WatchfulEyE

# Surge Protective Device


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# 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/US120324.html

## 3D file download

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

## Model & Ordering Code

| Model | Ordering Code | MCOV/Uc | Remote Contacts | UPC/EAN Code |
|---|---|---|---|---|
| WTH-165/B/R/1P-275 | US120324 | 275VAC | YES | (0) 811914031000 |
| WTH-165/B/1P-275 | US120314 | | NO | (0) 811914031055 |
| WTH-165/B/R/1P-320 | US120325 | 320VAC | YES | (0) 811914031017 |
| WTH-165/B/1P-320 | US120315 | | NO | (0) 811914031062 |
| WTH-165/B/R/1P-385 | US120326 | 385VAC | YES | (0) 811914031024 |
| WTH-165/B/1P-385 | US120316 | | NO | (0) 811914031079 |
| WTH-165/B/R/1P-420 | US120327 | 420VAC | YES | (0) 811914031031 |
| WTH-165/B/1P-420 | US120317 | | NO | (0) 811914031086 |

## Certificates of Products

LISTED E345944 CE RoHS IEC61643-11

Note: MCOV 385VAC UL listed only

## More Package

| Model with suffix | WTH-165/B/R/1P-275 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120324 | US120324x2 | US120324x3 | US120324x4 |

| Model with suffix | WTH-165/B/1P-275 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120314 | US120314x2 | US120314x3 | US120314x4 |

| Model with suffix | WTH-165/B/R/1P-320 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120325 | US120325x2 | US120325x3 | US120325x4 |

| Model with suffix | WTH-165/B/1P-320 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120315 | US120315x2 | US120315x3 | US120315x4 |

| Model with suffix | WTH-165/B/R/1P-385 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120326 | US120326x2 | US120326x3 | US120326x4 |

| Model with suffix | WTH-165/B/1P-385 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120316 | US120316x2 | US120316x3 | US120316x4 |

| Model with suffix | WTH-165/B/R/1P-420 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120327 | US120327x2 | US120327x3 | US120327x4 |

| Model with suffix | WTH-165/B/1P-420 | x2pcs | x3pcs | x4pcs |
|---|---|---|---|---|
| Ordering Code | US120317 | US120317x2 | US120317x3 | US120317x4 |

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# Surge Protective Device

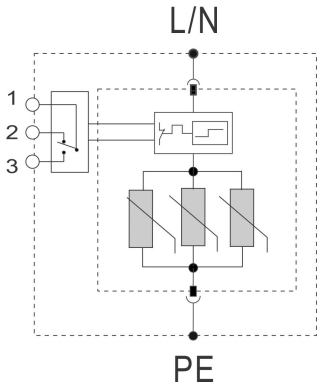
## Description

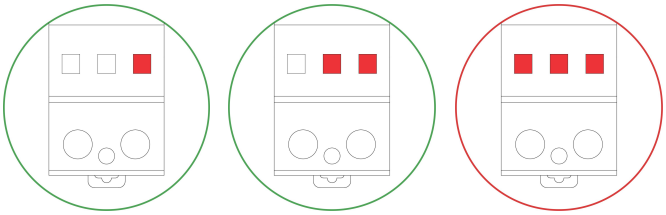
In accordance with: IEC/EN61643-11 - Class I and UL1449 Type 4 Location
Location of use: main sub-distribution boards
One-piece compact design with minimized volume but maximized capability of Class I surge protection.
Internal thermal disconnect devices help ensure safe or at end-of-life

| WTH-165/B/R/1P Series Technical Data | |
|---|---|
| Requirement Class to IEC/EN61643-11 | Class I |
| IEEE Category Rating | C & B |
| Nominal Discharge Current (In) | 80kA |
| Max. Discharge Current (Imax) | 165kA |
| Pulsed Current (Iimp) | 17.5kA |
| 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 | 35mm² (solid) / 25mm² (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 Protective Device

## Surge Protection Connection Diagram

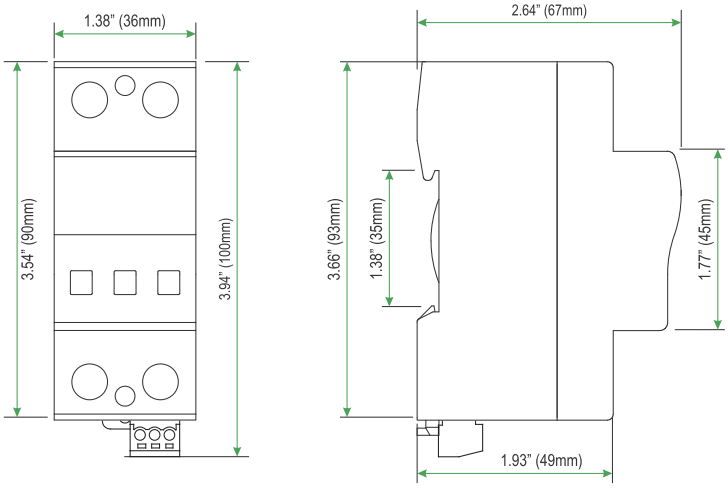


Indication of three levels of surge protection
With three MOVs' protection at the same time, the module can realize Class I surge protection; in case that two of the indicator windows indicates red, it can still meet Class II surge protection requirements.

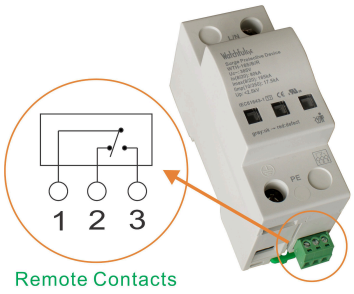
| Maximum Continuous Operating Voltage (MCOV/Uc) | 275VAC | 320VAC | 385VAC | 420VAC |
|---|---|---|---|---|
| Voltage Protection Level (Up) | 2.3kV | 2.4kV | 2.5kV | 2.7kV |
| Residual Voltage (Ures) | 1.0kV | 1.1kV | 1.2kV | 1.4kV |

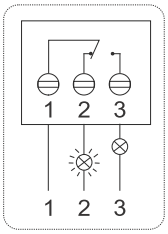
## Dimensions



## Remote Contacts (Dry Contacts)

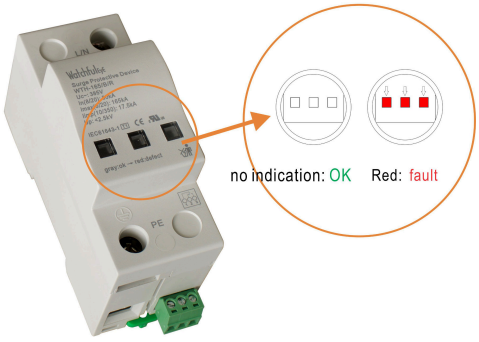
1: COM (Common)
2: NC (Normally Close)
3: NO (Normally Open)




| | |
|---|---|
| Contact Ratings | 125VAC/3A, 250VAC/1.5A |
| Terminal Cross Section | Max. 1.5mm² |
| Stripping Length Contacts | 0.25 inches (6-7mm) |
| Remote Terminal Torque | 0.25Nm |

## Fault Indication



## Common Terms and Definitions

1. Normal operating voltage rating (Un)
2. Maximum Continuous Operating Voltage (Uc/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 (In):
crest value of the current through the surge protective device having a current waveshape of 8/20μs.
4. Maximum Discharge Current (Imax):
Crest value of a current through the surge protective device having an 8/20μs waveshape and magnitude according to the manufacturers specification. Imax is equal to or greater than In.
5. Voltage Protection Level (Up):
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 (Ures):
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)

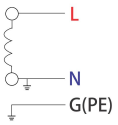
## How to choose a suitable Uc(MCOV) value

Note: Uc >1.15Un
The relationship between two parameters Uc and Up of a surge protective device is proportional.
If Uc is small, the value of Up is also small; surge protective devices with smaller Up can provide better surge protection.
Whether to choose smaller Uc depends on the voltage stability of the grid.
If you choose surge protective devices with smaller Uc 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 Uc, and the value of Up 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(Uc) using the following formula: $\sqrt{2}$ Un < Uc < $\sqrt{3}$ Un

| AC Network (Un) | MCOV(Uc), 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 (1/2)

1



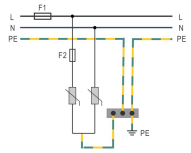

Single Phase
2 Wire + Ground

AC System Voltage

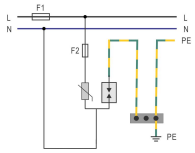
L-N:

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

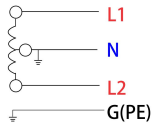
2P Combination



1P+NPE Combination



2



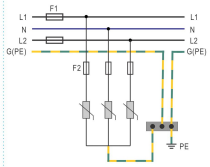

Split Phase
3 Wire + Ground

AC System Voltage

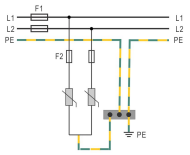
L-N/L-L:

120/240Y
127/254V
240/480V
277/480V

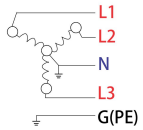
3P Combination



2P Combination



3



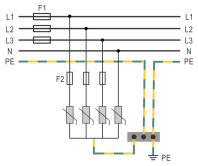

3 Phase Wye
4 Wire + Ground

AC System Voltage

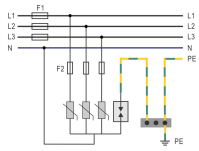
L-N/L-L:

120V/208Y
127V/220Y
220V/380Y
230V/400Y
240V/415Y
277V/480Y
347V/600Y

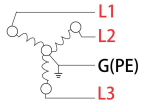
4P Combination



3P+NPE Combination



4



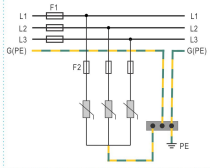

3 Phase Wye
3 Wire + Ground

AC System Voltage

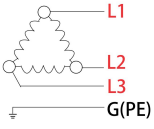
L-L:

480V

3P Combination



5



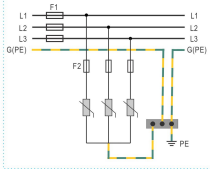

3 Phase Delta
3 Wire + Ground

AC System Voltage

L-L:

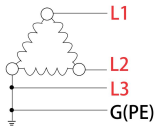
240V
480V
600V

3P Combination



## AC Network Connection Diagram (2/2)

6



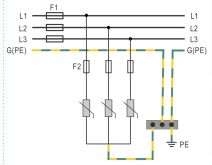

3 Phase Delta
3 Wire + Ground

AC System Voltage

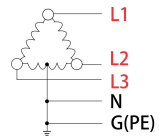
L-L:

240V
480V
600V

3P Combination




7



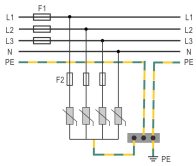

3 Phase Delta
4 Wire + Ground

AC System Voltage

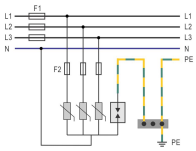
L-N/L-L:

120/240V
240/480V

4P Combination

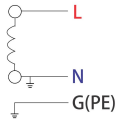



3P+NPE Combination




## Difference mode & Common mode Connection Diagram

8



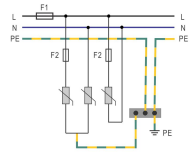

Single Phase
2 Wire + Ground

AC System Voltage

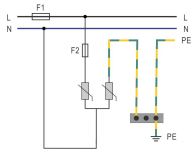
L-N:

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

3P Full Protection



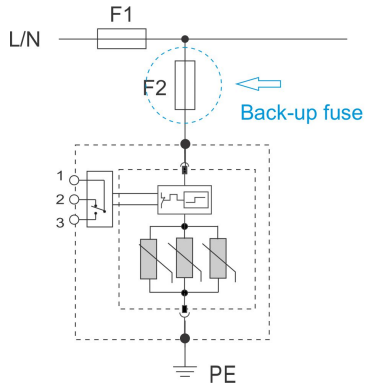

2P, L-N, N-PE Mode




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

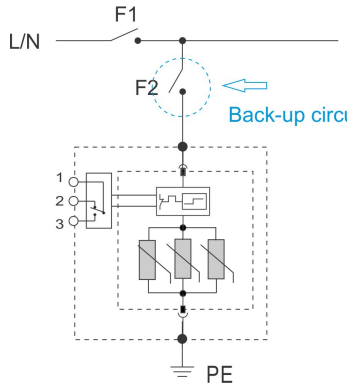
.

## Selection of back-up fuse




F1 > 160A gL ⇨ F2 = 160A gL
F1 ≤ 160A gL ⇨ ~~F2~~

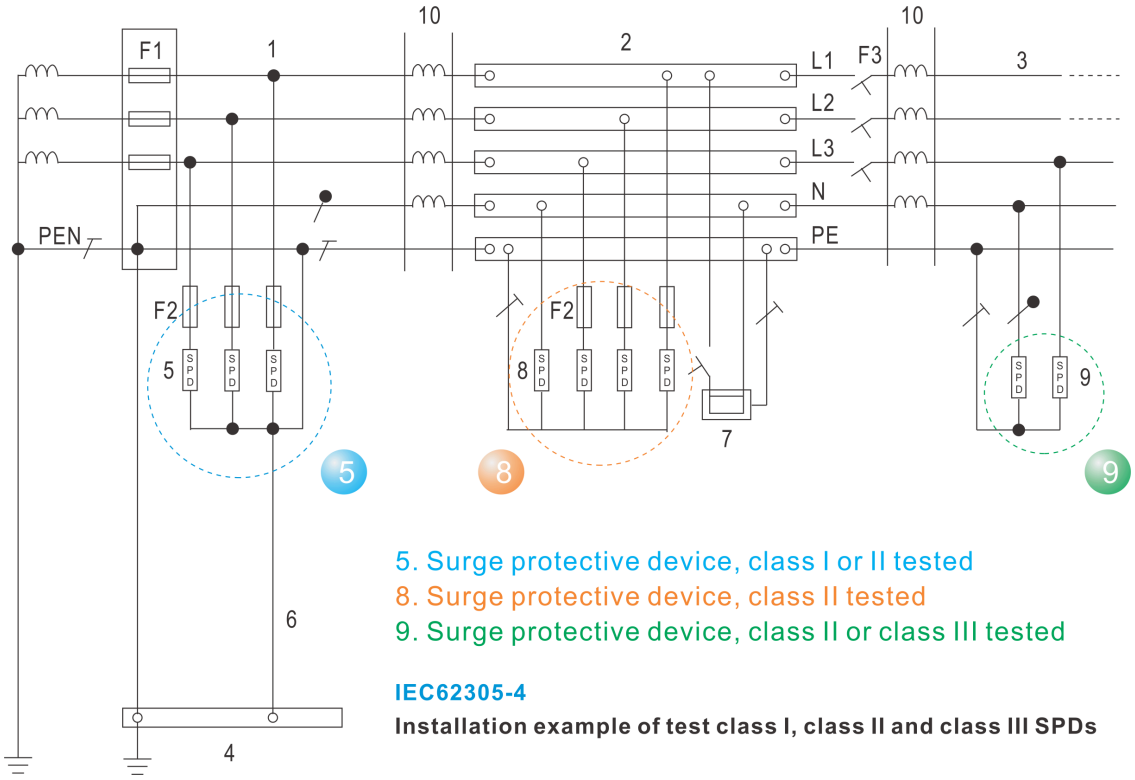
## Selection of back-up circuit-breaker




F1 > 100A ⇨ F2 = 100A
F1 ≤ 100A ⇨ ~~F2~~

.

## Application




5. Surge protective device, class I or II tested
8. Surge protective device, class II tested
9. Surge protective device, class II or class III tested

**IEC62305-4**

**Installation example of test class I, class II and class III SPDs**

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.

## 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-275 x3pcs +NPE | US120324x3N | | WTH-165/B/1P-275 x3pcs +NPE | US120314x3N |
| WTH-165/B/R/1P-320 x3pcs +NPE | US120325x3N | | WTH-165/B/1P-320 x3pcs +NPE | US120315x3N |
| WTH-165/B/R/1P-385 x3pcs +NPE | US120326x3N | | WTH-165/B/1P-385 x3pcs +NPE | US120316x3N |
| WTH-165/B/R/1P-420 x3pcs +NPE | US120327x3N | | WTH-165/B/1P-420 x3pcs +NPE | US120317x3N |

## 1P + NPE Combintion Package

| Model with suffix | Ordering Code | | Model with suffix | Ordering Code |
|---|---|---|---|---|
| WTH-165/B/R/1P-275 +NPE | US120324x1N | | WTH-165/B/1P-275 +NPE | US120314x1N |
| WTH-165/B/R/1P-320 +NPE | US120325x1N | | WTH-165/B/1P-320 +NPE | US120315x1N |
| WTH-165/B/R/1P-385 +NPE | US120326x1N | | WTH-165/B/1P-385 +NPE | US120316x1N |
| WTH-165/B/R/1P-420 +NPE | US120327x1N | | WTH-165/B/1P-420 +NPE | US120317x1N |

## 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

## Download WatchfulEyE Official App

To learn about more products and updates from company, please scan QR code to download the official App:

## After-sale Services

Watchful Eye provides a 5-year quality warranty globally.

I have a question