

### 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/US220199.html>

### 3D file download

[http://www.watchfuleyesolutions.com/wth\\_rar/3D/WTH-40\\_1P.STEP.zip](http://www.watchfuleyesolutions.com/wth_rar/3D/WTH-40_1P.STEP.zip)

### Model & Ordering Code

| Model             | Ordering Code | Remote Contacts | UPC/EAN Code |  |
|-------------------|---------------|-----------------|--------------|--|
| WTH-20/D/R/1P-690 | US120199      | YES             | -            |  |
| WTH-20/D/1P-690   | US120189      | NO              | -            |  |

| Model with suffix | WTH-20/D/R/1P-690 | x2pcs      | x3pcs      | x4pcs      |
|-------------------|-------------------|------------|------------|------------|
| Ordering Code     | US220099          | US220099x2 | US220099x3 | US220099x4 |

| Model with suffix | WTH-20/D/1P-690 | x2pcs      | x3pcs      | x4pcs      |
|-------------------|-----------------|------------|------------|------------|
| Ordering Code     | US120189        | US120189x2 | US120189x3 | US120189x4 |



### Certificates of Products

**CE RoHS** IEC61643-11



## Surge Protective Device

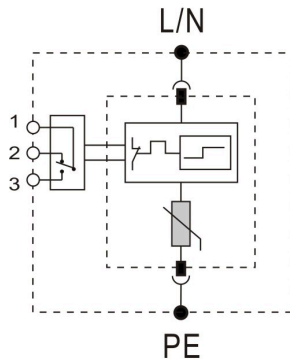
### Description

In accordance with: IEC/EN61643-11 - Class II and UL1449 Type 4 Location  
Location of use: branch sub-distribution boards  
Plug-in module and separate base design enables convenient maintenance.  
Internal thermal disconnect devices help ensure safe or at end-of-life

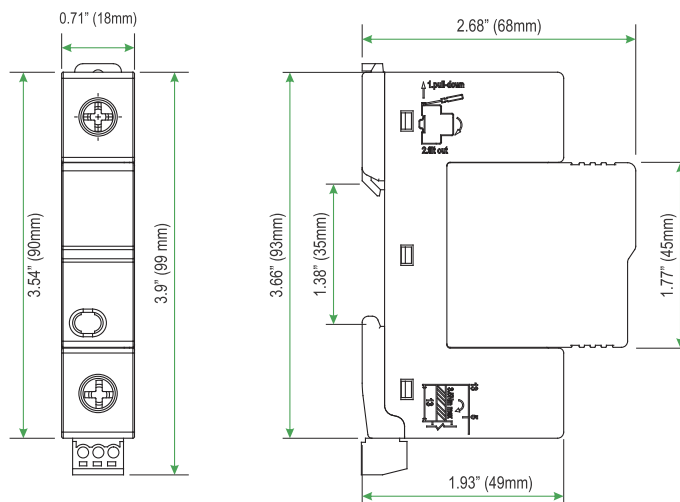
### WTH-20/D/R/1P-690 Series Technical Data

|                                                |                                                          |
|------------------------------------------------|----------------------------------------------------------|
| Requirement Class to IEC/EN61643-11            | Class III                                                |
| IEEE Category Rating                           | B & A                                                    |
| Maximum Continuous Operating Voltage (Uc/MCOV) | 690VAC 50/60Hz                                           |
| Nominal Discharge Current (In)                 | 10kA                                                     |
| Max. Discharge Current (Imax)                  | 20kA                                                     |
| Voltage Protection Level (Up)                  | 2.4kV                                                    |
| Residual Voltage (Ures)                        | 2.1kV                                                    |
| Open circuit voltage (Uoc)                     | 20kV                                                     |
| Protection Modes                               | L-PE, N-PE                                               |
| Protective Element                             | 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 >80A)              | 80A gL (circuit-breaker: <40A)                           |
| 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 <sup>2</sup> (solid) / 25mm <sup>2</sup> (stranded) |
| Stripping Length Contacts                      | 0.6inches (15mm)                                         |
| Terminal Screw Torque                          | Max. 3.5Nm                                               |
| DIN Rail EN60715                               | 35mm top-hat rail                                        |
| Dimensions DIN 43880                           | 18mm (1TE)                                               |
| Housing Material                               | Thermoplastic (UL94 V-0)                                 |
| Housing Design                                 | Modular design                                           |
| Net Weight Per Unit                            | 0.3Lb (136g)                                             |

### Surge Protection Connection Diagram

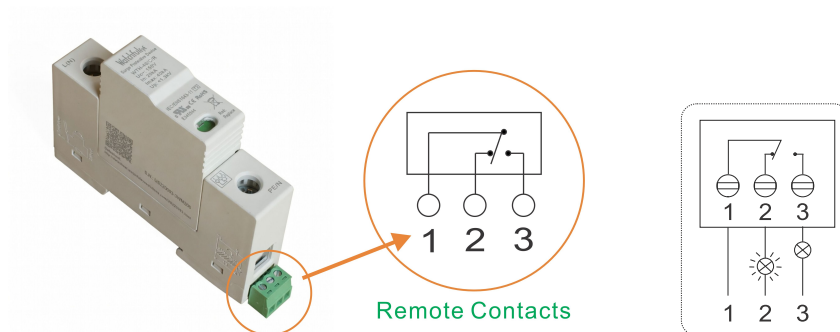


### Dimensions



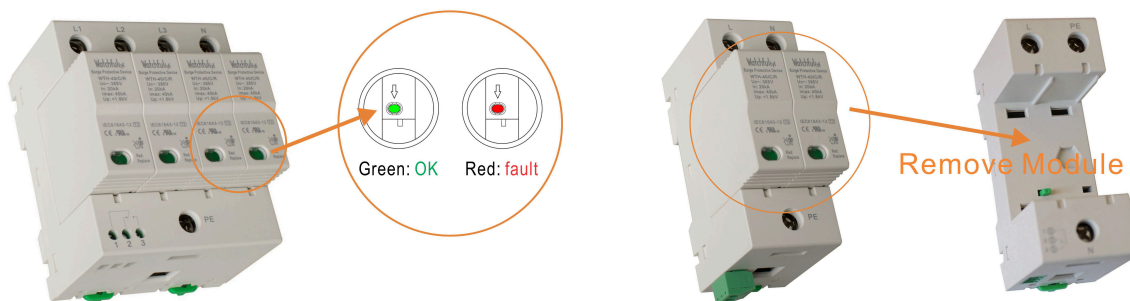
### Remote Contacts (Dry Contacts)

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



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

### Fault Indication (same indication in 1P/2P/3P/4P/1P+NPE/3P+NPE models)



### 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 (1/2)

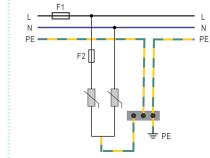
1



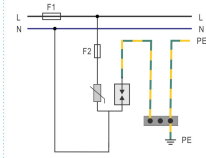
#### AC System Voltage

L-N:  
110V, 120V, 127V  
220V, 230V, 240V  
277V, 480V

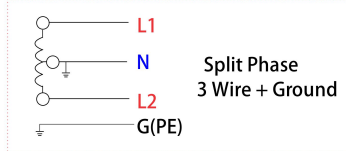
#### 2P Combination



#### 1P+NPE Combination



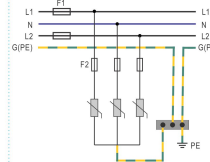
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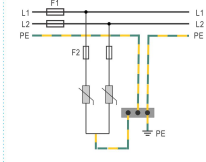
#### AC System Voltage

L-N/L-L:  
120/240V  
127/254V  
240/480V  
277/480V

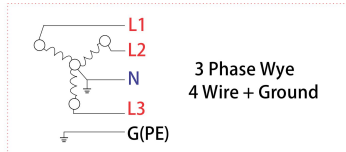
#### 3P Combination



#### 2P Combination



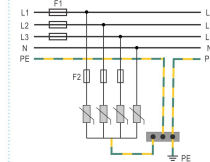
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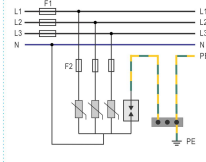
#### AC System Voltage

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

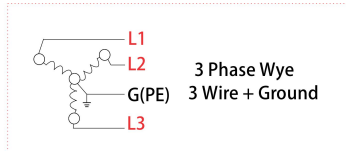
#### 4P Combination



#### 3P+NPE Combination



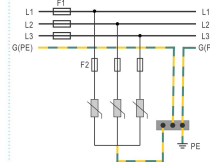
4



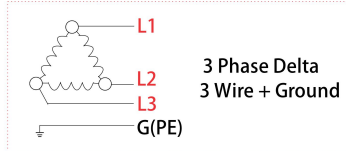
#### AC System Voltage

L-L:  
480V

#### 3P Combination



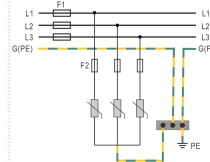
5



#### AC System Voltage

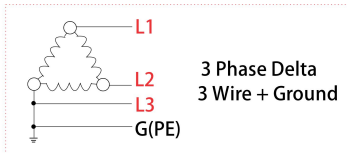
L-L:  
240V  
480V  
600V

#### 3P Combination



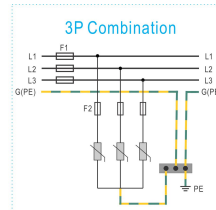
### AC Network Connection Diagram (2/2)

6

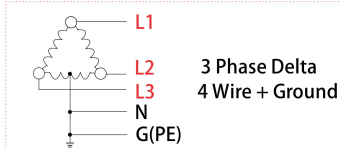


AC System Voltage

L-L:  
240V  
480V  
600V

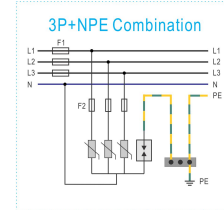
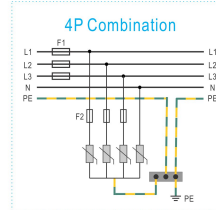


7



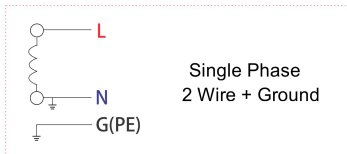
AC System Voltage

L-N/L-L:  
120/240V  
240/480V



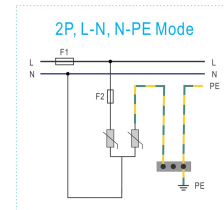
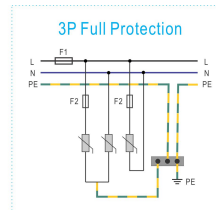
### Difference mode & Common mode Connection Diagram

8



AC System Voltage

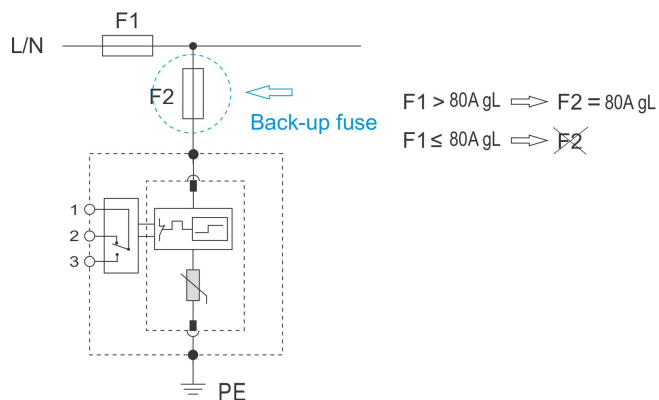
L-N:  
110V, 120V, 127V  
220V, 230V, 240V  
277V, 480V



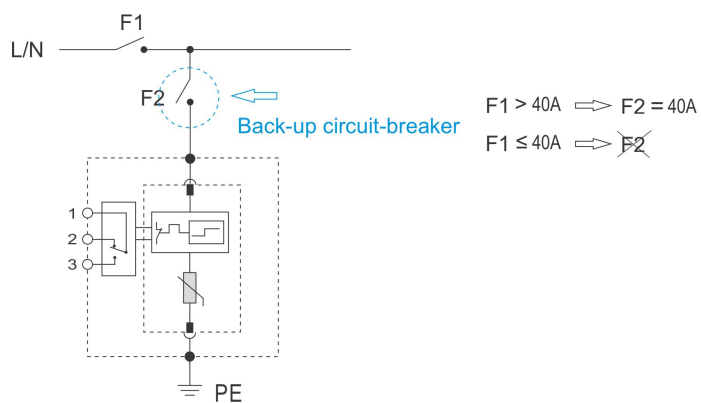
Common mode: L-PE, N-PE surge protection

Difference mode: L-N surge protection

### Selection of back-up fuse

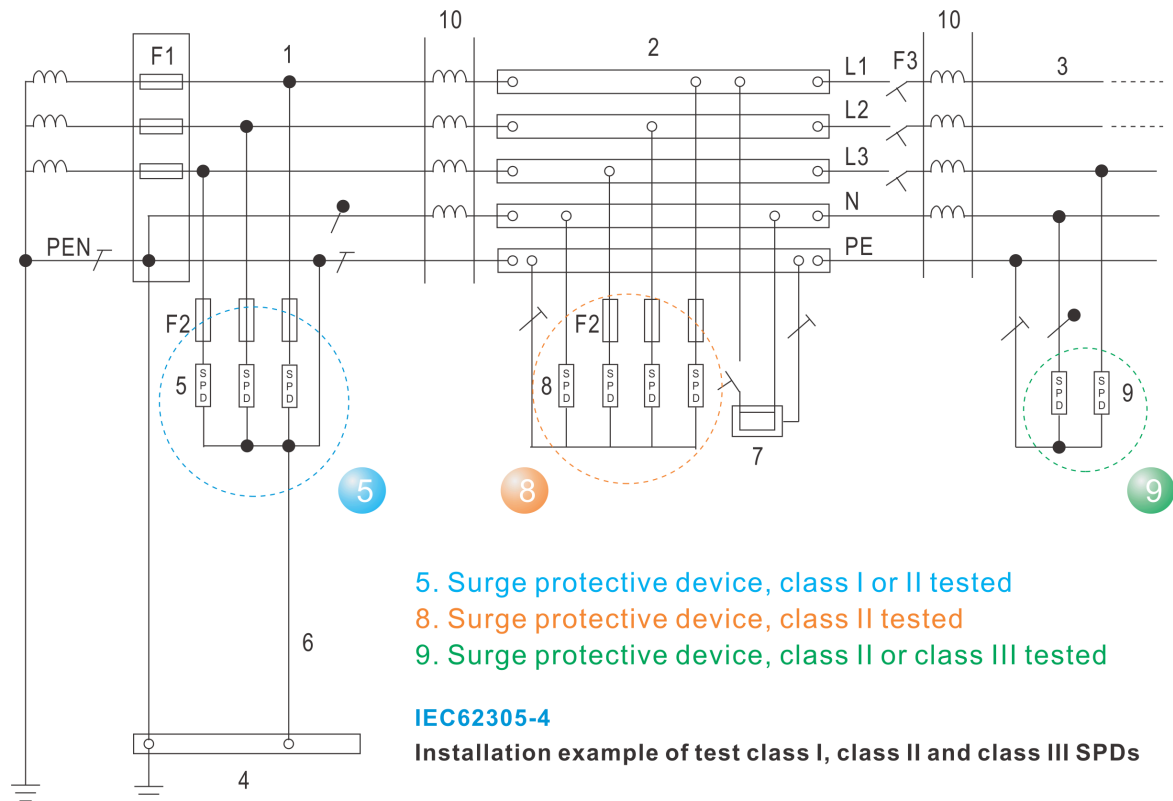


### Selection of back-up circuit-breaker





### 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

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### 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 mm<sup>2</sup> copper or equivalent for class II tested SPDs installed at or near the origin of the installation;

- 16 mm<sup>2</sup> 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 (10mm<sup>2</sup>), minimum: 6mm<sup>2</sup>

b) surge protector to PE copper recommended diameter: 5AWG (16mm<sup>2</sup>), minimum: 10mm<sup>2</sup>

(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](#)