

# IEEE Standard for Metal-Enclosed Switchgear Rated 1 kV to 52 kV Incorporating Gas Insulating Systems

IEEE Power and Energy Society

Developed by the  
Switchgear Committee

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**Switchgear Committee**  
of the  
**IEEE Power and Energy Society**

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**IEEE-SA Standards Board**

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**Abstract:** Metal-enclosed switchgear assemblies incorporating gas insulating systems containing, but not limited to, such devices as interrupter switches; selector switches; fuses; circuit breakers; control, instrumentation, and metering devices; and protective equipment are covered in this standard. Equipment for the control and protection of apparatus used for distribution of electrical power is also included, but not specifically limited to, in this standard.

**Keywords:** IEEE C37.20.9™, metal-enclosed power switchgear, metal-enclosed switchgear incorporating gas insulating systems (MEGIS), switchgear, switchgear assembly

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## Introduction

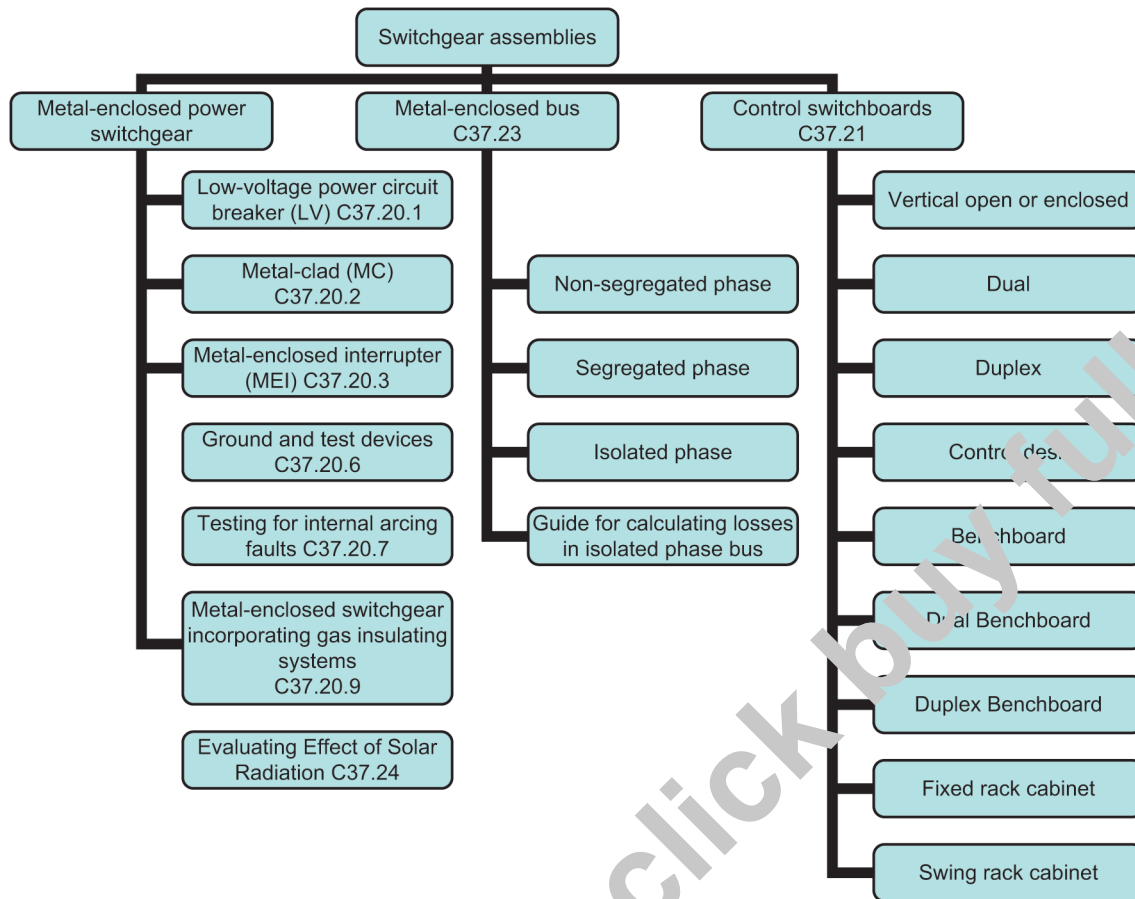
This introduction is not part of IEEE Std C37.20.9-2019, IEEE Standard for Metal-Enclosed Switchgear Rated 1 kV to 52 kV Incorporating Gas Insulating Systems.

This standard provides the requirements for switchgear that incorporate gas (typically SF<sub>6</sub>) at higher than ambient pressure as an insulation medium for alternating-current applications rated above 1 kV up to 52 kV. This standard recognizes the growing use of gas-insulated switchgear and is one of a series covering switchgear assemblies as follows (see [Figure 1](#)):

- a) IEEE Std C37.20.2™, IEEE Standard for Metal-Clad Switchgear<sup>1</sup>
- b) IEEE Std C37.20.3™, IEEE Standard for Metal-Enclosed Interrupter Switchgear (1 kV to 38 kV)
- c) IEEE Std C37.20.4™, IEEE Standard for Indoor AC Switches (1 kV to 38 kV) for Use in Metal-Enclosed Switchgear
- d) IEEE Std C37.20.6™-2015, IEEE Standard for 4.76 kV to 38 kV Rated Ground and Test Devices Used in Enclosures [\[B33\]](#)<sup>2</sup>
- e) IEEE Std C37.20.1™-2015, IEEE Standard for Metal-Enclosed Low-Voltage (1000 Vac and below, 3200 Vdc and below) Power Circuit Breaker Switchgear [\[B32\]](#)
- f) IEEE Std C37.20.9™-2019, IEEE Standard for Metal-Enclosed Switchgear Rated 1 kV to 52 kV Incorporating Gas Insulating Systems (this standard)
- g) IEEE Std C37.21™-2017, IEEE Standard for Control Switchboards [\[B34\]](#)
- h) IEEE Std C37.23™-2015, IEEE Standard for Metal-Enclosed Bus [\[B35\]](#)

<sup>1</sup>Information on references can be found in [Clause 2](#).

<sup>2</sup>The numbers in brackets correspond to those of the bibliography in [Annex K](#).



**Figure 1—Publications about switchgear assemblies**

There was much discussion about voltage transformer protection during the development of this document. The agreement was made to require primary fuse protection for the transformer based mainly on the National Electric Code® (NEC®) requirement. Similar IEC documents do not have a requirement for fuses. Many IEC-based MV and HV designs do not use fuses and have decades of installed service. The debate has been whether the fuse protects the system when the transformer fails or whether the transformer is protected by the fuse. The first position indicates that higher performances from and reliability of the transformers are needed. The second position suggests that investigations into both the transformers and the fuses used are needed. As the primary voltage increases, the ability of the fuse to protect the transformer is reduced. This is because the primary wire used inside some voltage transformers may melt before the primary fuse interrupts the circuit. Some internal transformer and secondary faults are also not protected by primary fuses. Work will be conducted in the future with the National Fire Protection Association (NFPA) and the transformer committee in an attempt to address these issues.

CF<sub>6</sub> is recognized worldwide as having a very high global warming potential (GWP) of 22 800 years (as benchmarked with the 1.0-GWP value of CO<sub>2</sub> gas); thus, other gases are currently being developed and studied for use in metal-enclosed, gas-insulated switchgear (MEGIS) equipment. There is not a leading candidate for a replacement gas at this time; however, consideration and requirements for future gases have been included in this document.

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# IEEE Standard for Metal-Enclosed Switchgear Rated 1 kV to 52 kV Incorporating Gas Insulating Systems

## 1. Scope

This standard covers the design, testing, and installation of metal-enclosed switchgear that incorporates gas (typically SF<sub>6</sub>) at higher than ambient pressure as an insulation medium for alternating-current applications rated above 1 kV to 52 kV. The contents of the switchgear may include but are not limited to circuit breakers, switches, bushings, buses, instrument transformers, cable terminations, instrumentation, metering and controls, and protective relays. In a vertical section of the switchgear, some or all of the medium-voltage compartment(s) shall be composed of a gas pressure system for the primary insulating medium. This standard covers both indoor and outdoor installations.

This standard covers switchgear using sealed pressure systems or closed pressure systems. Switchgear employing controlled pressure systems is not covered by this standard.

This standard also does not cover switchgear that is covered under IEEE Std C37.20.2<sup>TM3</sup>, IEEE Std C37.20.3<sup>TM</sup>, or IEEE Std C37.74<sup>TM</sup>-2014 [B38]<sup>4</sup> that uses individual components that are gas-insulated such as switches, circuit breakers, and other equipment, nor does it fully cover those components that are covered by their individual component standards.

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

Accredited Standards Committee C2, National Electrical Safety Code<sup>®</sup>(NESC<sup>®</sup>).<sup>5,6</sup>

ANSI (NEMA) C37.85, Alternating-Current High-Voltage Power Vacuum Interrupters—Safety Requirements for X-Radiation Limits.<sup>7</sup>

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