Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

Photo from Zhecheng Electric company

**General about Loss of Service Continuity:**

When working with switchgear safety of personnel is critical, including during installation and maintenance. The ability to work on an installation without switching off the power to maximize uptime is defined as “Loss of Service Continuity” (LSC). It describes the extent to which the switchgear are allowed to remain operational in case access to a main circuit compartment is necessary.

The IEC 62271-200 standard defines the performance of medium voltage switchgears must provide by introducing the **Loss of Service Continuity** concept (LSC). It establishes four main categories defining the extent to which other compartments and/or functional units

source: [https://switchgearcontent.com](https://switchgearcontent.com)
may remain energized when an accessible high voltage compartment is opened.

Generally speaking, designers can adopt different **LSC** categories for different loads and, thus, functional units. For this reason, the Standard requires LSC classification as a mandatory rating plate data item.

Also must be notice that the LCS category does not describe ranks of reliability of switchgears.

**Loss of Service Continuity (LSC) categories in IEC standard:**

*According to accessible compartments and service continuity, 4 categories are possible: LSC1, LSC2, LSC2A, LSC2B as below:*

**Category LSC1:**

This form is not intended to provide service continuity during opening of any accessible compartment(s) and may require complete disconnection of the switchgear from the system and making dead before such opening.

Functional unit with one or more accessible medium voltage compartments such that, when any one of these accessible high voltage compartments is open, at least one other functional unit may not be kept energized.

The example above illustrates a functional unit of a circuit breaker with cable connections in the same compartment as the circuit-breaker and busbar, which will therefore be classified as LSC1.

In Figure 1 we can see LSC1 diagram in **MV switchgear**: a circuit breaker functional unit with cable connections in the same compartment as the circuit-breaker and busbar will be classified as LSC1.

source: [https://switchgearcontent.com](https://switchgearcontent.com)
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

Figure 1

LSC2 family:

1-Category LSC2:

In this category switchgear having at least an accessible compartment for the medium voltage connection (connection compartment), such that, when this compartment is open, at least one busbar can remain energized and all other functional units of the switchgear can be operated normally.

This means that the accessible medium voltage compartments in a functional unit can be opened while the other functional units in the same section remain energized. It implies that at least one busbar must be kept energized. Installation of a removable partition can be used to obtain this category. Category LSC2 requires that at least the connection compartment may be opened while keeping the busbar(s) energized.

source: https://switchgearcontent.com
LSC2 as a minimum requires that it is possible to open the connection compartment while keeping the busbar(s) live. There may or may not be other accessible high-voltage compartments (e.g. main switching device).

When LSC2 functional units have accessible compartments other than the connection compartment, further subdivisions into LSC2A and LSC2B are defined.

LSC2 (Figure 2): a non-withdrawable circuit breaker functional unit has two accessible medium voltage compartments (other than the busbar compartment), and a disconnector in the CB compartment. It is not allowed to open the circuit breaker compartment with the busbar live. However, the medium voltage connection may be earthed via the circuit-breaker: if there is full partitioning between the connection compartment and the circuit-breaker compartment, then the connection compartment may be opened with the busbar live. The functional unit should be defined as LSC2.

LSC2 (Figure 3): a circuit breaker functional unit with cable connections in the same compartment as the circuit-breaker, this compartment being accessible with the busbar live because it can be isolated and earthed by DS&ES placed in the busbar compartment. Similar to Figure 3, a typical Ring Main Unit design (RMU) where the busbar compartment contains the switch-disconnectors or circuit breakers of several functional
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

units is also designated as **LSC2**.

**Figure 3**

**2-Category LSC2A:**

LSC2A applies to switchgear which has accessible compartments other than for medium voltage connection (for instance the main switching device compartment); this requires that it is allowed, after making the relevant MV circuit dead and earthed, to open any high-voltage compartment while keeping the busbar(s) energised (it is of course not allowed to open the live busbar compartment(s)).

It could be of additional value to keep the high-voltage connection (e.g. cables) energised when accessing such other compartments of the corresponding functional unit. This situation can occur when alternative power supplies are part of the installation (loop operation, generators, etc.). For these situations switchgear can be specified to be **LSC2B**; this requires that the connection (cable) compartment can be kept energised when any other accessible medium voltage compartment is open.

LSC2A (Figure 4): This is similar to Figure 2, except that the disconnector is located in the busbar compartment, and there is full partitioning between the busbar and circuit breaker compartments. Both the CB compartment and the connection compartment may be opened safely with the busbar live after the disconnector is opened and the earthing switch is

source: [https://switchgearcontent.com](https://switchgearcontent.com)
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

closed. Access to the circuit-breaker compartment requires that the cables are dead and earthed.

Figure 4

3- Category LSC2B:

This category requires that the connection (cable) compartment can be kept energised when any other accessible high-voltage compartment is open.

In addition to the requirements of LSC2A, the MV connections (e.g., cables) to the functional unit being accessed may be kept energized. This implies that there also is a point of disconnection, as well as proper partitioning, between the accessed compartment and the MV connections.

This functional unit also corresponds to that of category LSC2, with the addition of other accessible compartments (or apparatuses). In addition to level of service continuity LSCA, the incoming high voltage connections (thus also the cable connections) to the functional unit may be kept energized when any other accessible high voltage compartment of the corresponding functional unit is open.

The example above includes withdrawable switching devices.

If the main switching device of each LSC2B switchgear is fitted in its own accessible

source: https://switchgearcontent.com
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

compartment, maintenance may be performed on this main switching device without de-energizing the corresponding cable connection.

As a consequence, a minimum of three compartments for each functional unit is necessary in this example of LSC2B switchgear:

- for the main switching device;
- for connection compartment
- for busbar compartment. Where more than one set of busbars is provided, each set must be in a separate compartment.

LSC2B (Figure 5): for non-withdrawable main switching device designs.

This is similar to Figure 4, but in addition a second DS&ES are provided in the connection compartment; there is full partitioning between the CB compartment and connection compartment. This allows the CB compartment to be opened with both the busbars and connection compartment live.
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

LSC2B (Figure 6): For withdrawable designs. If the main switching device of each LSC2B functional unit is fitted in its own accessible compartment, maintenance may be performed on this main switching device without de-energizing the corresponding connection compartment. As a consequence, a minimum of three compartments for each LSC2B functional unit is necessary in this category:

- for each main switching device.

- for components connected to one side of a main switching device, for example, feeder circuit.

- for components connected to the other side of the main switching device, for example, busbar. For double busbar switchgear, each busbar shall be in its own, separate compartment.

source: https://switchgearcontent.com
Loss of Service Continuity (LSC) categories in medium voltage switchgears according to IEC 62271-200

Figure 6

source: https://switchgearcontent.com