

Supplementary Specification to UL 845 for Low Voltage Motor Control Centers

Public Review Draft

Revision history

VERSION	DATE	PURPOSE
1.1	July 2026	Issued for Public Review
1.0	December 2020	First Edition

Acknowledgements

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

Disclaimer

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

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

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

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

Copyright notice

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

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

Foreword

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

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

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

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

Table of contents

Foreword	1
Introduction	3
1 Scope	5
1.1 Products covered	5
2 Normative references	5
3 Definitions	5
4 Application information and components	5
4.3 Dependability of materials and parts	5
4.4 Technology readiness and obsolescence	6
5 Characteristics	6
5.1 General	6
5.2 Voltage ratings	7
5.3 Current	7
5.4 Short-circuit	7
6 Markings and product information	8
6.1 Identification	8
6.2 Product information	8
6.3 Marking	8
7 Normal service and transport conditions	10
7.3 Floating marine applications	10
8 Construction and performance requirements	10
8.1 General assembly	10
8.2 Construction requirements	12
9 Motor control center tests	30
9.22 Factory tests	30
TABLES	32
Annex C (Normative) Normative references	33
Annex F (Normative) Factory tests	34
Annex H (Informative) Application information	35
Bibliography	36

List of tables

Table 46 Rating for motor space heaters	32
---	----

Introduction

The purpose of the IOGP S-732 specification documents is to define a minimum common set of requirements for the procurement of low voltage motor control centers in accordance with UL 845, Sixth Edition, published February 2025, Motor Control Centers, for application in the petroleum and natural gas industries.

The IOGP S-732 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a procurement data sheet (PDS), an information requirements specification (IRS) and a quality requirements specification (QRS). These four specification documents, together with the purchase order, define the overall technical specification for procurement.



JIP33 Specification for Procurement Documents Supplementary Technical Requirements Specification (TRS)

This specification is to be applied in conjunction with the supporting PDS, IRS and QRS as follows.

IOGP S-732 : Supplementary Specification to UL 845 for Low Voltage Motor Control Centers

This specification defines technical requirements for the supply of the equipment and is written as an overlay to UL 845, following the UL 845 clause structure. Clauses from UL 845 not amended by this specification apply as written. Modifications to UL 845 defined in this specification are introduced by a description that includes the type of modification (i.e. Add, Replace or Delete) and the position of the modification within the clause.

NOTE Lists, notes, tables, figures, equations, examples and warnings are not counted as paragraphs.

IOGP S-732D: Procurement Data Sheet for Low Voltage Motor Control Centers (UL)

The PDS defines application-specific requirements. The PDS is applied during the procurement cycle only and does not replace the equipment data sheet. The PDS may also include fields for supplier-provided information required as part of the purchaser's technical evaluation. Additional purchaser-supplied documents may also be incorporated or referenced in the PDS to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-732L: Information Requirements for Low Voltage Motor Control Centers (UL)

The IRS defines information requirements for the scope of supply. The IRS includes information content, format, timing and purpose to be provided by the supplier, and may also define specific conditions that invoke the information requirements.

IOGP S-732Q: Quality Requirements for Low Voltage Motor Control Centers (UL)

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 PDS or in the purchase order.

The specification documents follow the editorial format of UL 845 and, where appropriate, the drafting principles and rules of ISO/IEC Directives Part 2.

The PDS and IRS are published as editable documents for the purchaser to specify application-specific requirements. The TRS and QRS are fixed documents.

The order of precedence of documents applicable to the supply of the equipment, with the highest authority listed first, shall be as follows:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser-defined requirements (e.g. PDS, IRS and QRS);
- d) this specification;
- e) UL 845.

1 Scope

1.1 Products covered

Add new clause

1.1.5

This specification defines minimum technical requirements for the purchase (including design features, fabrication quality, inspection, testing, shipment and documentation) of low voltage motor control center equipment. This specification does not apply to motor control centers installed in hazardous (classified) areas.

2 Normative references

Add to section

The documents listed in Annex C are referred to in this specification, the PDS (IOGP S-732D) or the IRS (IOGP S-732L) in such a way that some or all of their content constitutes requirements of these specification documents.

3 Definitions

Add new definition

3.21 touch-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 per ANSI/IEC 60529, but most products are not tested to a particular IP rating.

Add new definition

3.22 manufacturer – an organization manufacturing and/or supplying the equipment or services, and/or contractor on project.

NOTE May be referred to as "vendor", "seller" or "supplier".

4 Application information and components

Add new clause

4.3 Dependability of materials and parts

4.3.1

The motor control center, excluding electronic components, shall have a design life of and be supported for at least 25 years after delivery.

4.3.2

The electronic components (e.g. protection and control devices) shall have a minimum design life of 14 years under usual (normal) service conditions.

4.3.3

The motor control center and sub-components shall not be required to be de-energized for at least 45 000 h (five years) at the continuous-current rating and under normal service conditions

Add new clause

4.4 Technology readiness and obsolescence

4.4.1

The motor control center, excluding electronic devices, shall be supported for a minimum of 25 years after delivery.

4.4.2

An obsolescence management plan shall be available from the manufacturer for all motor control center components excluding devices that are specified by the purchaser and not part of the manufacturer's standard offering.

NOTE IEC 62402 is an example of an obsolescence management guide.

4.4.3

Proposals shall indicate whether the motor control center or any sub-component (individually denoted) has less than three years of proven operational service.

5 Characteristics

5.1 General

Add new clause

5.1.3

Low voltage motor control centers and controllers shall be provided in accordance with the single line diagrams, standard motor control schematics and IOGP S-732D.

Add new clause

5.1.4

The complete assembly and its components shall have a short-circuit rating meeting or exceeding the specified system available fault current and the system X/R ratio.

Add new clause

5.1.5

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

NOTE Applications for this equipment in other countries may have additional requirements for certification.

5.2 Voltage ratings

Add new clause

5.2.1

If 24 Vdc control is specified, dual power supplies shall be provided.

Add new clause

5.2.2

If dc power supplies are provided, an alarm contact for each power supply shall be provided to indicate that the output voltage is outside of the acceptable range (i.e. the supply has been turned off or has failed).

5.3 Current

5.3.2 Horizontal bus rating

Add new clause

5.3.2.1

The bus bar joint and connection plates shall be the same material and plating type as the main power bus.

Add new clause

5.3.2.2

Bus connections from the incoming main section to the horizontal power bus shall have the same minimum ampacity as the horizontal bus.

5.3.3 Vertical bus

Add to clause

All vertical bus bars in each section shall be able to carry the current as specified.

5.4 Short-circuit

5.4.1 Short-circuit and short-time current withstand ratings of motor center units

Add new clause

5.4.1.5

The short-circuit rating of each unit shall be greater than or equal to the short-circuit current rating of the motor control center bus structure.

5.4.4 Rating of bus structure

Add new clause

5.4.4.3

The horizontal and vertical bus short-circuit rating in the motor control center shall be greater than or equal to the maximum available fault current specified in the data sheet.

6 Markings and product information

6.1 Identification

Add to clause

A master nameplate with the following information shall be mounted on the motor control center main incoming unit:

- a) purchase order number;
- b) motor control center designation (tag number);
- c) month and year of manufacture.

6.2 Product information

6.2.2

Add new list item f)

- f) the following information on a nameplate on each individual unit:
 - 1) equipment tag number;
 - 2) equipment name;
 - 3) HP rating, kW rating or full load amperes (FLA).

Add new clause

6.2.3

If an arc-resistant motor control center is specified, an additional nameplate shall be provided to identify the arc resistant ratings of the motor control center in accordance with IEEE C37.20.7:2017, Clause 6.3.

6.3 Marking

6.3.11B

In first sentence, replace "may" with

shall

In second sentence, delete "or the equivalent"

6.3.46

Add to clause

When the disconnecting means uses a magnetic-only trip motor circuit protector or a thermal-magnetic molded-case circuit breaker, the position indicator shall include the "TRIP" position.

6.3.64

Replace clause with

A warning label shall be provided on the doors of compartments with an external voltage source.

NOTE This clause does not apply to circuits less than 50 V.

Add new clause

6.3.73 Nameplate details

6.3.73.1

The motor control center and individual units shall be provided with engraved nameplates and field markings depicting the information within the project nameplate schedule or single line drawing.

6.3.73.2

Nameplates shall be of the engravable type with black letters on a white background.

6.3.73.3

Nameplates shall be mounted with stainless steel screws on the front of the cubicle.

6.3.73.4

The lettering on the master motor control center nameplate (see Clause 6.1) shall be at least 50 mm (2 in) high.

6.3.73.5

The size of unit nameplates shall be at least 25.4 mm (1 in) wide by 63.5 mm (2.5 in) long.

6.3.73.6

Characters of unit nameplates shall be at least 4.8 mm (0.1875 in) high.

Add new clause

6.3.74

Separate nameplates shall be provided to identify door-mounted items such as meters, switches, indication lights and other devices.

Add new clause

6.3.75

Separate device markers shall be provided to identify components (e.g. terminals, relays, switches and other devices) within each unit.

7 Normal service and transport conditions

Add new clause

7.3 Floating marine applications

If specified, motor control center 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 motor control centers installed on floating facilities in US territorial waters can be found in API RP 14F and API RP 14FZ.

8 Construction and performance requirements

8.1 General assembly

8.1.2 Enclosure – General

Add new clause

8.1.2.3

The motor control center structure shall be a dead front, totally enclosed and freestanding assembly.

Add new clause

8.1.2.4

If NEMA Type 1 with gasket enclosure is provided, front doors and covers shall close on gaskets installed around the edge of the door, cover or structure.

Add new clause

8.1.2.5

Equipment, wiring and field connection terminals shall be accessible from the front.

Add new clause

8.1.2.6

Each motor control center shipping section shall be provided with removable eyes or removable angle irons for lifting.

Add new clause**8.1.2.7**

If seismic requirements are specified, the motor control center shall be designed in accordance with the requirements of ASCE/SEI 7-16.

Add new clause**8.1.2.8 Arc-resistant motor control centers****8.1.2.8.1**

Arc-resistant assemblies shall be tested in accordance with IEEE C37.20.7-2017 for a duration of not less than 0.1 s, unless an optional short-time withstand rating is specified.

8.1.2.8.2

When an optional short-time withstand rating is specified, the arc-resistant assembly shall be tested for the specified duration or 0.5 s, whichever is less.

8.1.2.8.3

The manufacturer shall identify the methodology defined in IEEE C37.20.7 that is utilized to achieve the arc-resistant certification of the motor control center.

8.1.2.8.4

Minimum requirements for clear space above or around and other guidelines (e.g. for plenum) related to the performance of the arc-resistant motor control center shall be provided.

8.1.2.8.5

If a plenum is provided, it shall run the full length of the motor control center assembly.

8.1.2.8.6

Motor control center doors shall be secured with latches (tie-down bolts are not allowed).

8.1.2.8.7

Special tools shall not be required to latch the front compartment door or engage the arc-resistant function.

8.1.2.8.8

If accessories (e.g. a solid door) are required to maintain the arc-resistant rating when a unit is removed, they shall be provided for each unit (physical size) in the quantity specified.

8.1.7 Door interlock

8.1.7.2

Replace clause with

A tool operated provision for deactivating the interlock for inspection purposes while the disconnecting device is closed shall be provided.

8.1.9

Replace first sentence with

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

Add to NOTE

Accessing vertical wireways is considered normal operation.

8.2 Construction requirements

8.2.2 Size, location, and covering or screening

Add new clause

8.2.2.10

If ventilation filters are provided, ventilation openings shall be covered with externally accessible washable-type filters.

8.2.4 Hinged doors and covers

Add new clause

8.2.4.6

Vertical and horizontal wireways shall have separate access covers.

Add new clause

8.2.4.7

Vertical wireway covers shall be provided with hinges.

Add new clause

8.2.4.8

If specified, the enclosure and unit doors shall include NRTL- or ACO-approved thermal scanning inspection windows to allow for infrared scanning of the equipment without opening the equipment doors or removing covers.

8.2.6 Protection against corrosion

Delete list item b)

Add new clause

8.2.6.1

Unpainted parts and hardware shall be plated for corrosion resistance or made of stainless steel.

8.2.6.2

The equipment shall be protected against deterioration from corrosive gases by the use of compatible coatings and material selection.

8.2.6.3

Bare copper, bare silver, silver-plated copper and their alloys shall not be provided for current-carrying parts when the presence of corrosive gases is identified.

8.2.8 Current-carrying parts

8.2.8.2

In first sentence, replace "may" with

shall

8.2.9 Bus bars

8.2.9.1

Replace clause with

Vertical and horizontal current-carrying bus bars shall be tin-plated copper or silver-plated copper as specified.

Add new clause

8.2.9.5

Main and ground buses shall be pre-drilled for connection of future sections on each end without the need for additional bus supports or bracing.

Add new clause

8.2.9.6 Removable cover plates

8.2.9.6.1

Removable cover plates shall be provided for the main bus, ground bus and horizontal wireway.

8.2.9.6.2

Removable cover plates shall be attached with bolts or screws.

Add new clause

8.2.9.7

If an insulated main horizontal bus is specified, each bus bar shall be fully insulated for the rated voltage of the motor control center using an insulated covering (e.g. insulated sleeving or epoxy coating).

Add new clause

8.2.9.8

Main and ground bus bars shall be free of splices within the shipping split.

Add new clause

8.2.9.9

Space shall be provided to allow for field installation and servicing of shipping split joint connections with a front accessible bus cover removed (i.e. assembly of joints and access with a torque wrench).

Add new clause

8.2.9.10

When a back-to-back motor control center configuration is specified, two separate motor control center assemblies shall be connected through a transition section that has separate vertical power buses with the same phasing sequence for the front and back assemblies.

Add new clause

8.2.9.11

Vertical bus bars in each motor control center section shall be provided as either of the following:

- a) fully insulated for the rated voltage of the motor control center using an insulated covering around each bus bar (e.g. insulated sleeving or epoxy coating) except for locations where removable units make contact with the bus bars;
- b) isolated such that the bus bars are enclosed individually or as a group by an insulated protective covering (e.g. clamshell).

Add new clause

8.2.9.12

If an insulated main horizontal bus is specified, all bus bar joints (including shipping splits) shall be fully insulated for the rated voltage of the motor control center using either insulated protective boots or tape in accordance with Clause 8.2.27.8.

8.2.10 Protection of service personnel

Add new clause

8.2.10.4

Vertical bus bars shall be protected against incidental contact by a touch-safe bus bar enclosure or by automatic insulating shutters when the individual motor control center draw-out unit is removed from the structure.

Add new clause

8.2.10.5

If specified, controllers and feeder units shall be provided with an absence of voltage tester device that is NRTL listed to UL 1436 in order to establish electrically safe work conditions and provide a means of verification of isolation without opening the unit door.

Add new clause

8.2.10.6

Line side conducting parts that remain energized when the unit disconnect is in the "OFF" position shall be covered with a barrier or otherwise protected from incidental contact.

8.2.11 Combination motor control unit

Add new clause

8.2.11.10

Motor controllers shall be sized in accordance with NEMA standard maximum horsepower ratings.

Add new clause

8.2.11.11

The minimum acceptable motor controller size shall be NEMA size 1.

Add new clause

8.2.11.12

Dual- and intermediate-size motor controllers (e.g. size 1¾) shall not be acceptable.

Add new clause

8.2.11.13

Sizes 1 and 2 motor controllers shall have a minimum vertical space allowance of 305 mm (12 in) nominal.

Add new clause**8.2.11.14**

Plug-in unit stabs shall be plated copper and equipped with a retractable stab assembly mechanism or other withdrawable unit designs, allowing the primary voltage to be disconnected with the unit door closed.

Add new clause**8.2.11.15**

Breaker frames and trip units shall be sized for starting premium efficiency motors.

Add new clause**8.2.11.16 Mechanical overload relays**

If mechanical overload relays are specified, they shall be provided in accordance with the requirements given in Clauses 8.2.11.16.1 through 8.2.11.16.3.

8.2.11.16.1

Mechanical overload relays shall be provided with ambient compensated overload elements.

8.2.11.16.2

Mechanical overload relays shall be designed to accept replaceable elements.

8.2.11.16.3

Mechanical overload relays shall be equipped with an externally operable manual reset function.

Add new clause**8.2.11.17 Adjustable solid-state overload relays**

If adjustable solid-state overload relays are specified, they shall be provided in accordance with the requirements given in Clauses 8.2.11.17.1 through 8.2.11.17.6.

8.2.11.17.1

Adjustable solid-state overload relays shall be three-pole type.

8.2.11.17.2

Adjustable solid-state overload relays shall be current sensing.

8.2.11.17.3

Adjustable solid-state overload relays shall have a selectable overload trip of NEMA class 10 to 30.

8.2.11.17.4

Adjustable solid-state overload relays shall be provided with an overload trip range that allows a setting of up to 125 % of the motor full load current.

8.2.11.17.5

Adjustable solid-state overload relays shall be equipped with an externally operable manual reset function.

8.2.11.17.6

If fused disconnect type is provided for the unit disconnect means, the adjustable solid-state overload relay shall be designed and configured to open the contactor on loss of a phase to prevent single phase operation of the motor.

Add new clause

8.2.11.18

If microprocessor-based digital multifunction motor protection relays are specified, they shall be provided with the following functions:

- a) three-phase, adjustable overload protection;
- b) adjustable overload trip of NEMA class 5 to 30;
- c) protective functions to include thermal overload, underload, locked rotor, current imbalance, stall, phase loss and zero sequence ground fault;
- d) programmable trip level, warning level, time delay and inhibit window;
- e) current monitoring functions to include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized and ground fault current;
- f) on-board communications;
- g) diagnostic information to include device status, warning status, time to reset, trip status, time to overload trip and historical event recording;
- h) four digital inputs and two digital outputs;
- i) undervoltage ride-through and/or auto-restart functionality for the equipment as shown on the single line diagram;
- j) LEDs for status indication;
- k) remote reset.

Add new clause

8.2.11.19

Surge suppressors shall be installed across all control relay coils, except for electronic relays that include internal surge suppression.

Add new clause

8.2.11.20

Contactors provided in combination motor controllers shall be of the air-break magnetic type for sizes 1 through 4 and of the vacuum-break type for size 5 and larger.

Add new clause

8.2.11.21

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

Add new clause

8.2.11.22

If control power transformers are provided, the sizing shall include the control circuit load and motor space heater loads as defined in Table 46.

Add new clause

8.2.11.23

If extra-capacity control power transformers are specified, a minimum of an additional 50 VA shall be provided in addition to the requirement in Clause 8.2.11.29.

Add new clause

8.2.11.24

Each motor control unit shall be provided with a minimum of one seal-in contact (for three-wire control) plus one spare normally open and normally closed contact.

Add new clause

8.2.11.25

If a control power source external to the motor control center is specified, the motor control center line-up shall be provided in accordance with the requirements given in Clauses 8.2.11.25.1 through 8.2.11.25.4.

8.2.11.25.1

A control power circuit shall be provided in each vertical section with all units wired in parallel.

8.2.11.25.2

Separate control power fuses shall be provided for each unit.

8.2.11.25.3

The line side of the control power fuse (X1) and the grounded conductor (X2) in each unit shall be wired to pull apart terminal blocks.

8.2.11.25.4

An auxiliary contact that operates simultaneously with the unit disconnecting device shall open the control power circuit.

Add new clause

8.2.11.26

Unit interposing relays, auxiliary control devices, control wiring and terminal block connection points shall be provided as shown on the project drawings.

Add new clause

8.2.11.27

Plug-in type interposing relays supplied within the units shall be provided with retaining clips.

Add new clause

8.2.11.28

If motor space heaters are specified, the combination motor controller shall be provided with a normally closed "M" contact wired in series with the control power source such that the motor space heater is energized when the contactor is open.

Add new clause

8.2.11.29

Plug-in units shall be equipped with a mechanical safety interlock that prevents connecting or disconnecting the unit to the vertical bus when the disconnect handle is in the "ON" position.

Add new clause

8.2.11.30

If auto trip reset is specified, an overload relay shall include functionality to automatically reset after a specified period of time (e.g. automatic reset with a maximum number of resets or reset after thermal capacity is sufficient to allow a restart).

8.2.12 Unit mounting

Add to clause

Units of size 4 and larger shall be located in the lower half of the vertical section of the motor control center with smaller units located in the upper half.

Add new clause

8.2.12.1

Feeder units providing circuit protection devices shall be thermal MCCB or fused switches, with the fuses supplied and installed as indicated on project drawings.

Add new clause

8.2.12.2

Feeder units shall include a retractable power stab assembly mechanism or withdrawable unit design allowing the primary voltage to be disconnected with the unit door closed.

Add new clause

8.2.12.3

If fused disconnect switches are specified, fuse holders shall be provided as touch-safe.

Add new clause

8.2.12.4

Dual feeder-tap units with two MCCB feeders shall not be provided in a single 12-inch space factor unit.

NOTE The use of two separate 6-inch space factor units is acceptable.

Add new clause

8.2.12.5

Unit control wiring and communication cabling shall be capable of being disconnected without de-energizing adjacent units.

Add new clause

8.2.12.6

Plug-in units shall be provided with self-aligning stab construction to ensure positive electrical and mechanical contact to the bus under all load and rated fault conditions.

Add new clause

8.2.12.7

A vertical section future space allowance of 305 mm (12 in) or larger shall be provided with the necessary hardware to allow for installation of a removable unit (e.g. guide, support or barrier) and to isolate units from each other.

Add new clause

8.2.12.8

Supports and barriers for draw-out and fixed removable units shall be designed to be removed or added in the field without special tools.

Add new clause

8.2.12.9

Withdrawable units shall be equipped with a mechanical interlock that prevents drawing the device out in a single motion.

8.2.13 Internal wiring

8.2.13.1

Delete second sentence

Add new clause

8.2.13.1.1

The internal motor control center wiring shall be soft or annealed copper wire with 600 V flame-retardant insulation rated not less than 90 °C.

Add new clause

8.2.13.1.2

The internal motor control center wiring shall be stranded in accordance with ASTM B8 with Class D stranding for wires that cross hinged joints and Class C stranding or finer for all other wires.

Add new clause

8.2.13.1.3

The minimum size for control wiring internal to the motor control center shall be 1.3 mm² (No.16 AWG).

Add new clause

8.2.13.1.4

Terminal blocks for termination of field run control conductors shall accept at minimum two conductors sized 2.1 mm² (No. 14 AWG) each.

8.2.13.4

Replace clause with

Internal wiring shall be installed in a single continuous piece from termination point to termination point, and free of splices and taps.

Add new clause

8.2.13.17

Circuit wiring shall be NEMA Class II, Type B.

Add new clause

8.2.13.18

Terminal strips located in individual units shall be provided with a minimum of 20 % spare control terminal blocks (provided it does not increase the size of the unit) and guarded, touch-safe type.

Add new clause**8.2.13.19 Wire marking****8.2.13.19.1**

Internal wiring shall be identified at both ends within 25.4 mm (1 in) of the termination, using one of the following:

- a) machine-printed 360° slip-on wire markers;
- b) heat-shrink wire markers;
- c) permanent stenciling per wire with a unique tag or wire number.

8.2.13.19.2

Adhesive wrap around or clip-on type wire markers shall not be used for identification.

Add new clause**8.2.13.20 Unit door wiring****8.2.13.20.1**

Wiring connected to unit doors shall operate at 120 Vac (nominal) or less.

8.2.13.20.2

Wiring across hinged panels and doors shall be bundled with wraps to protect conductors from damage caused by abrasion or pinching.

8.2.13.20.3

Terminals shall be touch-safe or covered by an insulating barrier to protect from incidental contact.

Add new clause**8.2.13.21**

Accessories (e.g. terminal strips) shall not be installed in wireways unless integral to the draw out design of the motor control center unit.

Add new clause**8.2.13.22 Current transformers for incoming protection and metering****8.2.13.22.1**

Current transformer secondary circuit wiring shall be terminated with insulated, compression-ring-type lugs.

8.2.13.22.2

Current transformer secondary circuit wiring shall be wired directly to short-circuiting-type terminal blocks.

8.2.13.22.3

Current transformer circuit grounding shall have green insulation and be marked "CT GROUND" or with the grounding symbol (see IEC 60417, symbol 5019) at the terminal block and at the ground bus termination point.

8.2.13.22.4

One direct ground connection shall be made from the current transformer short-circuiting terminal block to the ground bus without any intermediate terminations or splices.

8.2.15 Control circuit transformer protection**8.2.15.5**

Delete Clause 8.2.15.5

8.2.16 Field-wiring terminals**8.2.16.1**

Replace first sentence with

Units shall be provided with pull-apart terminal blocks (one terminal for each conductor) to terminate field control wiring.

Add new clause

8.2.16.9

The motor control center assembly shall be provided with insulating barriers between each phase at the incoming supply connection point (i.e. phase barriers if exposed bus, fuses or lugs are present).

Add new clause

8.2.16.10

The motor control center assembly shall be provided with insulating barriers to protect the incoming supply (including line side of any overcurrent protective device) against incidental contact.

Add new clause

8.2.16.11

The motor control center assembly shall be arranged to allow for incoming supply conductors to be tested for voltage without removal of insulation barriers or guards (e.g. holes for test probes).

8.2.29 Wiring space

8.2.29.3 Clear wiring space

Add new clause

8.2.29.3.8 Vertical wireways

8.2.29.3.8.1

Vertical wireways shall be full-height, full-depth (space within the motor control center assembly occupied by units) and isolated from all power buses.

8.2.29.3.8.2

Vertical wireways shall have a minimum width of 100 mm (4 in) nominal.

8.2.29.3.8.3

Vertical wireways shall be isolated from the unit by a metal barrier except for openings necessary for wire passage between the wireway and the unit.

Add new clause

8.2.29.3.9 Horizontal wireways

8.2.29.3.9.1

Horizontal wireways shall be isolated from all power buses using one or more barriers.

8.2.29.3.9.2

Horizontal wireways shall be continuous across the top and bottom locations for each section.

8.2.29.3.9.3

Horizontal wireways shall have a minimum height of 150 mm (6 in) nominal.

8.2.32 Transformer secondary grounding

8.2.32.1

Replace clause with

Control power transformers shall have one secondary terminal grounded.

8.2.34 Ground bus

8.2.34.1 Horizontal ground bus

Replace clause with

8.2.34.1.1

Motor control centers shall include a tin-plated copper horizontal ground bus.

8.2.34.1.2

The horizontal ground bus shall be sized in accordance with Table 24 and Table 25 with a minimum rating of 300 A.

8.2.34.1.3

The horizontal ground bus shall be uniform and continuous across the entire length of the motor control center with the exception of shipping splits.

8.2.34.1.4

The horizontal ground bus shall be pre-drilled for outgoing equipment grounding conductors at each end section and equipped with NEMA 2-hole 107 mm² (4/0 AWG) lugs.

8.2.34.1.5

The horizontal ground bus shall extend to the incoming line section and be supplied with a suitable NEMA 2-hole compression-type lugs.

Add new clause

8.2.34.7

Each individual motor control center section shall include a tin-plated copper vertical ground bus with a minimum rating of 300 A.

Add new clause

8.2.34.8

Each motor control center section vertical ground bus shall be mechanically connected to the horizontal ground bus, forming a complete internal grounding system.

Add new clause

8.2.35 Incoming line section**8.2.35.1**

When a main circuit breaker is specified, the requirements given in Clauses 8.2.35.1.1 through 8.2.35.1.3 shall apply.

8.2.35.1.1

The main circuit breaker shall be accessible from the front of the unit with removable protective barriers or insulating guards on the line side terminations.

8.2.35.1.2

The main circuit breaker shall be operable with the enclosure door closed.

8.2.35.1.3

The breaker position status (closed, open, tripped) shall be visible with the enclosure door closed or open.

8.2.35.2

If "main lugs only" (MLO) is specified, the incoming section shall be provided with NEMA 2-hole, compression-type lugs sized for the specified incoming cables.

8.2.35.3

If "main lugs only" (MLO) are specified, the incoming section shall be provided with supports for the incoming cables to prevent mechanical stress on the busbars.

8.2.35.4

When cable bus or bus duct is specified for the incoming line section, the necessary components for the motor control center to accept the cable bus or bus duct shall be provided.

8.2.35.5

If incoming line metering is specified, a microprocessor-based metering package that includes phase voltage, phase current, kVA, kW, power factor and communications capability shall be provided.

Add new clause

8.2.36 Non-motor loads**8.2.36.1**

Contactors provided for non-motor loads shall be sized/rated for the specific application (e.g. switching of capacitors, transformers, lighting) as indicated on the project drawings.

8.2.36.2

For lighting contactor, process heating and similar applications, units shall be provided with two spare normally open and normally closed auxiliary contacts wired to terminal blocks.

8.2.36.3

Lighting contactor units shall have door-mounted hand-off-auto (HOA) switch and on/off status light indicators with the capability of being remotely controlled from a photoelectric cell or other devices indicated on the project drawings.

Add new clause

8.2.37 Integral adjustable speed drives and soft starters**8.2.37.1**

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

8.2.37.2

The programmer or operator interface shall display speed, current, voltage, alarms and shutdowns.

8.2.37.3

Adjustable speed drives and soft starter terminals that interface with field wiring shall be wired to customer terminal blocks.

8.2.37.4

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

8.2.37.5

If status indicator lights are specified for motor controller units, adjustable speed drives and soft starter units shall be provided with lights in accordance with Clause 8.2.41.1.

8.2.37.6

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

Add new clause

8.2.38 Integral power distribution panels (panelboards)**8.2.38.1**

If low voltage distribution panels are provided, they shall meet the requirements of UL 67.

8.2.38.2

Low-voltage distribution panels shall be provided with thermal magnetic, bolt-on type branch circuit breakers equipped with a means to be individually locked out in the "OFF" position.

8.2.38.3

Low-voltage distribution panels shall be provided with a circuit directory.

Add new clause

8.2.39 Integral distribution transformers**8.2.39.1**

Transformers shall be dry type with an insulation system temperature of 130 °C and a maximum allowable hot spot winding temperature rise of 90 °C.

8.2.39.2

Transformers shall be provided with a K4 minimum rating.

8.2.39.3

Transformers shall be provided with four 2.5 % full capacity taps on the high voltage winding with two above and two below rated voltage.

8.2.39.4

Transformers primary circuit protection shall be provided by a feeder-tap unit within the motor control center.

8.2.39.5

Transformers shall be provided with a thermal-magnetic molded case circuit breaker in the panelboard for secondary protection.

Add new clause

8.2.40 Motor control center vertical section space heaters**8.2.40.1 Moisture condensation control**

If space heaters are specified, they shall provide moisture condensation control within each vertical section of the motor control center in accordance with the requirements given in Clauses 8.2.40.1.1 through 8.2.40.1.4.

8.2.40.1.1

Space heaters shall be wired to an accessible terminal block provided for connection to an external power source.

8.2.40.1.2

Space heaters shall be guarded by an expanded metal cage to prevent burns due to incidental contact.

8.2.40.1.3

Space heaters shall be operated at 120 Vac.

8.2.40.1.4

Space heaters shall be sized to provide a 5 K temperature rise to prevent condensation.

8.2.40.2

If thermostat control is specified for space heaters, a control unit shall be provided in accordance with the requirements given in Clauses 8.2.40.2.1 through 8.2.40.2.5.

8.2.40.2.1

The control unit supply disconnect shall be a circuit breaker equipped with a means to lockout.

8.2.40.2.2

The control unit shall have a control circuit that includes a momentary push button that energizes the heaters by bypassing the thermostat to verify the proper operation of the heaters.

8.2.40.2.3

The control unit shall be provided with an ammeter.

8.2.40.2.4

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

8.2.40.2.5

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

Add new clause

8.2.41 Motor control center data communications**8.2.41.1**

If motor control center data communications are required, devices intended to be monitored shall be compatible with the specified communication protocol or combination of protocols.

8.2.41.2

Communication network cable connections made in wireways shall have a mechanical means (e.g. screw-type connectors, RJ-45 connectors) to prevent unintended separation.

8.2.41.3

Communication cabling shall be rated for 600 Vac.

Add new clause

8.2.42 Motor control center indication and control**8.2.42.1**

Add new clause

If status indicator lights are specified, they shall be provided in accordance with the requirements given in Clauses 8.2.42.1.1 through 8.2.42.1.3.

8.2.42.1.1

Status indicator lights shall be installed on the unit door or be visible with the door closed.

8.2.42.1.2

Status indicator light colors shall be red (running), green (stopped) and amber (tripped).

8.2.42.1.3

Status indicator lights shall be LED type with a minimum illumination life of 100 000 h.

8.2.42.2

Push buttons, selector switches and other door-mounted devices shall be oil tight and have a heavy-duty rating as defined in NEMA ICS 5.

8.2.42.3

Control relay output contacts or other auxiliary (interposing) control-circuit device contacts for field wiring to external equipment shall have a contact ampacity performance rating suitable for the intended switching application in accordance with NEMA ICS 5.

Add new clause

8.2.43 Motor control center condition-based monitoring

If continuous thermal monitoring is specified, it shall be provided in accordance with the requirements given in Clauses 8.2.43.1 through 8.2.43.4.

8.2.43.1

Motor control center assemblies shall be equipped with factory integrated continuous thermal monitoring technology.

8.2.43.2

Thermal monitoring shall provide hotspot detection sensors for main incoming section (main circuit breaker or lug) and other areas of concern, such as individual units or shipping split connections.

8.2.43.3

The continuous thermal monitoring system shall include a fault relay dry contact output and communications (status and alarming).

9 Motor control center tests**9.22 Factory tests**

Add new clause

9.22.1

After completion of the motor control center assembly and the wiring of each unit, the motor control center shall be functionally tested prior to shipping preparations.

Add new clause

9.22.2

Functional testing of the completed motor control center shall include the following:

- a) operation of unit contactor;
- b) unit electrical and mechanical interlocks;
- c) all control devices that are hard wired and/or communicating over a network to a system controller and, if applicable, local human machine interface (HMI);
- d) protective relay and metering;
- e) indicator lights;

- f) unit draw out and mechanical insertions, including operation of any retractable stabs and shutters;
- g) vertical section space heaters and thermostat, if applicable;
- h) continuous thermal monitoring system, if applicable;
- i) auxiliary equipment (e.g. interposing relay panel, mimic panel) provided with the motor control center as part of the system design.

Public Review Draft

TABLES

Add new Table 46

Table 46
Rating for motor space heaters

(Clause 8.2.11.22)

Motor horsepower	Space heater rating (W)
0.5 – 5	45
7.5 – 20	60
25 – 50	120
60 – 100	240
125 – 250	350

In Annex C heading, add title

Annex C (Normative)

Normative references

Add items 31 to 38 to table

Item	United States	Canada	Mexico
31	46 CFR 111, Title 46 – Shipping, Chapter I - Department of Coast Guard, Subchapter J - Electrical Engineering, Part 111 - Electrical Systems - General Requirements	NA	NA
32	ABS MODU, Publication Number 6 Part 4, Rules for Building and Classing Mobile Offshore Drilling Units - Part 4 Machinery and Systems	NA	NA
33	ASCE/SEI 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures	ASCE/SEI 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures	ASCE/SEI 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures
34	IEC 61850 (all parts), Communication networks and systems for power utility automation	IEC 61850 (all parts), Communication networks and systems for power utility automation	IEC 61850 (all parts), Communication networks and systems for power utility automation
35	IEEE C37.20.7:2017, Guide for Testing Metal-Enclosed Switchgear Rated Up to 52 kV for Internal Arcing Faults	IEEE C37.20.7 - 2017, Guide for Testing Metal-Enclosed Switchgear Rated Up to 52 kV for Internal Arcing Faults	IEEE C37.20.7 - 2017, Guide for Testing Metal-Enclosed Switchgear Rated Up to 52 kV for Internal Arcing Faults
36	NEMA ICS 5, Industrial Control and Systems: Control-Circuit and Pilot Devices	NEMA ICS 5, Industrial Control and Systems: Control-Circuit and Pilot Devices	NEMA ICS 5, Industrial Control and Systems: Control-Circuit and Pilot Devices
37	UL 67, Panelboards	CSA C22.2 No. 29, Panelboards and Enclosed Panelboards	NMX-J-118-1-ANCE, Panelboards
38	UL 1436, Outlet Circuit Testers and Similar Indicating Devices	CSA-C22.2 No. 160, Voltage and Polarity Testers	UL 1436, Outlet Circuit Testers and Similar Indicating Devices

In Annex F heading, replace "Informative" with "Normative" and add title

Annex F (Normative)

Factory tests

F.1

Delete second paragraph ("As an alternative, ...")

Public Review Draft

In Annex H heading, replace "Informative" with "Normative"

Annex H (Informative)

Application information

H.5 Service and storage conditions

H.5.2 Storage temperature

Replace last sentence with

If energizing assembly space heaters for temporary storage is specified, an easily accessible (temporary if required) connection point shall be provided for each shipping split.

Add new clause

H.5.3

If energizing assembly space heaters for temporary storage is specified, the connection point shall be accessible without uncrating or unpacking the motor control center.

Add new clause

H.5.4

If energizing assembly space heaters for temporary storage is specified, the connection point shall be labelled as "TEMPORARY SPACE HEATER CONNECTION POINT" including the voltage and current requirements.

Add Bibliography

Bibliography

The following documents are informatively cited in the text of this specification, the PDS (IOGP S-732D) or the IRS (IOGP S-732L).

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

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

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*

API Recommended Practice 14FZ, *Recommended Practice for Design, Installation, and Maintenance of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1, and Zone 2 Locations*

IEC 62402, *Obsolescence management*

IEC 62439-3, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)*

ISO/IEC Directives, Part 2, *Principles and rules for the structure and drafting of ISO and IEC documents*

ISO 9001:2015, *Quality management systems — Requirements*

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

NFPA 70E, *Standard for Electrical Safety in the Workplace*



New Draft