, the UPS shall comply with ASCE/SEI 7-16.

4.3 Electrical Characteristics

Table 1. Electrical Characteristics

Add row 6. to section A.

	Ferroresonant	Pulse-Width Modulated (PWM)
A. Input		
6. AC input supply voltage total harmonic distortion (THDv)	≤ 8% as per IEEE 519	≤ 8% as per IEEE 519

In section D, replace rows 9. and 10. with

	Ferroresonant	Pulse-Width Modulated (PWM)
D. Output		
9. Overload (inverter only, without transfer to bypass)	a. 100% continuously b. 125% for 10 minutes c. 150% for 1 minute d. 200% for 100 milliseconds	a. 100% continuously b. 125% for 10 minutes c. 150% for 1 minute d. 200% for 100 milliseconds
10. Overload/fault-clearing current capability on bypass source, including static transfer switch	a. 100% continuously b. 125% for 10 minutes c. 150% for 1 minute d. 200% for 100 milliseconds e. 1000% for 50 milliseconds	a. 100% continuously b. 125% for 10 minutes c. 150% for 1 minute d. 200% for 100 milliseconds e. 1000% for 50 milliseconds

4.5 Input Isolation and Bypass Isolation Transformers

4.5.6

Delete section 4.5.6

4.6 Rectifier/Charger

4.6.1 General

Replace list section 12. with

12. Input transient protection shall be in accordance with IEC 62040-2, Category C2 and C3 UPS.

4.9 Internal Manual Bypass Switch (MBS)

Delete section 4.9

4.10 Remote Maintenance Bypass Switch (RMBS)

4.10.1

Replace first sentence with

A remote maintenance bypass switch shall be provided.

Add new section

4.10.5

The RMBS shall have a three-position switch to select between normal, test and bypass modes, with the ability to be locked in the bypass position.

4.11 Inverter Test Load Connection

4.11.1

Replace section with

If test load terminals are specified, they shall be rated for the full load rating of the UPS at the inverter output.

4.11.2

Delete section 4.11.2

4.11.3

Delete section 4.11.3

4.11.4

Replace section with

Terminals used for the test load connection shall be clearly identified in the UPS.

4.13 Batteries

4.13.1

Delete section 4.13.1

4.13.2

Delete section 4.13.2

4.13.3

Add to section

If batteries are specified, hardware and accessories applicable to the battery technology selected shall be provided (e.g., insulated inter-cell connectors, flame arrestor type vent plugs with dust caps and racks with provisions for grounding).

4.14 Enclosures

4.14.12

Delete "to less than 2% by volume in accordance with IEEE 484"

4.15 Circuit Breakers and Switches

4.15.1

Replace "the one-line diagram" with

Figure 1, Figure 2 or the purchaser's diagram

4.16 Fuses

4.16.1

Replace "finger safe, with an open fuse indication light" with

touch-safe (finger safe)

4.16.3

Replace section with

Exposed energized terminals of low-voltage components (e.g., fuse holders and fuse blocks) with a line-to-ground voltage greater than or equal to 50 V shall be provided as touch-safe (finger safe) or covered by an insulating barrier to provide protection from incidental contact.

4.17 Wiring and Terminals

4.17.1

Replace section with

Exposed energized terminals of low-voltage components (e.g., relays, power terminal blocks and alarm terminal blocks) with a line-to-ground voltage greater than or equal 50 V shall be provided as touch-safe (finger safe) or covered by an insulating barrier to provide protection from incidental contact.

4.18 UPS Controls, Monitoring, and Communications

4.18.3 Measurement

4.18.3.3

Delete list item c.

Delete list item e.

4.18.4 Protection and Alarms

4.18.4.6

Delete list item 3. of list section j.

4.18.4.7

Delete section 4.18.4.7

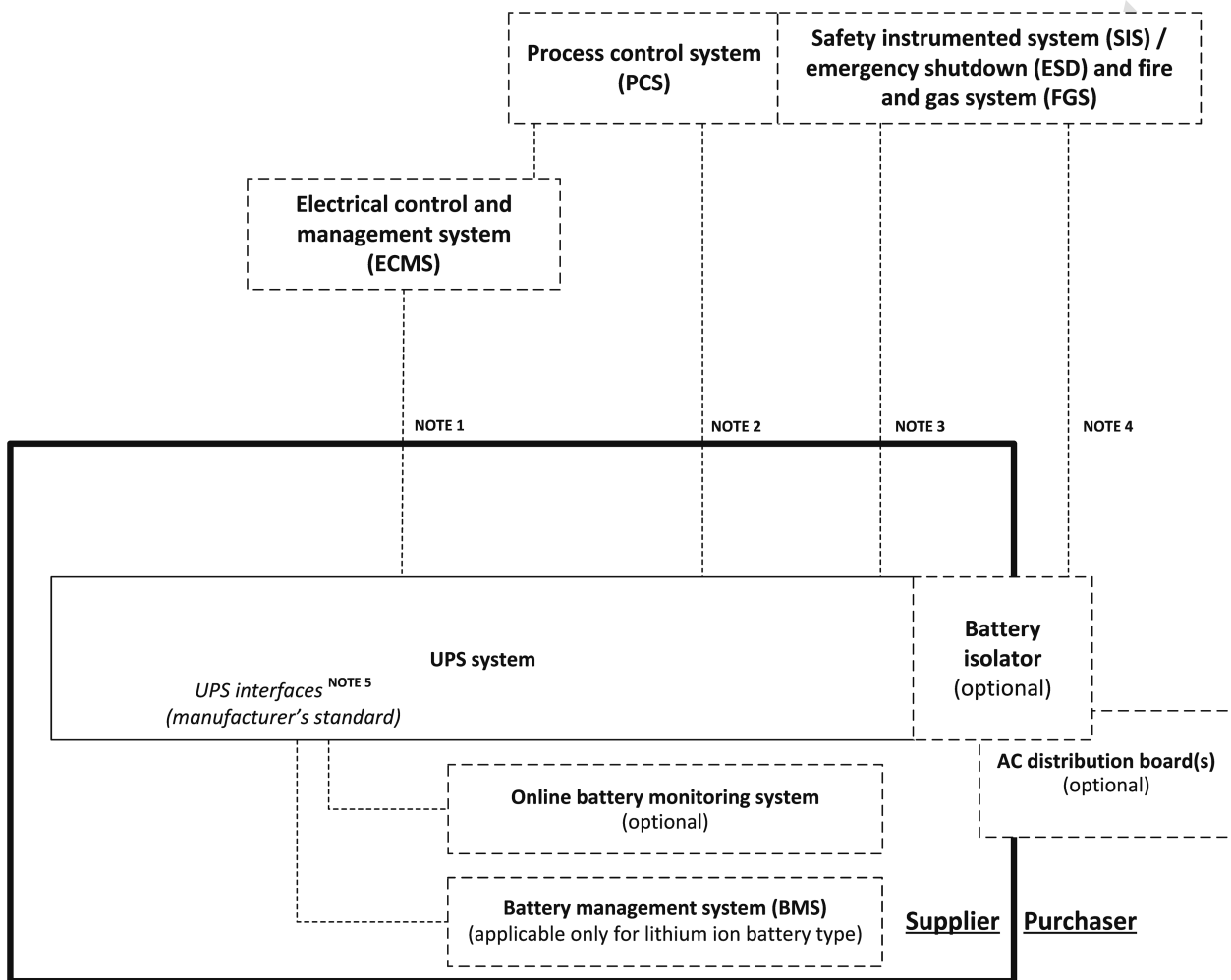
4.18.7 Communications

4.18.7.2

Replace section with

Figure 3 shall be used to reference additional details on UPS interfaces and interconnections.

Add new Figure 3



NOTE 1 Network connectivity interface for time synchronization, remote access and configuration.

NOTE 2 Direct interface for critical / safety critical status and alarms to PCS where ECMS is not present. Independent to emergency shutdown system trip.

NOTE 3 Direct interface for emergency shutdown trip and fire and gas system function (example: boost charge inhibit) / trip.

NOTE 4 Direct interface for emergency shutdown and fire and gas system trips.

NOTE 5 Supplier standard interface for synchronization and load sharing between UPSs (applicable for parallel systems), UPS battery monitoring system and battery management system where applicable.

Figure 3. Communications Block Diagram

4.19 Tagging and Nameplates

4.19.3

4.19.3.4

Delete section 4.19.3.4

4.19.3.7

Delete section 4.19.3.7

Add to section

4.19.8

Compartments with an external voltage source shall have a caution label fitted on the doors.

4.20 Inspection and Testing

4.20.3

Replace section with

Type testing shall be performed in accordance with IEC 62040-3, Table 5.

4.20.4

Delete section 4.20.4

4.20.5

Delete section 4.20.5

4.20.6

Delete section 4.20.6

4.20.7

Delete section 4.20.7

4.20.8

Delete section 4.20.8

Add new section

4.20.9

Routine testing shall be performed in accordance with IEC 62040-3, Table 5.

Add new section

4.20.10

If burn-in testing is specified, a continuous operation at full rated capacity burn-in test shall be completed.

Add new section

4.20.11

Communication interfaces shall be tested to verify the physical hardware media and associated software protocols.

Add new section

4.20.12

For duplicate paralleled UPSs, equal load sharing shall be verified in accordance with IEC 62040-3:2021, Section 6.4.2.6.

4.22 Documentation

4.22.3

Delete section 4.22.3

4.22.4

Delete section 4.22.4

4.22.5

Delete section 4.22.5

4.22.6

Delete Section 4.22.6

4.22.7

Delete section 4.22.7

Table 2. Documentation Requirements

Delete Table 2

4.23 Conflict Resolution

Delete section 4.23

Add Bibliography

Bibliography

- [1] API Recommended Practice 14F, *Recommended Practice for Design, Installation, and Maintenance of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1, and Division 2 Locations*
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- [8] IOGP S-701, *Supplementary Specification to IEC 62040-3 for AC Uninterruptible Power Systems (UPS)*
- [9] ISO 9001, *Quality management systems — Requirements*
- [10] ISO/IEC 17000, *Conformity assessment — Vocabulary and general principles*

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