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Guidance on Industry Standard for Low Voltage Switchgear & Controlgear (IEC)

GIS 12-101

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This is the first issue of Engineering Technical Practice (ETP) GIS 12-101. This Guidance on Industry Standard (GIS) is based on the following heritage documents from merged BP companies:

BP RPSE

GS 112-8

Guidance for Specification 112-8 Low Voltage Switchgear and Control Gear

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1. Scope

This GIS document provides guidance on industry standard for the design, materials, fabrication, inspection, testing, documentation, and preparation for shipment of low voltage switchgear and controlgear.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

International Electrotechnical Commission (IEC)

IEC 60034-11	Rotating electrical machines. Part 11: Built-in thermal protection - Chapter 1: Rules for protection of rotating electrical machines
IEC 60034-12	Rotating electrical machines. Part 12: Starting performance of single speed three phase cage induction motors
IEC 60044-1	Instrument transformers – Part 1: Current transformers
IEC 60044-2	Instrument transformers – Part 2: Voltage transformers
IEC 60051	Direct acting indicating analogue electrical measuring instruments and their accessories - All Parts
IEC 60073	Basic and Safety Principles for Man-Machine Interface, Marking and Identification
IEC 60255	Electrical relays - All Parts
IEC 60269-1	Low-Voltage Fuses - Part 1: General Requirements
IEC 60269-2	Low-Voltage Fuses Part 2: Supplementary Requirements for Fuses for Use by Authorized Persons (Fuses Mainly for Industrial Application)
IEC 60417	Graphical symbols for use on equipment
IEC 60439-1	Low-voltage switchgear and control gear assemblies – Part 1: Type-tested and partially type-tested assemblies.
IEC 60439-2	Factory built assemblies of low voltage switchgear and control gear. Particular requirements of busbar trunking systems
IEC 60445	Basic safety principles for man-machine interface marking and identification - Identification of equipment terminals of certain designated conductors, including general rules for an alphanumeric system.
IEC 60529	Degrees of protection provided by enclosures.
IEC 60742	Isolating transformers and safety isolating transformers
IEC 60947	Specification for low-voltage switchgear and controlgear - All Parts
IEC 61892-1	Mobile and Fixed Offshore Units-Electrical Installation Part 1-General requirements and required conditions
IEC 61892-2	Mobile and Fixed Offshore Units-Electrical Installation Part 2-Equipment

3. Design, materials and fabrication

3.1. General

- a. Assemblies shall be multi-cubicle type for indoor installation in accordance with IEC 60439-1 and relevant parts of IEC 60947.
- b. Assemblies for offshore installations shall comply with IEC 61892-1 and 2.

3.2. Enclosures, general construction and rating

3.2.1. General

- a. Enclosures of assemblies shall provide an overall degree of protection of IP42 to IEC 60529.
- b. Assemblies shall be extendable at either end without cutting or drilling any part of enclosure.
It is preferable to be able to erect extension panels at either end without isolating the assembly, until it is required to connect the busbars.
- c. Withdrawable equipment shall be equipped with a stop to limit withdrawal distance.
- d. When a functional unit is open or withdrawn the degree of protection from the inside of the open or withdrawn functional unit to all other compartments of the assembly shall be at least IP 40.
 - 1. When a functional unit is isolated and open or withdrawn the degree of protection to any live part remaining live shall be at least IP 20 and any covers, shrouds etc. preventing access to live parts shall be fitted with labels stating the voltage as follows: 'Danger volts'. Safety shutters may achieve this.
 - 2. If the IP20 degree of protection cannot be fully complied with, it shall only be possible to open or withdraw the functional unit with the use of tools. Labels shall be fitted to the outside and inside of the functional unit stating the voltage as follows:
'Danger volts, isolate elsewhere before removing covers'.
 - 3. Exception:
Covers or shrouds not exceeding 50 mm measured along the greatest dimension, forming part of a volume produced product, e.g. a fuse holder, do not require to be fitted with a label, providing the cover or shroud is red or yellow.
- e. Equipment shall be rated for the full load current specified, assuming 24 hour average maximum ambient temperature with all functional units including circuit breakers operating at their rated full load current, with no diversity.
- f. Equipment shall be designed such that anti-condensation heaters are not required.
- g. Test reports shall be provided confirming the switchboard capability of containing internal arcing faults. Such reports shall cover arcing faults upstream of short circuit interrupting devices unless it can be demonstrated that such enclosure areas can be deemed 'fault free zones' by the use of all insulated components.

3.2.2. Partitions and shutters

- a. Degree of protection provided by shutters shall be IP 3X or better as defined by IEC 60529
- b. Automatic safety shutters shall cover fixed isolating contacts.
- c. Shutters shall be individually operated by withdrawable part.

- d. Shutters shall be opened and closed by a positive mechanical drive.
- e. Facilities shall be provided to padlock shutters closed.
- f. Means shall be provided to facilitate testing shutters.
- g. Shutters shall be coloured and labelled in accordance with Table 1.

Table 1

Equipment	Shutter Colour	Label	Letter Colour
Busbars	Red	Busbars Danger...Volts	Black
Circuit	Yellow	Circuit Danger...Volts	Black

3.3. Busbar

- a. Busbar shall be hard-drawn high conductivity copper and comply with IEC 60439-2.
- b. Busbar shall have same current rating, throughout length of switchgear assembly.
- c. Busbar and connections shall be insulated. Insulation materials shall be flexible and able to withstand, without damage, effects of rated short time withstand current.
- d. Busbar joints and connections shall be corrosion-protected, secured to prevent loosening and discharge-free.
- e. Means shall be provided to prevent arc propagation across bus-section switching units.
- f. No wiring shall be contained within busbar compartments, other than phase and neutral connections to incoming and outgoing main circuits.
- g. Segregation barriers shall be provided along horizontal busbars, and between horizontal and vertical busbars. The preferred spacing is 1 m.

Spacing between segregation barriers along horizontal busbars should be discussed with the manufacturer at the time of enquiry. The intent of these barriers is to limit the spread of debris produced by a fault from spreading throughout the switchboard.

- h. Bus phasing shall be A, B, C left to right, top to bottom, and front to back viewed from front of switchgear. Busbar insulations shall be marked red, yellow, or blue according to the phase and black for neutral.
- i. Where bus duct is used to connect two or more sections of switchgear or motor control center, the continuous ampere rating, momentary rating, and bus bracing shall equal or exceed similar ratings of main bus.
- j. Horizontal and vertical bus shall be sized as specified on the data sheet
- k. Momentary duty rating and bus bracing for motor control centers shall exceed the maximum available fault current specified on drawings and/or data sheets.
- l. Covers providing access to busbars shall carry a "caution, risk of electric shock" symbol.
- m. Current rating of neutral busbars shall be at least 50% of corresponding phase busbars.

3.4. Provisions for external cable

- a. Separate, IP40 minimum, terminal boxes shall be provided for main and auxiliary circuit cables.