

Type VFI Underground Distribution Switchgear

How To Use This Publication

This publication (Bulletin B285-09042) contains detailed product and application information and provides answers to commonly asked questions about Type VFI vacuum fault interrupter underground distribution switchgear.

If you have additional questions concerning the design, operating features, or application of the Type VFI underground distribution switchgear, contact your Cooper Power Systems representative.

Important Information

The information contained in this document is intended for Cooper Power Systems customers. The information contained in the questions and answers is generalized to present overall guidance in the use and application of these products. This information is in no way intended to be used in the creation of any, or supersede the application, use, and safety standards of any government authorities or the user. Users are cautioned to obtain the applicable service literature and instructions from Cooper Power Systems (available at www.cooperpower.com and shipped with each product) and to strictly follow those instructions. The information in this document is not in any way intended to modify or supersede those applicable product instructions.

Switching and Fault Interruption

1. Why does Cooper Power Systems supply switches and fault interrupters with vacuum technology?

Vacuum technology is the most reliable means of arc interruption. Because all arc products are contained within the vacuum interrupter the major dielectric media is never degraded or compromised by arc products as in some other designs.

Cooper does not use SF₆ to interrupt arcs – such designs produce harmful and toxic by-products and compromise the dielectric integrity of the major insulation system over time.

2. What power is required for the VFI to function?

VFIs are completely self-powered by the internal CTs and no external power is required.

Optional control heaters and the motor controllers require a source of 120 V AC power. This voltage is most economically supplied by the user from available sources – but is often provided by internal potential transformers for a self-contained solution.

Technical Information

3. What options are available for compartment depths for accessories?

The minimum compartment depth for units with 200 ampere bushing wells and parking stands is 16” of usable “stacking depth.” This yields a minimum footprint with flexibility in operations.

The preferred depth for 600 ampere accessories is 22” – this allows for double “T-Bodies” and a reducing plug for 200 ampere accessories (200 ampere elbow, a MOVE surge arrester or a test/grounding device) and motor operators.

For units with the iTAP-260 controller and motor operators, up to a 36” compartment depth is required. This allows the controller to be mounted on the main door of the unit, without requiring an external “bolt-on” enclosure.

Cooper’s standard bushing and bushing well mounting heights are 24” above the pad level to aid in cable training and cable accessory operations.

4. What happens to the VFI switchgear if it is flooded?

All VFI units are in a sealed tank, and as such, protected from the environment. They may be occasionally flooded without risk, as the major dielectric is always contained and isolated, and the connections are dead-front molded rubber terminations that, when properly installed, provide a termination that is submersible. This is in direct contrast to air-insulated switchgear.

VFI controls should remain above any flooding level as it is vented to the atmosphere and water may damage the electronics. In vault applications, remotely mounted VFI controls are available.

The equipment is not rated for continuous submersibility.

Visible Break

5. Does Cooper Power Systems offer a visible break in their switchgear? What types of dielectric media are available with the visible-break option?

Yes, Cooper Power Systems offers visible-break switches on all liquid-filled pad-mounted switchgear units for ways rated 600 amperes continuous and below. These switches are mechanically interlocked with the vacuum switch or VFI, so that the current interruption is always accomplished by the vacuum interrupters. Since all arc products are contained within the vacuum interrupter,

the major dielectric media is never degraded or compromised. The visible-break switches are visible through large windows on the front-plate and are available in two-position (close-open), and three-position (close-open-ground) variations.

6. What is the fault-close rating on the 3-position visible-break switch?

The visible-break switch has a fault-close rating of up to 16 kA (symmetrical).

Insulating Medium

7. Cooper Power Systems offers underground distribution switchgear in what dielectric media?

Cooper Power Systems offers underground distribution switchgear in four (4) dielectric media: Envirotemp 200 fluid, Envirotemp FR3 fluid, conventional mineral oil, and SF₆ (by customer request only). Each dielectric choice has its place based on a customer's view of price, features, and environmental compatibility and sustainability.

8. If Cooper Power Systems is a leader in alternative dielectrics such as FR3 fluid and Envirotemp 200 fluid, do you offer SF₆ insulation?

As an industry-leading manufacturer of medium voltage pad-mounted transformers and switchgear, Cooper Power Systems intends to provide equipment that is designed in the best interest of the customer.

When specified, Cooper Power Systems provides underground distribution switchgear with SF₆ dielectric. Cooper's VFI delivers the most responsible use of SF₆, by limiting the possibility of arcing in the SF₆ medium. Because all Cooper SF₆ switchgear utilizes vacuum bottle switching medium, hazardous arcing by-products are mitigated.

Cooper Power Systems believes that environmentally sustainable high fire point fluids are a better choice for most underground distribution switchgear applications, and encourages customers to consider alternatives, such as Envirotemp 200 fluid.

9. What are the advantages of a liquid (Envirotemp 200 fluid, Envirotemp FR3 fluid, or mineral oil) dielectric?

A liquid dielectric offers the ability to design a compact construction. Cooper's designs separate the liquid from any arc quenching or interrupting duty (via the VFI). Since it only provides the major insulation, the fluid is never contaminated in normal equipment operation. Most underground distribution switchgear users also have a large installed base of fluid-filled transformers on their system. The additional use of fluid in switchgear has little to no impact on their total operational and environmental costs, as maintenance is minimal and users are familiar with the dielectric.

10. What are the advantages of using Envirotemp 200 fluid as the dielectric media and what are the limitations to its use?

VFI switchgear can be supplied with environmentally preferred Envirotemp 200 fluid dielectric with all the environmental benefits. This non-toxic, biodegradable fluid is not bio-accumulating and has a fire point of >300°C. There are no known limitations associated with the use of Envirotemp 200 fluid in VFI switchgear.

11. What are the advantages of using FR3 fluid as the dielectric media and are there any limitations to its use?

FR3 fluid has a flash point of greater than 300°C. It is Cooper's recommendation that FR3 fluid-filled switchgear not be applied in locations in which the temperature may fall below 0°C. This FR3 fluid application for switchgear is different from transformers that have a source of internal heat. This constraint is based on fluid viscosity impact on the mechanism performance.

12. Does VFI underground distribution switchgear degrade the dielectric media during switching and interrupting?

No, since all arc products are contained within the vacuum interrupter, the major dielectric media is never degraded or compromised by normal switching and current interruption arc products.

Options and Accessories

13. What can Cooper Power Systems offer to mitigate corrosion for installations near the sea-coast?

VFI underground distribution switchgear is offered in 100% stainless steel construction. Units are painted and conform to ANSI/IEEE C57.12.29™-2005 "Enclosure Integrity for Coastal Environments."

Any installation that demands robust corrosion protection deserves 100% stainless steel construction. Cooper's stainless steel designs are 304L grade throughout, with corrosion-resistant details.

14. Can Cooper Power Systems supply internal potential transformers to power auxiliary features such as motor operators and SCADA?

Yes, internal potential transformers can be supplied for voltage sensing and for powering auxiliaries such as motor operators. This is only available with liquid dielectric media.

15. Can auxiliary switches [“a & b” contacts] be provided to give remote indication of the OPEN or CLOSED position of an interrupter or a switch?

Yes, up to a 3-stage auxiliary switch (3a, 3b) can be provided when remote position indication is required, especially with SCADA.

They are always supplied with motor operators as part of the motor control scheme.

Auxiliary contacts cannot be field-added, so if an installation may require auxiliary switches in the future – they should be ordered initially.

16. Can the VFI unit be remotely operated?

Yes, the VFI underground distribution switchgear with the TPG control and SCADA accessory can be remotely operated to open and close. While underground distribution switchgear is fully self-contained to provide circuit protection without any source of control power, the VFI switchgear is fully automation-ready through the selection of various accessories.

The TPG control may be ordered with the SCADA accessory that provides contact I/O to remotely close or trip the switchgear. For closing functionality, the motor operator accessory is also required.

Cooper also offers the ProView software-based iTAP-260 controller for more advanced automation applications.

The other option is to connect an RTU to the motor operator control for open and close commands. The motor operator control is capable of controlling six motor operators through contact I/O.

Applications

17. Cooper Power Systems switchgear is two-sided. Does Cooper offer single-sided equipment for installations with only single-side access?

Yes, single-side equipment is available with up to 6-ways on one side.

18. Do single-sided units offer additional operations benefits to personnel?

No, single-sided units require the same personal protective equipment for operation as double-sided units, per NFPA 70E. Single-sided units are only an advantage if the operators and terminators are on the same side of the unit. This configuration allows the single-sided unit to be placed near obstructions, such as walls, where access to the back side of the switchgear is limited by the obstruction.

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