IEEE Recommended Practice for the Interface of New Gas-Insulated Equipment in Existing Gas-Insulated Substations

Sponsor

Gas-Insulated Substations Subcommittee
of the
IEEE Power Engineering Society

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IEEE-SA Standards Board

Abstract: Recommendations for the connection of a gas-insulated substation to another gas-insulated substation of a different make are given.
Keywords: gas-insulated substation (GIS), gas-insulated transmission line (GIL), interface

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Introduction

(This introduction is not part of IEEE Std 1416-1998, IEEE Recommended Practice for the Interface of New Gas-Insulated Equipment in Existing Gas-Insulated Substations.)

Gas-Insulated Substations (GIS) are proven technologies covered by international standards and guides. But so far, very little guidance has been made available to utilities when they have to connect a GIS to a GIS of another make. This document defines a recommended practice to cover such a case.

At the time this recommended practice was approved, the Interface Working Group of the GIS subcommittee had the following membership:

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Randal Baker
Philip Bolin
Dan Charbonnet
Noboru Fujimoto
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The following persons were on the balloting committee that approved this recommended practice for submission to the IEEE-SA Standards Board:

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The final conditions for approval of this recommended practice were met on 28 September 1998. This recommended practice was conditionally approved by the IEEE-SA Standards Board on 16 September 1998, with the following membership:

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1. Scope

These recommendations apply to the following cases:

a) When a gas-insulated substation (GIS) has to be connected to another GIS, in the case of a planned or unplanned extension.
b) When, in the same way, a GIS has to be connected to a gas-insulated transmission line (GIL) of another make.

In both cases, the interface is assumed to concern busbars or busducts only, and not direct connections to "active" devices such as circuit breakers or disconnectors.

The case of a three-phase GIS or GIL can be more complicated than the single-phase case, and should be defined on a case-by-case basis. However, if appropriate, more specific guidelines will be added in further revisions.

2. References

This recommended practice shall be used in conjunction with the following publications.

IEEE Std C37.122-1993, IEEE Standard for Gas-Insulated Substations.[1]

IEEE Std C37.122.1-1993, IEEE Guide for Gas-Insulated Substations.

IEEE Std C37.123-1996, IEEE Guide to Specifications for Gas-Insulated, Electric Power Substation Equipment.

[1]IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA (http: //www.standards.ieee.org/).

3. Definitions

For the purposes of this recommended practice, the following definitions apply. IEEE Std 100-1996 should be referenced for terms not defined in this clause.

3.1 manufacturer A: The supplier of the initial GIS.

3.2 manufacturer B: The supplier of the extension GIS.

4. General recommendation

Extra effort is always required when connecting an interface; therefore, the user should minimize the number of interfaces. For example, in view of consistent design criteria, small extensions should be supplied preferably by manufacturer A, except when opportunities for uniformity or economics dictate otherwise.

5. Recommended practice

Whenever a future extension or interface is planned

a) The customer should state very clearly
   1) Each point of possible extension or interface on the single-line diagram;
   2) Outage conditions during planned extensions.
b) Manufacturer A should supply an “as built” drawing with all required data, as indicated in Table 1 and illustrated in Figure 1.
c) The limit of supply at the interface for both manufacturer A and manufacturer B should follow indications given in Table 2.

NOTE—The general arrangement shown in Figure 1 is to be considered typical, and is not intended to define a standard interface involving any extra cost at the initial stage.

6. Responsibility

Should a failure occur in normal operating conditions, responsibility should be attributed

a) To manufacturer A in zone I;
b) To manufacturer B in zone III;
c) Half to manufacturer A and half to manufacturer B if the failure occurs in zone II, and if the cause of failure cannot be determined.

Table 1—Request for additional data from manufacturer A

Distance to closest supporting structure (a)[a] Type of support sliding ☐ fixed ☐
Diameter of the conductor inside the shield (b)[a] minimum maximum
Maximum diameter of the conductor outside the shield (c)[a]
Inside diameter of the enclosure (d)[a]
Thickness of the flange (e)[a] outside diameter of the flange number and diameter of holes in the flange bolt circle diameter outside and inside diameter of the flat sealing surface orientation of the hole pattern
Distance from the connecting flat pad to the next enclosure flange (f)[a]
Allowance for thermal expansion under service condition (±g)[a]
Length of enclosure (L)[a]
SF_6 pressure in zone II (kpa/psig) rated pressure alarm pressure minimum pressure
Bursting disc or other pressure-relief setting (kpa/psig)
Maximum permissible continuous differential pressure of the spacer (kpa/psig)
Maximum permissible differential pressure of the spacer during construction (kpa/psig)
Connecting pad (conductor) copper-plated aluminum ☐ silver-plated copper ☐ silver-plated aluminum ☐
Enclosure material steel ☐ aluminum ☐
Gas supervision of zone II during step I (subject to agreement between manufacturer A and user) is independent ☐ temporarily connected to zone I ☐

[a]See labels in Figure 1.

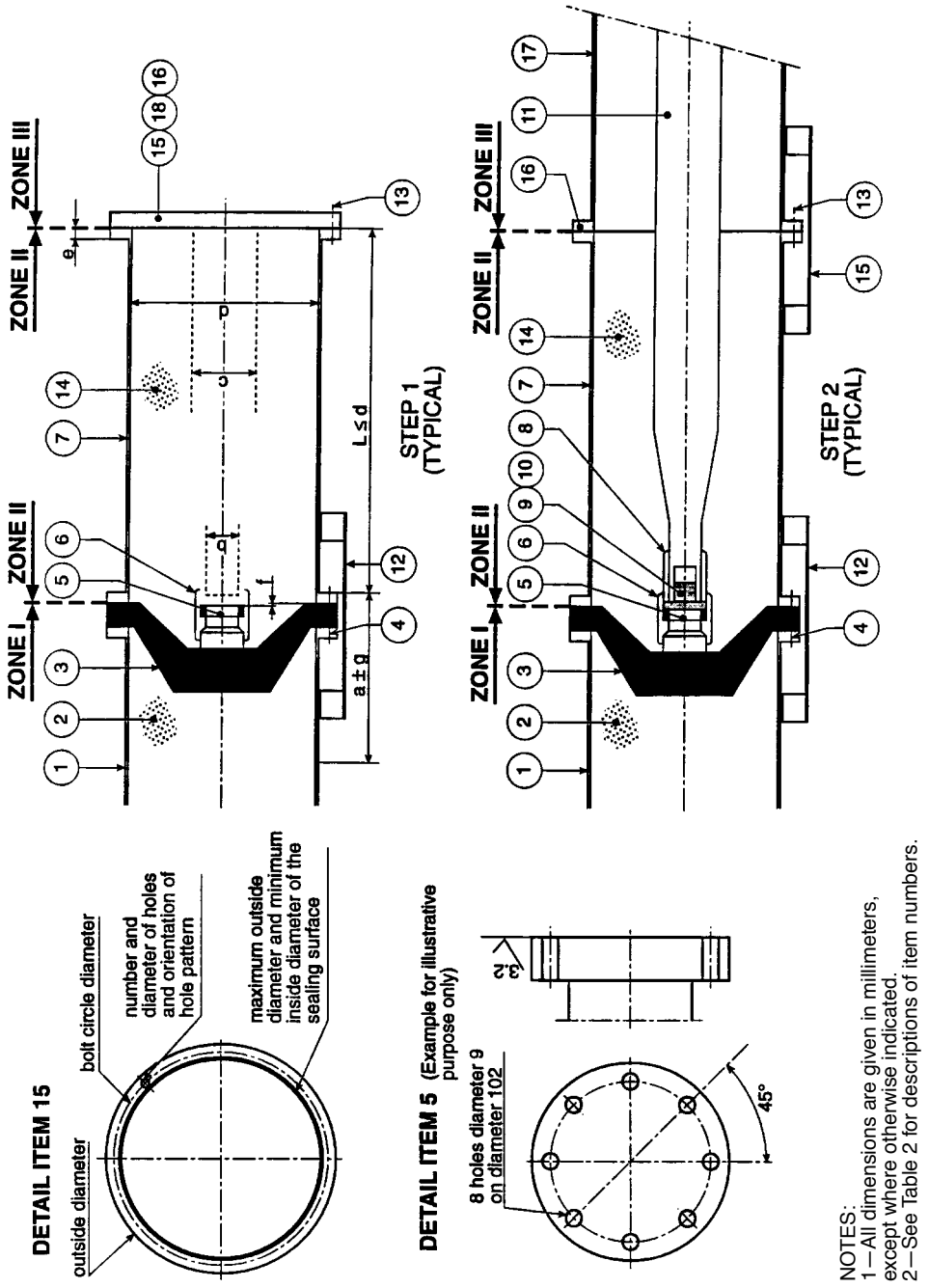

Figure 1—Typical interface drawing

Table 2—Scope of supply

Step 1					Step 2				
Item	Designation	Supply by Manufacturer		Comments	Item	Designation	Supply by Manufacturer		Comments
		A	B				A	B	
1	Enclosure	X		—	1	Enclosure	X		—
2	SF_6 gas	X		—	2	SF_6 gas	X		—
3	Gas barrier insulator	X		Closed type	3	Gas barrier insulator	X		Closed type
4	Bolts and gaskets	X		For fixing and gas tightness between items 3 and 1, and between items 3 and 7	4	Bolts and gaskets	X		For fixing and gas tightness between items 3 and 1, and between items 3 and 7
5	Contact support	X		—	5	Contact support	X		—
6	Stress shield	X		—	6	Stress shield	X		—
7	Enclosure	X		An access may be required	7	Enclosure	X		—
8	—			—	8	Stress shield		X	If necessary
9	—			—	9	Contact		X	—
10	—			—	10	Bolts		X	For fixing item 9 on item 5
11	—			—	11	Conductor		X	—
12	Bonding/grounding	X		May be integrated with flanged enclosure joint	12	Bonding/grounding	X		May be integrated with flanged enclosure joint
13	Bolts	X		For fixing item 15 on item 7	13	Bolts		X	For fixing item 17 on item 7
14	SF_6 Gas	X		—	14	SF_6 Gas		X	—
15	Cover	X		With density switch, valve, pressure relief device	15	Bonding/grounding	X		May be integrated with flanged enclosure joint
16	Gaskets	X		For gas tightness between items 7 and 15	16	Gaskets		X	For gas tightness between items 7 and 17
17	—			—	17	Enclosure		X	With density switch, valve, pressure relief device
18	Rupture disk	X		Needed for small compartments	18	Rupture disk		X	Needed for small compartments

NOTES:
1—Manufacturer B would need to supply a rupture disk in zone III, if, as suggested, the initial rupture disk was on the end plate that is removed and the gas compartment was small enough after extension to require a rupture disk.
2—Interface gaskets should be of a standard “O-ring type.”
3—The groove for gasket item 16 should preferably be in the cover item 15, rather than in the flange of enclosure item 17.

Annex A

(informative)

Bibliography

[B1] CIGRE Report 23-208-1992 Session, *Commissioning of GIS extensions*.[2]

[2]CIGRE publications are available from CIGRE-21, rue d'Artois, 75008 Paris, France [tel. 33 (0)1 53 89 12 90] (http: //www.cigre.org/).