Surge protection for double-fed turbine

Surge Protective Devices (SPDs), intended to afford protection from electrical surges and spikes, including those caused directly and indirectly by lightning, are utilized as both complete devices and as components within electrical equipment installed in AC and DC power applications.

Wind turbine converts the wind's kinetic energy into electrical energy. Arrays of large turbines, known as wind farms, are becoming an increasingly important source of renewable energy and are used by many countries as part of a strategy to reduce their reliance on fossil fuels.

Wind turbines are tall, isolated towers composed of sensitive electronics, all of which are factors that make lightning a persistent and real threat. A properly installed lightning protection system, however, will intercept the lightning and effectively and safely conduct it to the earth without risking physical destruction to the wind turbine. This issue has become increasingly critical as wind turbine systems become more sophisticated and vulnerable to lightning, and that lightning dangers will increase with turbine height.

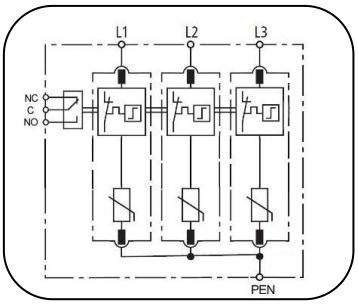
According to the updated National Fire Protection Association (NFPA) handbook:“While physical blade damage is the most expensive and disruptive damage caused by lightning, by far the most common is damage to the control system”. In Wind turbine system, there are many vulnerable electronics equipments which be damaged by lightning strikes or and transient over-voltages, such as:

- The control system, include sensors, actuators, and the motors for steering the equipment into the wind etc.
- The electronics, include transformer, frequency converter, switchgear elements, and other expensive, sensitive equipment.
- And Generators, battery subsystem etc.

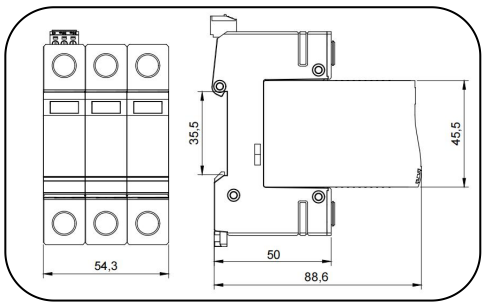
Properly installed surge protective devices (SPDs) will minimize the potential impact of lightning events.

690Vac Power system, Class II (T2) SPD

- BPS12.5V/1000(-S)/3P-WD



Basic circuit diagram



Dimension drawing

The BPS12.5V/1000(-S)/3P-WD is class II (or T2) prewired three poles SPD designed for high voltage power system lightning current & surge protection, used at the boundaries from lightning protection zone 1 -2 and higher.

For 690Vac wind turbine system, Uc as 1000Vac is recommended to realize the high voltage tolerance and temporary over-voltage (TOV) withstand level to prevent voltage fluctuations which may occur during operation in generator circuit.

With built in PROSURGE high energy MOV, BPS12.5V/1000(-S)/3P-WD ensures remarkable surge current discharge capacity up to 40kA 8/20μs. Also thanks to MOV technology, BPS12.5 models are not be affected by external environmental factors (e.g. humidity,salt mist etc.) and the property of the SPDs can be maintained for long term, it's an ideal solution for offshore wind turbines.

The unique design of thermal protection provides quick thermal response and secure disconnection, and a visual indication indicates the activation of thermal protection.

- Class II and T2 SPD per IEC/EN 61643-11 standard.
- Prewired three poles SPD ("3+0" circuit) for use in three phase 690Vac IT / TN-C systems
- 18mm narrow model design, pluggable module for easy replacement without the need to remove system wiring.
- Unique thermal disconnector design provides quick thermal response and secure disconnection
- Surge current capability up to 40kA 8/20μs
- Low voltage protection level
- High short-circuit current rating up to 50kArms, suitable for application in most AC power systems.
- Degradation failure indication and optional remote signal contact.
- Wide operating temperature -40° C ~85° C
- 35mm DIN-rail mounting
- Comply with UL1449 5th, IEEE C62.41,CSA C22.2 standards

Technical data

Part No.	BPS12.5V/1000(-S)/3P-WD
In accordance with	IEC/EN 61643-11:2011; UL1449 5th; EN50539-22
Category IEC/EU/VDE	I+ II /1+2/ B+C
Protection mode	L-PE, L-L
Nominal Voltage (AC) Un	690V, 3-Phase TN-C/IT
Power frequency	50/60Hz
Max. continuous operating voltage(AC) Uc	1000V
Nominal discharge current (8/20) In	20kA
Max. discharge current (8/20) Imax	40kA
Voltage protection level Up	4.0kV (L-PE)
Response time tA	≤25ns
Temporary overvoltage TOV U_T Withstand mode 5s	1200Vac
Temporary overvoltage TOV U_T failure mode 120min	1580Vac
Follow current & interrupt rating Ifi	No
Leakage current Ipe	0.1mA
Short-circuit current rating Isscr	50kArms
Backup fuse(only required if not already provided in mains)	≤125A gL/gG
Operating temperature range	-40ºC ~ +85ºC
Altitude	-500m ~ +4000m
Cross-section of connection wire (max)	Single-strand 35mm^2; multi-strand 25mm^2
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-3
Enclosure material	Thermoplastic; extinguishing degree UL94 V-0
Degree of protection	IP20
Installation width	3 modules, DIN 43880
Thermal disconnector	Internal Green – normal ; red - failure
Remote alarm contact	Optional
Approvals, Certifications	CE
Additional data for Remote Alarm Contacts	
Remote alarm contact type	Isolated Form C
Switching capability Un/In	AC: 250V/0.5A DC: 250V/0.1A; 125V/0.2A; 75V/0.5A
Cross-section of remote signaling wire	Max. 1.5mm^2(or # 16AWG)