

Superconducting Fault Current Limiter

APPLICATION

The device is designed to maintain a reliable electrical network due to the effective and ultra-fast short circuit current limitation.

Superconducting Fault Current Limiter (SFCL) provides:

- city network protection by reducing short circuit currents, protecting network equipment (switchgear, cable, transformer);
- protection of continuous-cycle plants by reducing the voltage drop across consumer tires, no downtime of production equipment;
- generator stability due to high active SFCL resistance during short circuit.

GENERAL DESCRIPTION

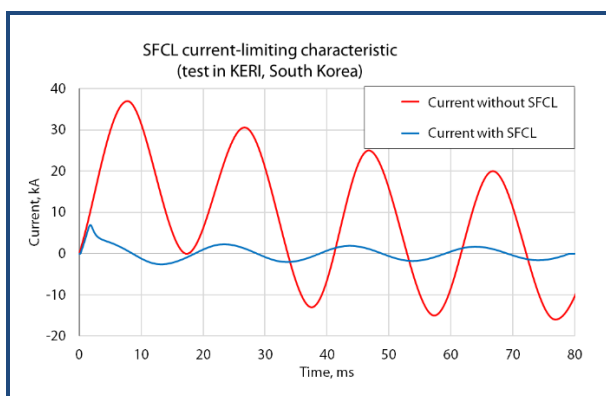
SFCL has zero resistance when the current is less than switching current and SFCL does not affect the network operation in nominal mode. The short circuit current causes an instant SFCL transition (less than 2 ms) into current limiting mode with high active resistance, which limits the current. After removing the short circuit, the resistance of the device gradually decreases to zero.

The device's transition from normal mode to the current limiting mode and back occurs exclusively when the switching current is exceeded and does not require control actions. Such behavior can be achieved only by using superconductor material which is the main operating element of the device.

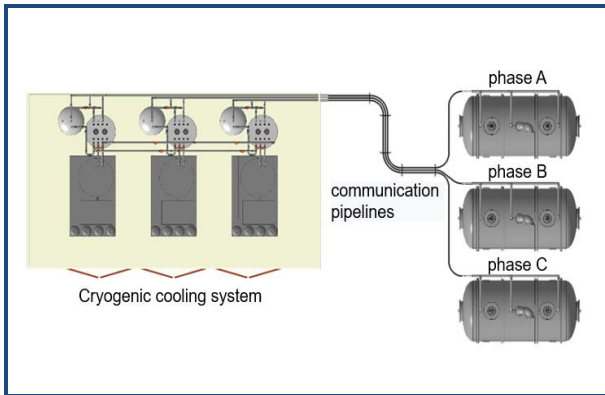


SPECIFICATION

Nominal voltage	110 kV	220 kV
Nominal frequency	50 Hz	
Nominal current	1000 - 1200 A	
Switching current, less than	3350 A	
Normal (superconducting) operation active resistance, less than	0,01 Ohm	
Current limitation active resistance, no less	20 Ohm	40 Ohm
Dimensions per phase (Length x Width x Height), less than	5,5x3x8m	5,5x3x12 m
Location of SFCL phase	Outdoor	
Power type	380 V	
Climatic category	from -45°C to +50°C	



FEATURES AND ADVANTAGES

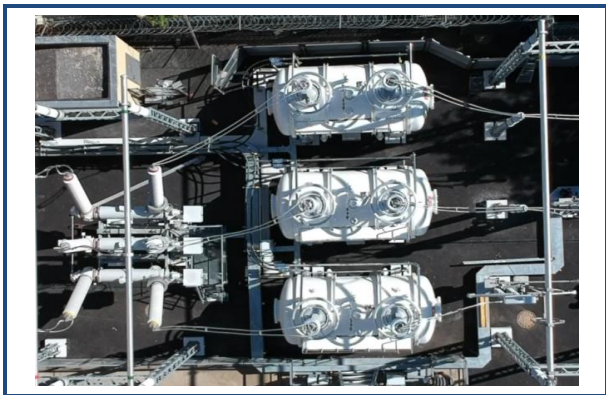


One SFCL set consists of:

1. 3 (three) single-phase units (phases),
2. Cryogenic cooling system,
3. Cryogenic control system,
4. Integral relay protection system.

SFCL technology enables to:

- Increase grid capacity;
- Reduce grid splitting;
- Reduce damage caused by fault currents;
- Reduce equipment requirements, reducing costs for renovation and new construction;
- Extend service life of equipment in use;
- Improve fire safety;
- Reduce losses;
- Improve quality of power supply.



QUALITY AND RELIABILITY

SFCL is tested according IEEE C37.302-2015 international test guide. The test program includes:

1. Acceptance tests in the international testing center, including:
 - Short-circuit current test,
 - Lightning impulse test,
 - Power frequency voltage withstand test,
 - Partial discharge test,
 - Heating rated current test.
2. Onsite tests:
 - Cooling system performance test,
 - Control system test,
 - High voltage test.
3. Grid compatibility tests:
 - Electromagnetic compatibility test,
 - Relay protection testing (RTDS).

EXPERIENCE AND REFERENCES

The designer and manufacturer of SFCL – CJSC SuperOx was founded in 2006. The company's production plant and office are in Moscow, Russia. In 2019, the company commissioned the first superconducting device in the Russian energy system – SFCL of 220 kV voltage class (Moscow, end user – city owned energy company JSC UNECO). The device is the most powerful SFCL in the world with rated power of 450 MW.

SuperOx

SUPERCONDUCTOR TO THE FUTURE

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