

Supplementary Specification to IEC 61800-2 Low Voltage AC Drives

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 2014).

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Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of low voltage AC drives in accordance with IEC 61800-2, Edition 3, Adjustable speed electrical power drive systems – Part 2: General requirements – Rating specifications for adjustable speed AC power drive systems, 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-736: Supplementary Specification to IEC 61800-2 Low Voltage AC Drives

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to IEC 61800-2, following the IEC 61800-2 clause structure. Clauses from IEC 61800-2 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to IEC 61800-2 defined in this specification are identified as Add (add to clause or add new clause), Replace (part of or entire clause) or Delete.

IOGP S-736D: Data Sheet for Low Voltage AC Drives (IEC)

The data sheet defines application specific requirements, attributes and options specified by the customer for the supply of equipment to the technical specification. The data sheet may also include fields for manufacturer provided information attributes subject to customer's technical evaluation. Additional customer 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-736Q: Quality Requirements for Low Voltage AC Drives (IEC)

The QRS defines quality management system requirements and the proposed extent of customer conformity assessment activities for the scope of supply. Customer 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 customer in the data sheet or in the purchase order.

IOGP S-736L: Information Requirements for Low Voltage AC Drives (IEC)

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the manufacturer. 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 61800-2 and is in accordance with ISO/IEC Directives, Part 2 as appropriate.

The data sheet and IRS are published as editable documents for the customer 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) customer defined requirements (data sheet, QRS, IRS);
- d) this specification;
- e) IEC 61800-2.

1 Scope

Replace second paragraph with

This specification amends and supplements IEC 61800-2 and associated parts of IEC 61800 referenced in IEC 61800-2 for the design, manufacture and testing of:

- AC drive systems connected to 50 Hz or 60 Hz input voltages;
- AC drive systems with only low voltage BDMs (basic drive modules) with input and output line-to-line voltages up to and including 1 kV AC;
- AC drive systems with a low voltage BDM provided with either an input step-down transformer and/or an output step-up transformer integrated into a CDM (complete drive module) in accordance with Table 5.

Delete NOTE 1

Replace third paragraph with

This specification defines BDM/CDM criteria and properties with a focus on the following items:

- principal parts topology and classification of the BDM/CDM;
- ratings, performance and functionality;
- specifications for the environment in which the BDM/CDM is intended to be installed and operated;
- other specifications which might be applicable when specifying a complete BDM/CDM.

Delete fourth paragraph

Replace fifth paragraph with

This standard provides a non-exhaustive list from which minimum requirements can be used for the development of a specification between customer and manufacturer based on the application requirements. This same non-exhaustive list can be used by a manufacturer to determine the minimum requirements for a commoditised BDM/CDM without customer interaction based on the specified application of that BDM/CDM.

Replace sixth paragraph with

For some aspects which are covered by specific BDM/CDM product standards in the IEC 61800 series, this document provides a short introduction and reference to detailed requirements in these product standards.

In seventh paragraph, add to list

- explosion protection safety requirements covered by IEC 60079 series related to BDM/CDMs feeding motors located in potentially explosive atmospheres;
- IEC TS 60034-25.

Add to subclause

This specification applies to BDMs operating with low voltage at input and output terminals.

Add new subclause

1.1 Low voltage AC drives included in scope

This specification covers air cooled BDMs/CDMs located:

- in a non-hazardous area feeding motors located in a non-hazardous area;
- in a non-hazardous area feeding motors located in a hazardous area;
- indoors, either wall mounted or free standing;
- indoors, for integration in a switchgear/control gear assembly by others;
- indoors, for integration in a switchgear/control gear assembly by BDM/CDM supplier;
- outdoors, within a weatherproof enclosure;
- either onshore or offshore.

Add new subclause

1.2 Low voltage AC drives excluded from scope

The following power drive systems are excluded from the scope of this specification:

- low voltage AC drives for traction applications and electric vehicles;
- AC power drive systems with BDM input/output voltage above 1 000 V AC;
- low voltage adjustable speed DC power drive systems;
- BDMs/CDMs installed in a potentially explosive atmosphere.

The following components of the PDS which are not part of the BDM/CDM are outside the scope of this specification:

- low voltage switchgear (the upstream switching device protection and bypass);
- high voltage switchgear;
- supply transformer;
- low voltage AC motor;
- high voltage AC motor;
- oil cooled BDMs/CDMs.

Add new subclause

1.3 Extended use of this specification

This specification may be used for the procurement of low voltage AC drives which are not detailed in this specification, such as:

- drives with DC input voltage up to 1.5 kV;

- drives with current source converters;
- drives with water cooling;
- drives with input and output transformers which are external to an integrated CDM.

2 Normative references

Delete from clause

IEC 60721-3-1:1997, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-2:1997, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and Handling*

IEC 60721-3-3:1994, IEC 60721-3-3:1994/AMD1:1995, IEC 60721-3-3:1994/AMD2:1996, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weather protected locations*

IEC 60721-3-4:1995, IEC 60721-3-4:1995/AMD1:1996, *Classification of environmental conditions – Part 3-4: Classification of groups of environmental parameters and their severities – Stationary use at non-weather protected locations*

IEC 61800-5-1:2007, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC 61800-5-2:2007, *Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional*

Add to clause

IEC 60721-3-1:2018, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-2:2018, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and Handling*

IEC 60721-3-3:2019, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weather protected locations*

IEC 60721-3-4:2019, *Classification of environmental conditions – Part 3-4: Classification of groups of environmental parameters and their severities – Stationary use at non-weather protected locations*

IEC 61800-5-1:2016, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC 61800-5-2:2016, *Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional*

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

IEC TS 60034-25, *AC Electrical machines used in power drive systems - Application guide*

3 Terms and definitions

Table 5 – Basic classification of PDS by voltage

Replace Table 5 with

CDM voltage ratings				Classification of <i>PDS</i> by voltage
Input U_{LN}	BDM voltage ratings		Output U_{AN1}	
	Input U_{VN}	Output U_{aN1}		
low-voltage	low-voltage	low-voltage	low-voltage	low-voltage
low-voltage	low-voltage	low-voltage	high-voltage	high-voltage
high-voltage	low-voltage	low-voltage	low-voltage	high-voltage
high-voltage	low-voltage	low-voltage	high-voltage	high-voltage

Add new term

3.98

safety device

device intended for use inside or outside explosive atmosphere but required for or contributing to the safe functioning of Ex equipment and protective systems with respect to the risks of explosion

Note 1 to entry: Safety devices differ from the term devices used in the IEC 61508 and IEC 61511 series. Safety devices can be compared to the terms like "safety-related system (IEC 61508)" or "safety instrumented system (IEC 61511)".

[SOURCE: IEC TS 60079-42, 3.1]

Add new term

3.99

Ex equipment under control

EEUC

safety device controlled Ex equipment which contains a potential ignition source

[SOURCE: IEC TS 60079-42, 3.2, updated]

Add new term

3.100

cabinet

free-standing and self-supporting enclosure for housing electronic and/or electrical equipment, usually fitted with doors and/or side panels which may or may not be removable

[SOURCE: IEC 60917-1, 3.15, modified - Figure 4 has been deleted.]

Add new term

3.101

kinetic buffering

software function that can be used to buffer transient line failures (up to approximately one second or as long as the drive continues to turn)

Note 1 to entry: Kinetic buffering can usually only be used on drives that are primarily used in the motoring mode where the driven machine has a sufficiently high rotating mass, i.e. has sufficient kinetic energy.

Note 2 to entry: When the line supply fails, the KIP function causes the motor to either operate under no-load or go slightly into the regenerative mode (in order to cover the low losses of the motor and inverter).

Note 3 to entry: The drive immediately goes into the motoring mode once the line supply returns.

Note 4 to entry: In order to use kinetic buffering, the technological conditions must allow the motor to coast down or brake for the duration of the line supply failure.

Add new term

3.102

safety integrity level

SIL

discrete level (one out of a possible three) for specifying the safety integrity requirements of a safety sub-function allocated (in whole or in part) to a PDS(SR)

Note 1 to entry: SIL 3 has the highest level of safety integrity and SIL 1 has the lowest.

Note 2 to entry: SIL 4 is not considered in this standard as it is not relevant to the risk reduction requirements normally associated with PDS(SR)s. For requirements applicable to SIL 4, see IEC 61508.

[SOURCE: IEC 61800-5-2:2016, 3.25, modified - Notes 3 and 4 to entry have been deleted]

Add new term

3.103

notified body

organization designated by a European Union country to assess the conformity of equipment for use in potentially explosive atmospheres before being placed on the market

Note 1 to entry: These bodies carry out tasks related to conformity assessment procedures set out in the applicable legislation when a third party is required.

Note 2 to entry: The European Commission publishes a list of such notified bodies.

Note 3 to entry: Notified bodies can certify to European Directive 2014/34/EU.

Add new term

3.104

certification body

organization having successfully completed the IECEx assessment process and approved to operate within the IECEx Certified Equipment Scheme

4 Guidance for specification of BDM/CDM/PDS and methodologies for compliance

4.2 Methodology for compliance

4.2.1 Agreement between customer and manufacturer

In second paragraph, replace "it is the responsibility of the manufacturer to:" with

it shall be the responsibility of the manufacturer to:

5 Performance and functionality criteria

5.2 BDM/CDM/PDS characteristics and topology

5.2.3 Basic topology for BDM/CDM/PDS's

Add to first paragraph

BDMs shall have voltage source converter topology with inverters utilizing pulse width modulation.

Replace fourth paragraph with

The DC link connection shall be designed and protected to prevent a low power CDM from feeding a high power CDM.

5.2.4 Cooling Topology

5.2.4.1 General

Replace first paragraph with

Cooling topology shall be air-cooling.

Delete second paragraph

5.3 Ratings

5.3.2 Input ratings

5.3.2.2 Input voltage and input frequency

Replace first paragraph with

Selection of a BDM/CDM/PDS shall be verified based on the specified ratings of the BDM/CDM/PDS input voltage and input frequency.

Add to subclause

BDMs/CDMs shall be rated for continuous operation over the specified input voltage range with a deviation of $\pm 10\%$.

Add to subclause

BDMs/CDMs shall be rated for continuous operation for the specified input frequency with a deviation of $\pm 5\%$.

5.3.2.3 Input current

In first paragraph, replace "should" with

shall

5.3.2.4 Short Circuit Protective Devices (SCPD)

Replace first paragraph with

Short circuit protection of BDMs/CDMs output shall be in accordance with IEC 61800-5-1, 5.2.3.6.5.

5.3.3 Output ratings

5.3.3.1 BDM/CDM continuous operation

Replace first paragraph with

BDMs/CDMs shall be continuously rated at the specified site conditions to supply the specified motor duty in terms of:

- fundamental AC voltage (U_{aN1}/U_{AN1});
- rated output current (I_{aN}/I_{AN});
- output frequency range;
- rated maximum apparent output power (S_{aN}/S_{AN}) [kVA] or maximum output active power (P_{aN}/P_{AN}) [kW].

5.3.3.2 PDS continuous output

In first paragraph, replace "should" with

shall

5.3.3.3 Overcurrent and torque capability

In second paragraph, replace "should" with

shall

In fourth paragraph, replace "should" with

shall

In fifth paragraph, replace "should" with

shall

5.3.4 Operating quadrants

5.3.4.1 General

In first sentence, replace "should" with

shall

Add to subclause

~~BDMs/CDMs shall operate only in quadrant 1.~~

5.3.6 Special ratings related to BDM/CDM/PDS or motor

5.3.6.2 Transformers and reactors

5.3.6.2.1 General

Replace second paragraph with

The transformer rating shall be greater than the continuous input rating and overload rating of the BDM/CDM.

Replace fifth paragraph with

Transformers shall comply with IEC 60076 series and IEC 61378 series.

5.3.6.2.2 Transformers used in power conversion path

Replace second paragraph with

Transformers located within indoor BDMs/CDMs shall be dry-type.

5.3.6.3 Motor

5.3.6.3.4 Mechanical system integration requirements

5.3.6.3.4.1 Protection against destructive shaft voltages or bearing currents

Replace third paragraph with

BDMs/CDMs shall be designed with line filters based on the inverter topology, particularly in the case of PWM voltage source inverters by means of:

- common mode filters;
- dv/dt limitation; or
- a sinusoidal filter.

5.4 Performance

5.4.1 Operational

5.4.1.1

Replace subclause with

BDMs/CDMs shall incorporate the following features:

- timed acceleration/ deceleration;
- reversing;
- line filtering;
- input/output data processing (analog/digital);
- automatic restart;

- flying restart.

5.4.1.4 Dynamic braking

5.4.1.4.1 Resistive braking

5.4.1.4.1.2 Resistive braking (stop)

In subclause a), replace "should" with

shall

In subclause b), replace "should" with

shall

5.4.1.4.1.3 Resistive braking (slowdown)

In subclause a), replace "should" with

shall

In subclause b), replace "should" with

shall

In subclause c), replace "should" with

shall

5.4.1.5 Other performance requirements

5.4.1.5.1 Application requirements

Add to subclause

PDS shall operate only in quadrant 1.

Add new subclause

5.4.1.5.4 Performance during voltage deviations, dips and short interruptions

5.4.1.5.4.1

BDMs/CDMs shall be provided with user selectable kinetic buffering, flying restart and automatic restart functionality.

5.4.1.5.4.2

BDMs/CDMs shall be immune for voltage dips with 80 % voltage remaining for a period of 5 seconds with performance (acceptance) criterion A.

5.4.1.5.4.3

BDMs/CDMs and essential auxiliaries shall be provided with a user selectable automatic restart facility designed to restart the system in the event of a voltage dip greater than 20 % for a duration of less than 5 seconds.

5.4.1.5.4.4

The converter shall be designed to synchronize onto a rotating motor upon restart and develop rated acceleration torque within 10 seconds.

Add new subclause

5.4.1.5.5 Loss of process control signal

A programmable option shall be provided to determine the required output condition if the process control signal is lost.

5.4.2 Fault supervision

5.4.2.1 General

Replace "should" with

shall

Replace "may" with

shall

5.4.2.2 BDM/CDM/PDS protection interface

In first paragraph, replace "should" with

shall

Add to subclause

The fault diagnostic and monitoring logic shall be time logged and equipped with a memory function to retain information regarding the cause of tripping of the BDM/CDM.

Add to subclause

BDMs/CDMs shall have protection functions for motor side earth fault detection.

Add to subclause

BDMs/CDMs shall have provision for a PTC thermistor input.

5.4.3 Minimum status indication required

Replace "should" with

shall

5.4.4 I/O devices

5.4.4.1 General

In first paragraph, replace "should" with

shall

5.4.4.2 Process control interface/port

5.4.4.2.1 General

Replace "should" with

shall

5.4.4.2.2 Analog input

Replace "may" with

shall

Add to subclause

BDMs/CDMs shall be controlled by a 4 mA to 20 mA current loop input.

Add to subclause

BDMs/CDMs shall be provided with two analog inputs for accepting 0 V to +10 V and 0 mA to 20 mA or 4 mA to 20 mA input signals.

5.4.4.2.6 Communication interface/ports

Add to subclause

BDMs/CDMs shall be provided with one or more interface ports for communicating over the following protocols:

- PROFINET;
- PROFIBUS;
- EtherNet/IP;
- Modbus TCP;
- Modbus RTU.

5.5 General safety

Replace subclause with

BDM/CDM general safety requirements shall be in accordance with IEC 61800-5-1.

5.6 Functional safety

Replace fourth paragraph with

BDM/CDM functional safety requirements shall be in accordance with IEC 61800-5-2.

Add to subclause

The process to start and stop the drive shall be based on hardwired or buswired connections.

Add to subclause

BDM/CDM stop functionality shall be achieved using the functional safety stopping function safe torque off (STO) in accordance with IEC 61800-5-2.

Add to subclause

BDMs/CDMs shall be provided with SIL 3 rated safe torque off function in accordance with IEC 61800-5-2.

5.7 EMC

Add to subclause

Category C2 shall be provided for BDMs/CDMs used in the first environment in accordance with IEC 61800-3.

Add to subclause

Category C3 shall be provided for BDMs/CDMs used in the second environment in accordance with IEC 61800-3.

Add to subclause

Category C4 shall be provided for high voltage and high current rating PDS in the second environment in accordance with the criteria defined in IEC 61800-3, 6.5.1.

5.8 Ecodesign

5.8.2 Energy efficiency and power losses

Add to subclause

BDMs/CDMs shall have an efficiency class of IE2 or higher in accordance with IEC 61800-9-2.

5.9 Environmental condition for service, transport and storage

5.9.1 General

In first sentence of first paragraph, replace "should" with

shall

In second paragraph, replace "should" with

shall

5.9.2 Operation

5.9.2.1 Climatic conditions

5.9.2.1.1 General

Replace first paragraph with

BDMs/CDMs shall be rated for the specified environmental conditions in accordance with Table 12.

In Table 12, replace heading row and following rows

Table 12 – Environmental service conditions

Condition	Indoor conditioned IEC 60721-3-3:2019	Indoor unconditioned IEC 60721-3-3:2019	Outdoor unconditioned IEC 60721-3-4:2019
Climatic	Class 3K21 (Temperature: 15 °C to 30 °C) (Humidity: 10 % R.H to 75 % R.H./ non-condensing)	Class 3K22 (Temperature: 5 °C to 40 °C) (Humidity: 5 % R.H to 85 % R.H. / non-condensing)	Class 4K26 (Temperature: –20 °C to 55 °C) (Humidity: 4 % R.H to 100 % R.H. / condensing) Rain, snow and hail are permitted.
Chemically active substances	Class 3C1 (No salt mist)	Class 3C1 (No salt mist)	Class 4C5 (Salt mist) ^a
Mechanically active substances	Class 3S5 (No requirement)	Class 3S5 (No requirement)	Class 4S13 (Dust and sand)
Mechanical	Class 3M10 (Vibration: Table) (Shock: Table)	Class 3M10 (Vibration: Table) (Shock: Table)	Class 4M11 (Vibration: Table) (Shock: Table)

In second paragraph, replace "should" with

shall

Replace third paragraph with

The BDM/CDM IP rating shall be in accordance with IEC 60529 for the following:

- IP2X or higher for BDMs installed indoor inside switchgear or a cabinet;
- IP31 or higher for BDMs installed indoor free standing or wall mounted;
- IP55 or higher for BDMs/CDMs installed outdoor within a cabinet.

Add to subclause

BDMs/CDMs shall be provided for an indoor unconditioned type of environment in accordance with Table 12.

5.9.2.2 Mechanical installation service conditions and requirements

5.9.2.2.2 Fixed installations

Table 14 – Environmental vibration limits for fixed installation

Replace Table 14 with

IEC 60721-3-3: 2019 and IEC 60721-3-4:2019 3M10 and 4M11		
Frequency Hz	Amplitude mm	Acceleration m/s ²
$9 \leq f < 200$	n.a	1
NOTE The frequency range 2 Hz to 9 Hz covers earthquake, but not covered by this standard. Earthquake can be specified. IEC 60721-2-6 provides more details.		

Table 16 – Environmental shock limits for fixed installation

Replace Table 16 with

Shock	IEC 60721-3-3:2019 and IEC 60721-3-4:2019 3M10 and 4M11
Peak acceleration	40 m/s ²
Duration	22 ms

5.9.2.5 Sonic pressure and sound level

Add to subclause

The sound pressure level at one metre from the surface of the BDMS/CDMs operated within the operating load and frequency range shall not exceed:

- 70 dBA for 250 kW and lower rating;
- 75 dBA for above 250 kW rating.

5.9.3 Storage and transport of equipment

5.9.3.1 Climatic conditions

Table 17 – Storage and transport limits

In Table 17, replace following rows

	Storage according to IEC 60721-3-1:2018 in product packaging up to 6 months	Transport according to IEC 60721-3-2:2018 in shipping packaging for more than 6 months
Climatic class	1K22	2K12
Relative air humidity ^d	1K23 (5 % R.H to 95 % R.H.)	2K14 (5 % R.H to 95 % R.H.)
Vibration	1M12	2M6

5.9.4 Mechanical conditions

Replace first paragraph with

Equipment shall be transported in the product packaging and shipping packaging within the limits of IEC 60721-3-2, class 2M4.

Table 19 – Transportation limits of free fall

In Table 19, replace heading row with

Shipping weight with packaging kg	Random free-fall drop height mm		Number of falls
	IEC 60721-3-2:2018 (2M4)		
	With <i>product packaging</i>	With <i>shipping packaging</i>	

Add to subclause

Components or assemblies with a weight greater than 25 kg shall be supplied with lifting attachments.

5.9.5 Specific storage hazards

In subclause d), replace "class 1K3 of IEC 60271-3-1" with

class 1K23 of IEC 60721-3-1

5.14 Explosive environment

Add to subclause

BDM/CDM feeding motors located in potentially explosive atmospheres shall have safety devices supported with an equipment certificate issued by a notified body or certification body.

Add to subclause

Safety devices provided for Ex equipment under control shall be in accordance with IEC TS 60079-42.

Add new subclause

5.16 BDM/CDM cabinet

5.16.1 Cabinet

5.16.1.1

Accessible live parts within the BDM/CDM cabinets shall have a degree of protection of at least IP2X.

5.16.1.2

The internal arc classification (IAC) for BDMs/CDMs integrated within a cabinet shall be in accordance with the requirements of IEC TR 61641 and the arcing class specified.

5.16.1.3

For a supply short circuit current rating exceeding 20 kA, the internal arc classification shall be class B.

5.16.1.4

For a supply short circuit current rating of 20 kA and lower, the internal arc classification shall be class A.

5.16.2 Accessibility

5.16.2.1

Each cabinet compartment shall be separately accessible from the front via padlockable hinged doors.

5.16.2.2

The ferrous parts of cabinets shall be provided in accordance with IEC 61439-1:

- severity test A for indoor installations;
- severity test B for outdoor installations.

Add new subclause

5.17 Cable terminations

For BDMs/CDMs with cabinets, the undrilled gland plates for single core cables shall be of a non-ferrous (non-magnetic) material.

6 Test

6.6 Test specifications

6.6.3 Static performance and rating test

6.6.3.7 Additional tests for special rating

6.6.3.7.7 Checking properties under unusual service conditions

In first sentence of first paragraph, replace "may" with

shall

In second paragraph, replace "might" with

shall

6.6.3.8 Additional test (effect on motor) for special rating

6.6.3.8.3 Sonic pressure and sound level

In first paragraph, replace "may" with

shall

In first paragraph, replace "should" with

shall

6.6.3.10 Dynamic performance and rating

6.6.3.10.1 General

Replace "should" with

shall

7 Information and marking requirements

7.2 Marking on product

In first paragraph, replace "should" with

shall

In second paragraph, replace "should" with

shall

In third paragraph, replace "should" with

shall

7.3 Information to be supplied with the PDS or BDM/CDM

In first paragraph, replace "should" with

shall

In second paragraph, replace "should" with

shall

In third paragraph, replace "should" with

shall

7.4 Information to be supplied or made available

In first paragraph, replace "should" with

shall

In second paragraph, replace "should" with

shall

7.5 Safety and warning

7.5.1 Safety and warning labels

Replace "should" with

shall

7.5.2 Additional safety considerations of a PDS

In third paragraph, replace "should" with

shall

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Review Draft