

Guide to Forms of Separation

INTRODUCTION

For specifiers, one of the most significant choices they face when specifying a low-voltage assembly, is the form of separation. Selection of an inappropriate form of separation will at the very least cause disappointment. As a consequence the assembly may either be much more expensive than necessary or it may be unsuitable for the application.

Definitions

The Standard includes definitions relating to Assemblies. Those particularly relevant to the forms of separation of Assemblies include the following.

- **Assembly**
“Low-voltage switchgear and control gear assembly used to distribute and control energy for all types of loads, intended for industrial, commercial and similar applications where operation by ordinary persons is not intended.”
This includes floor standing or wall mounting distribution switchboards, panel boards, and motor control centers using electromechanical and/or electronic components. It does however specifically exclude individual devices and self-contained components which control a single circuit i.e. wall mounted starters and fuse switches.
- **Functional Unit**
“Part of an assembly comprising all the electrical and mechanical elements including switching devices that contribute to the fulfillment of the same function”. Conductors which are connected to a functional unit but which are external to its compartment or enclosed protected space (e.g. auxiliary cables connected to a common compartment) are not considered to form part of the functional unit.
It comprises all parts necessary to form a complete incoming or outgoing circuit. It includes the load current carrying device(s) and associated equipment, cable terminals, and control devices within the assembly, that are necessary to form the complete circuit. It excludes the connections from the unit to the busbars (busbar connections) and any insulation or shrouding with which they may be provided. It may consist of more than one compartment or enclosed protected space.
- **Section**
“Constructional unit of an assembly between two successive vertical delineations”.
Usually considered to be a single full height column containing one or more functional units. One or more columns are required to complete an assembly.
- **Sub-Section**
“Constructional unit of an assembly between two successive horizontal or vertical delineations within a section”.
The area or space within a column identified and bounded by two adjacent and horizontal constructional members e.g. cross members or shelves.

- **Compartment**
“Section or sub-section enclosed except for openings necessary for interconnection, control or ventilation”
- **Enclosure**
“Housing affording the type and degree of protection suitable for the intended application”.
Provides protection for equipment against certain external influences from any accessible direction and against direct contact to a degree of protection of at least IP2X.
- **Partition**
“Part of the enclosure of a compartment separating it from other compartments”.
A component used to form the top, bottom, sides, front or back of a compartment

Fundamental Objectives of Separation

The principal reason for separating an assembly is to facilitate access to a part of the assembly whilst other parts may remain energized and in service. Whilst, in general, separation does not improve the electrical performance of the assembly it does provide:

- Protection against contact with live parts belonging to the adjacent functional units
- Protection against the passage of solid foreign bodies from one unit of an assembly to an adjacent unit.

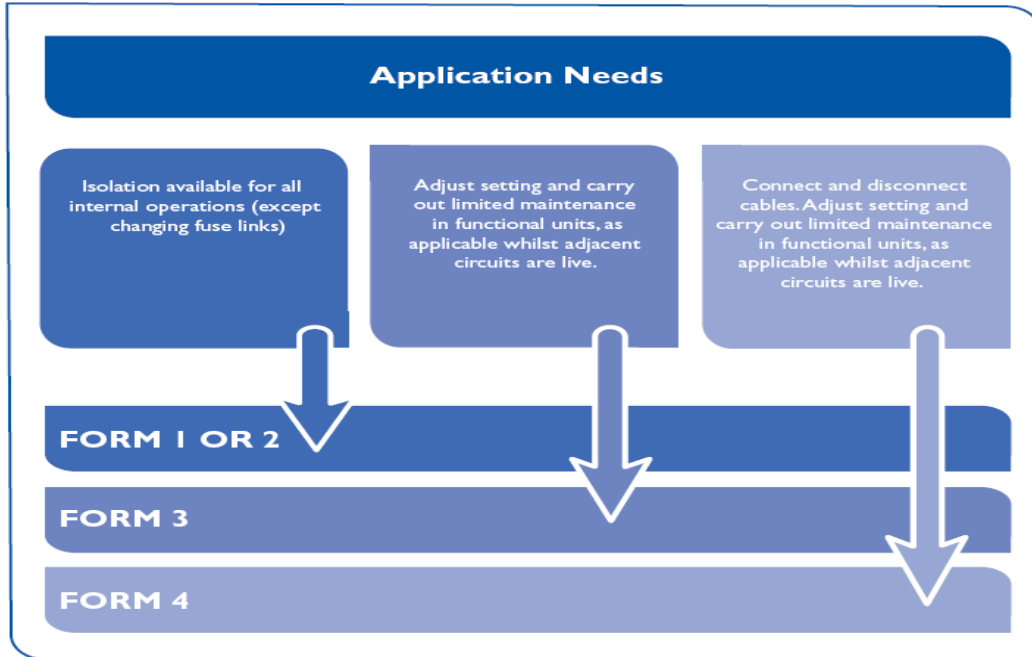
Basics of Separation

Specifying the most appropriate form of separation for an assembly is not an easy matter. In specifying a form of separation the following should be considered:

- The consequences of isolating the assembly or part of,
- Nature of task to be performed,
- Competence of person undertaking work whilst the remainder of the assembly is energized.

Main considerations

Four main categories of separations are identified - Forms 1, 2, 3 and 4. As a first step users should consider what operations they need to carry out without fully isolating the assembly. Then using a process generally as outlined in the chart below, identify the main category of separation they require for their application.



Options in the National Annex of BS EN 61439-2

Main criteria	Sub-criteria	Form	Type of construction
No separation		Form 1	
Separation of busbars from the functional units.	Terminals for external conductors not separated from busbars.	Form 2a	
	Terminals for external conductors separated from busbars.	Form 2b	Type 1 Busbar separation is achieved by insulated covering, e.g. sleeving, wrapping or coatings.
			Type 2 Busbar separation is by metallic or non-metallic rigid barriers or partitions.
Separation of busbars from the functional units and separation of all functional units from one another. Separation of the terminals for external conductors from the functional units, but not from each other.	Terminals for external conductors not separated from busbars.	Form 3a	
	Terminals for external conductors separated from busbars.	Form 3b	Type 1 Busbar separation is achieved by insulated covering, e.g. sleeving, wrapping or coatings.
			Type 2 Busbar separation is by metallic or non-metallic rigid barriers or partitions.

Separation of busbars from the functional units and separation of all functional units from one another, including the terminals for external conductors which are an integral part of the functional unit.	Terminals for external conductors in the same compartment as the associated functional unit.	Form 4a	Type 1	Busbar separation is achieved by insulated covering, e.g. sleeving, wrapping or coatings. Cables may be glanded elsewhere.
			Type 2	Busbar separation is by metallic or non-metallic rigid barriers or partitions. Cables may be glanded elsewhere.
			Type 3	Busbar separation is by metallic or non-metallic rigid barriers or partitions. The termination for each functional unit has its own integral glanding facility.
	Terminals for external conductors not in the same compartment as the associated functional unit, but in individual, separate, enclosed protected spaces or compartments.	Form 4b	Type 4	Busbar separation is achieved by insulated covering, e.g. sleeving, wrapping or coatings. Cables may be glanded elsewhere.
			Type 5	Busbar separation is by metallic or non-metallic rigid barriers or partitions. Terminals may be separated by insulated coverings and glanded in common cabling chamber(s).
			Type 6	All separation requirements are by metallic or non-metallic rigid barriers or partitions. Cables are glanded in common cabling chamber(s).
			Type 7	All separation requirements are by metallic or non-metallic rigid barriers or partitions. The termination for each functional unit has its own integral glanding facility.