

SM6 – Statement of performance 30 years lifetime

- 1 – Statement of performance

The performance characteristics obtained by the SM6 units meet the definition of a "sealed pressure system" in compliance with IEC publication 60694. Its tank is filled with SF6 gas as insulation and breaking medium at a 0,4 bar relative pressure. It is sealed for life after filling. Its tightness, which is systematically routine tested at the factory, gives the switchgear an expected lifetime of 30 years. No maintenance of the live parts is necessary with the SM6 breaking technique.

In addition, SM6 switch disconnectors are "E3/M1 class switch disconnectors" in compliance with IEC publication 60265. This is an "increased operating frequency switch" which has been tested by breaking the nominal current 200 times at end of life SF6 relative pressure of 0,1 bar, which shall correspond to a service life of at least 30 years under normal MV network operating conditions.

- 2 – Tightness check acceptance criteria

A - Preliminary

IEC publication 60698 in its annex GG recommend a preferential leakage rate of 1 or 3 % per year for "sealed pressure system". In order to ensure sufficient guarantee for 30 years lifetime on SM6 units, acceptance criteria chosen by Schneider Electric is 0,2 % per year

B – Calculation parameters

Switch disconnectors SM6 are delivered with epoxy cast resin enclosure of 27,5 Litres volume filled with SF6 gas at 0,4 bar relative pressure. Then, the SF6 gas volume can be calculated to be :

SF6 gas volume : 27.500 cm³ at 0,4 bar relative pressure = 38.500 cm³

0,2 % leakage rate during 30 years lifetime correspond to a global leakage of 6 % :

SF6 leakage during 30 years : 6 % x 38.500 cm³ = 2300 cm³

Then, corresponding flow of leakage may be calculated as follows :

Initial SF6 volume :	38.500 cm ³
End of life SF6 volume :	36.200 cm ³
End of life SF6 pressure :	$P = 36.200 \text{ cm}^3 / 27.500 \text{ cm}^3 = 1,32 \text{ bar}$
Pressure fall :	$\Delta P = 1,4 - 1,32 = 0,08 \text{ bar after 30 years}$
Flow of leakage :	$F = (\Delta P \times V) / T = (0,08 \times 38.500) / 9,46 \cdot 10^8 = 3,2 \cdot 10^{-6} \text{ bar.cm}^3/\text{s}$

- 3 – Operating conditions and maintenance specifications

On normal operating conditions as defined in IEC publication 60694, SM6 units have been designed to be operated without any maintenance during 30 years lifetime or 1000 mechanical operations on switch function.

The normal operating conditions are defined as follows :

- Altitude lower than or equal to 1000 m,
- Ambient air : little or none dust, little or none smoke, little or none corrosive or flammable gas, no salt.
- Ambient air temperature : lower than or equal to 40 ° C at nominal current, lower than or equal to 55 ° C with busbar current derating.
- Humidity : lower than or equal to 95 % relative humidity on average over 24 hours,
- Vibrations (external causes, earthquake, ...) neglectible.

However, our experience based on more than 400.000 units in service allows us to recommend at least 1 mechanical C-O operation every two (2) years on electrically operated switch function or on manual fuse-switch combination and CB function.