



Surge Protective Device

Paperless Datasheet

Going green and protecting environment is manufacturers' responsibility. Each WatchfulEyE product has a link of downloading data sheet on its enclosure:
<http://datasheet.watchfuleyesolutions.com/US120329.html>

3D file download

http://www.watchfuleyesolutions.com/wth_rar/3D/WTH-165.STEP.zip

Model & Ordering Code

Model	Ordering Code	Remote Contacts	UPC/EAN Code	
WTH-165/B/R/1P-690	US120329	YES	-	
WTH-165/B/1P-690	US120319	NO	-	
Model with suffix	WTH-165/B/R/1P-690	x2pcs	x3pcs	x4pcs
Ordering Code	US120329	US120329x2	US120329x3	US120329x4
Model with suffix	WTH-165/B/1P-690	x2pcs	x3pcs	x4pcs
Ordering Code	US120319	US120319x2	US120319x3	US120319x4



Certificates of Products

CE RoHS IEC61643-11



Surge Protective Device

Description

In accordance with: IEC/EN61643-11 - Class I and UL1449 Type 4 Location

Location of use: main sub-distribution boards

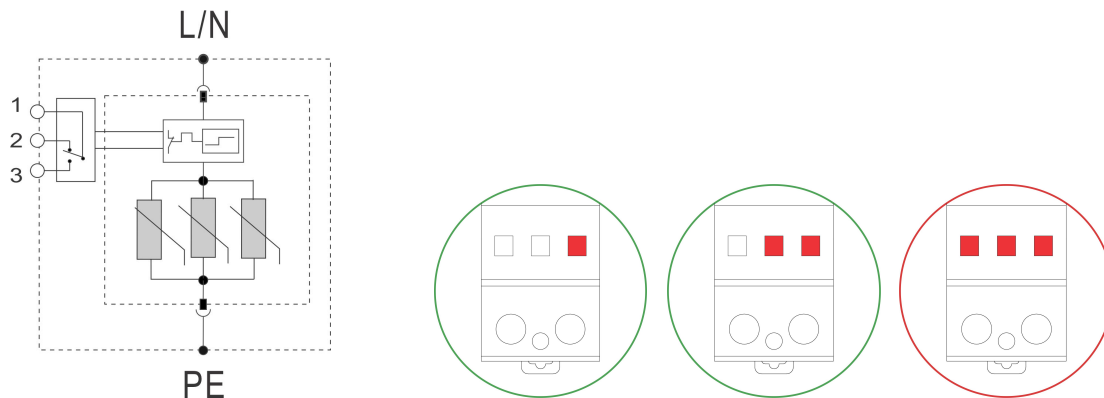
One-piece compact design with minimized volume but maximized capability of Class I surge protection.

Internal thermal disconnect devices help ensure safe or at end-of-life

WTH-165/B/R/1P-690 Series Technical Data

Requirement Class to IEC/EN61643-11	Class I
IEEE Category Rating	C & B
Maximum Continuous Operating Voltage (Uc/MCOV)	690VAC 50/60Hz
Nominal Discharge Current (In)	80kA
Max. Discharge Current (Imax)	165kA
Pulsed Current (Iimp)	17.5kA
Voltage Protection Level (Up)	3.3kV
Residual Voltage (Ures)	2.1kV
Protection Modes	L-PE, N-PE
Protective Element	High Energy MOV
Follow Current (If)	NO
Response Time (tA)	<5ns
Leakage Current (at 75%U1mA)	<20μA
Thermal Protection	YES
Protection Rating (IP Code)	IP 20
Short Circuit Current Ratings (SCCR)	25kA rms
Max. Back-up Fuse (if mains >160A)	160A gL (circuit-breaker: <100A)
Surge Life at 3kA (8/20μs)	>5000 events
Temperature Range	- 40°F to 176°F (-40°C to 80°C)
Relative Humidity	0% to 95% noncondensing
Maximum Operating Altitude	10,000 feet (3000m)
Terminal Cross Section	35mm ² (solid) / 25mm ² (stranded)
Stripping Length Contacts	0.6inches (15mm)
Terminal Screw Torque	Max. 3.5Nm
DIN Rail EN60715	35mm top-hat rail
Dimensions DIN 43880	36mm (2TE)
Housing Material	Thermoplastic (UL94 V-0)
Housing Design	One-piece compact design
Net Weight Per Unit	0.46Lb (209g)

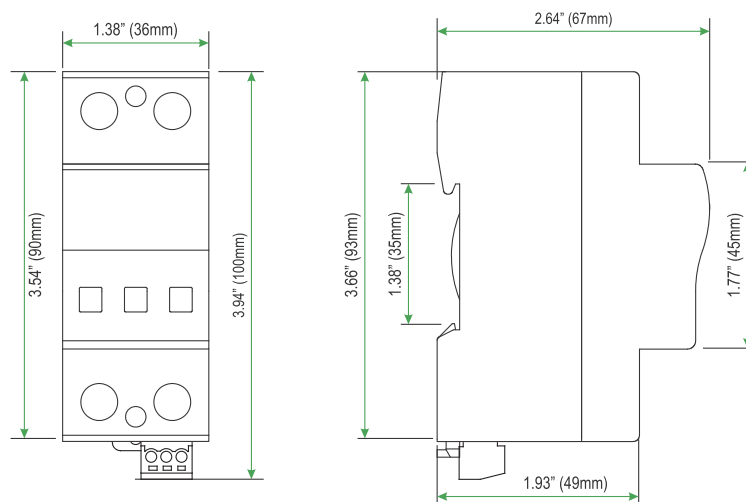
Surge Protection Connection Diagram



Indication of three levels of surge protection

With three MOVs' protection at the same time, the module can realize Class I surge protection; in case that two of the indicator windows indicates red, it can still meet Class II surge protection requirements.

Dimensions



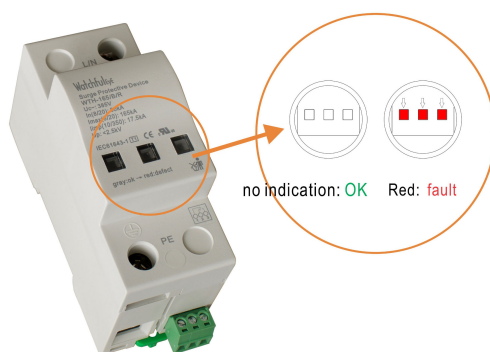
Remote Contacts (Dry Contacts)

- 1: COM (Common)
- 2: NC (Normally Close)
- 3: NO (Normally Open)



Contact Ratings	125VAC/3A, 250VAC/1.5A
Terminal Cross Section	Max. 1.5mm ²
Stripping Length Contacts	0.25 inches (6-7mm)
Remote Terminal Torque	0.25Nm

Fault Indication



Common Terms and Definitions

1. Normal operating voltage rating (U_n)
2. Maximum Continuous Operating Voltage (U_c /MCOV):
Maximum r.m.s. voltage, which may be continuously applied to the surge protective device's mode of protection.
3. Nominal Discharge Current for Class II Test (I_n):
crest value of the current through the surge protective device having a current waveshape of $8/20\mu s$.
4. Maximum Discharge Current (I_{max}):
Crest value of a current through the surge protective device having an $8/20\mu s$ waveshape and magnitude according to the manufacturers specification. I_{max} is equal to or greater than I_n .
5. Voltage Protection Level (U_p):
Maximum voltage to be expected at the surge protective device terminals due to an impulse stress with defined voltage steepness and an impulse stress with a discharge current with given amplitude and waveshape.
6. Residual Voltage (U_{res}):
Crest value of voltage that appears between the terminals of an surge protective device due to the passage of discharge current.
7. IEEE 62.41
CATEGORY C: outdoor overhead lines, service entrance (most severe)
CATEGORY B: major feeder, short branch circuits, service panel (indoor)
CATEGORY A: long branch circuits, receptacles (indoor) (least severe)

How to choose a suitable U_c (MCOV) value

Note: $U_c > 1.15U_n$

The relationship between two parameters U_c and U_p of a surge protective device is proportional.

If U_c is small, the value of U_p is also small; surge protective devices with smaller U_p can provide better surge protection.

Whether to choose smaller U_c depends on the voltage stability of the grid.

If you choose surge protective devices with smaller U_c for the grid with instable voltage, the surge protective devices will frequently work while the grid voltage fluctuates, resulting in shortening surge protective device's product life.

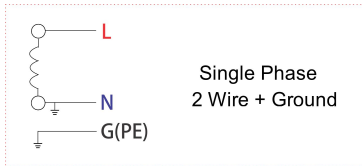
If you choose larger U_c , and the value of U_p is accordingly large, the surge protective efficiency will not be so fine.

If you are unsure of the voltage stability of the grid,

it is suggested to calculate MCOV(U_c) using the following formula: $\sqrt{2} U_n < U_c < \sqrt{3} U_n$

AC Network (U_n)	MCOV(U_c), L/N-PE Protection Mode
110V, 120/208V, 127/220V	150V
220/380V	275V, 320V, 385V
230/400V	275V, 320V, 385V, 420V
240/415V	320V, 385V, 420V
266/460V, 277/480V	385V, 420V
347/600V	550V, 690V
Wind Power System	690V (Grid side), 885V (Gen side)

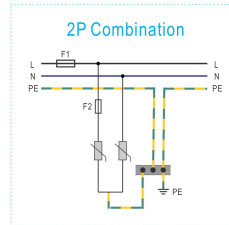
AC Network Connection Diagram



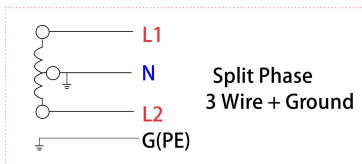
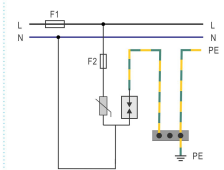
Single Phase
2 Wire + Ground

AC System Voltage

L-N:
110V, 120V, 127V



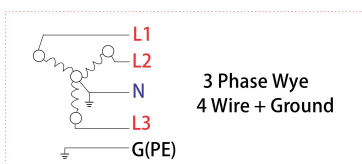
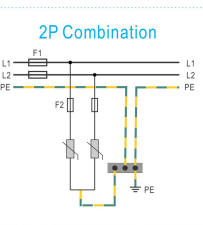
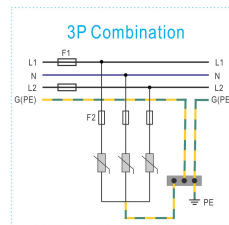
1P+NPE Combination



Split Phase
3 Wire + Ground

AC System Voltage

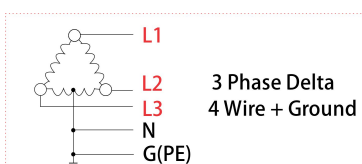
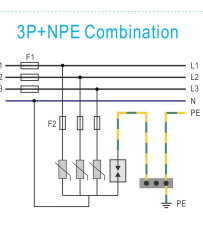
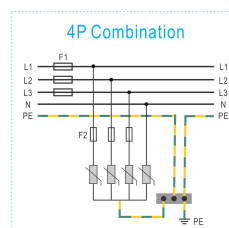
L-N/L-L:
120/240V
127/254V



3 Phase Wye
4 Wire + Ground

AC System Voltage

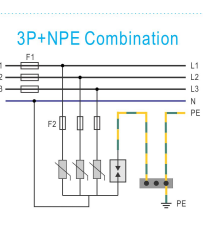
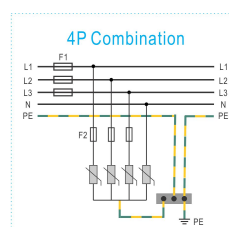
L-N/L-L:
120V/208Y
127V/220Y



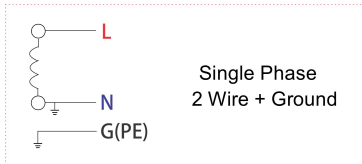
3 Phase Delta
4 Wire + Ground

AC System Voltage

L-N/L-L:
120/240V



Difference mode & Common mode Connection Diagram

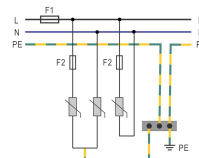


AC System Voltage

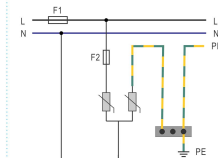
L-N:

110V, 120V, 127V
220V, 230V, 240V
277V, 480V

3P Full Protection



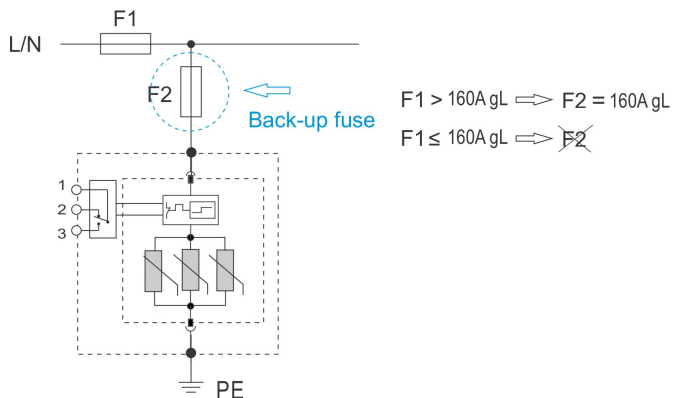
2P, L-N, N-PE Mode



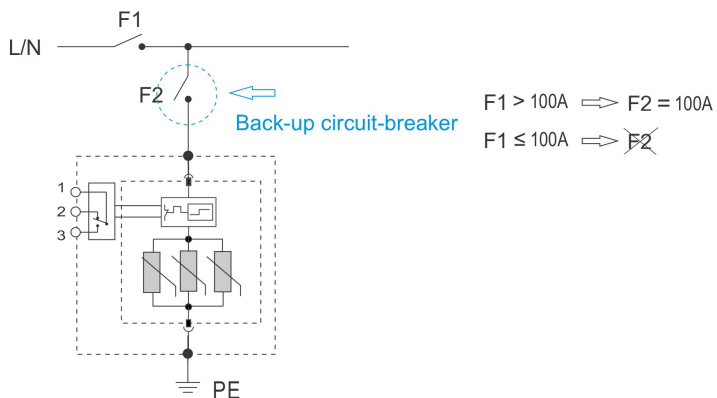
Common mode: L-PE, N-PE surge protection

Difference mode: L-N surge protection

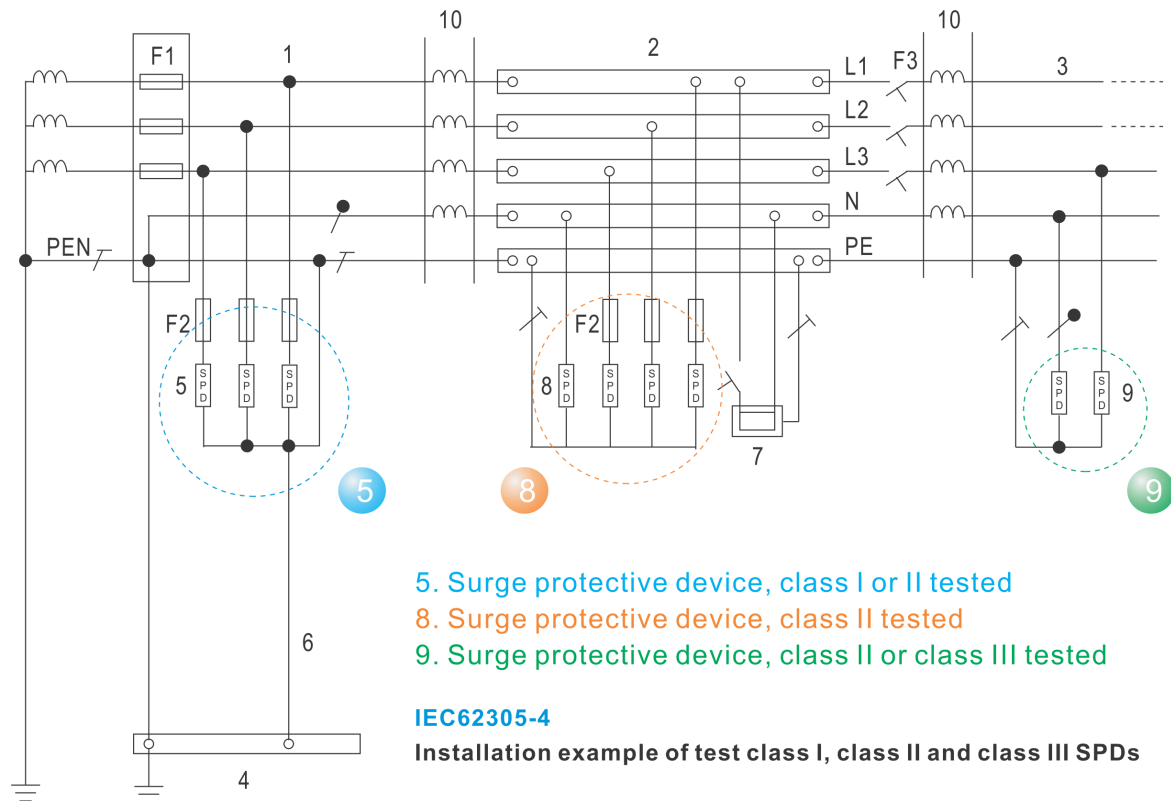
Selection of back-up fuse



Selection of back-up circuit-breaker



Application



Key

1. Origin of the installation
 2. Distribution board
 3. Distribution outlet
 4. Main earthing terminal or bar
 5. Surge protective device, class I or II tested
 6. Earthing connection (earthing conductor) of the surge protective device
 7. Fixed equipment to be protected
 8. Surge protective device, class II tested
 9. Surge protective device, class II or class III tested
 10. Decoupling element or line length
- F1, F2, F3 overcurrent protective disconnectors
- NOTE Refer to IEC 61643-12 for further information.



Surge Protective Device

N-PE Module (Model: WTH-165/G/1P-255 Ordering Code: US120289)

WTH-165/G module integrates High-Energy GDT, no leakage current. It pairs WTH-165/B/R series surge protector, combined into N-PE protection mode, the two modules are the same in dimension and shape, and are connected with a dedicated bus-bar to achieve a perfect combination.

WTH-165/G Series Technical Data

Max. continuous operating voltage (Uc)	255V
Nominal Discharge Current (In)	80kA
Max. Discharge Current (Imax)	165kA
Pulsed Current (Iimp)	52.5kA
Voltage protection level (Up)	1.5kV
Protection Modes	N-PE only
Protective Element	High Energy GDT
Follow Current (If)	100A rms
Response Time (tA)	<100ns
Net Weight Per Unit	0.4Lb (180g)

3P + NPE Combintion Package

Model with suffix	Ordering Code	Model with suffix	Ordering Code
WTH-165/B/R/1P-690 x3pcs +NPE	US120329x3N	WTH-165/B/1P-690 x3pcs +NPE	US120319x3N

1P + NPE Combintion Package

Model with suffix	Ordering Code	Model with suffix	Ordering Code
WTH-165/B/R/1P-690 +NPE	US120329x1N	WTH-165/B/1P-690 +NPE	US120319x1N



Surge Protective Device

FAQ & Help

1. What should I do if I can't find the paper manual in the product packaging?

Watchful Eye products is committed to going green with paperless data sheets. On the side of each product enclosure is an engraved link with URL for downloading paperless data sheet and QR code of the website. If you need the paper data sheet, you can open the link and print the data sheet by yourself.

2. The advantages of fault indication windows?

If surge protection fails, the fault indication windows will turn red, thus it can be seen intuitively, and the surge protective device can be replaced in time to avoid damage to the equipment caused by a second surge.

3. What instruments can be used to test whether its surge protection function is normal or not?

Test with a Watchful Eye surge protector tester

4. How to connections of the SPD?

Please refer to the standard IEC 60364-5-53

Connecting conductors of SPDs:

Conductors between the SPD and the main earthing terminal or the protective conductor shall have a cross-sectional area not less than: - 6 mm² copper or equivalent for class II tested SPDs installed at or near the origin of the installation;

- 16 mm² copper or equivalent for class I tested SPDs installed at or near the origin of the installation.

a) L/N to surge protector copper recommended diameter: 7AWG (10mm²), minimum: 6mm²

b) surge protector to PE copper recommended diameter: 5AWG (16mm²), minimum: 10mm²

(a+b) ≤ 0.5m

5. Can you list more applications?

Power supply panel, whole house



Surge Protective Device

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After-sale Services

Watchful Eye provides a 5-year quality warranty globally.

[I have a question](#)