

# Power supply systems in North America / USA

- Overview and specialties
- Most Common power supply systems in detail
- Rare power supply systems in detail

## Overview and requirements

- There are different type of power supply networks in North America in regards to their
  - design (e.g. wye, delta)
  - grounding (ungrounded, grounded, high impedance grounded)
- Generally, all voltages occurring in these network types are indicated (phase to phase / phase to ground)
- Also the ground connection and the circuit on the secondary side of the transformer are indicated
- Abbreviations and Indictaions of number of wires:
  - Number of phase wires: “**phase**”, “**p**”, or “**∅**”
  - Total number of wires: “**wire**” or “**w**”

### Example of voltage ratings:

- **slash rating: 480Y/277V; 3∅4w**
- **straight rating: 480V; 3p; 3w**

## Overview and requirements

### UL508A requires:

1.) For an industrial control panel with a slash voltage rating, *the input terminals* shall be marked:  
**“For use on a solidly grounded wye source only”**

2.) The voltage rating of an industrial control panel shall not exceed the voltage rating of any component connected to the source of supply. When an industrial control panel contains components marked with a slash voltage rating, **such as 120/240, 480Y/277, or 600Y/347**, the voltage rating of the industrial control panel shall be:

a) **The complete slash voltage rating**, when intended for connection to the higher voltage; or

b) **Not more than the lower voltage rating**

## Overview and requirements

### NFPA79 requires:

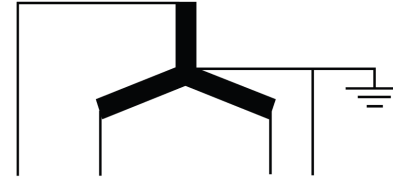
A *circuit breaker, self-protected combination motor, controller, or a manual motor controller* **marked with a slash rating, such as 120/240V or 480Y/277V**, shall be applied in a **solidly grounded circuit** where:

- the nominal **voltage of any conductor to ground does not exceed the lower voltage rating**
- and **the nominal voltage between any two conductors does not exceed the higher voltage rating.**

When ***slash-rated devices*** are connected to the supply circuit of the machine, the ***nameplate voltage rating shall not exceed the lower voltage rating or shall include the complete slash rating.***

# Most Important Network Types in Detail

## Grounded wye / solidly grounded wye



**SIEMENS**

### Slash rating:

- e.g.: 480Y/277V, solidly grounded wye
- 3 phase; 4 wire
- 3 phase; 3 wire

### Possible devices

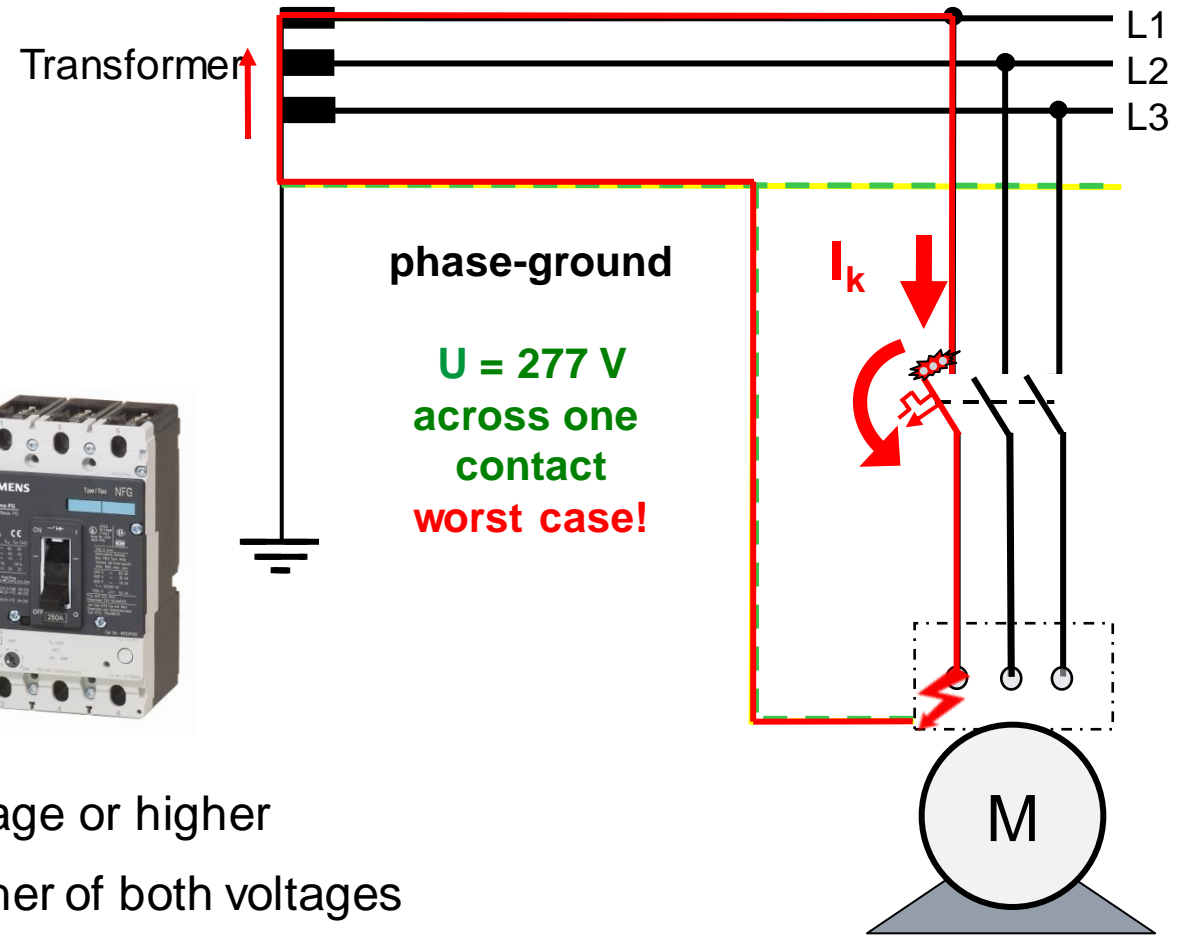
480Y/277V; 600/347V

480V; 600V



3p, 4w / grounded

480Y/277V AC

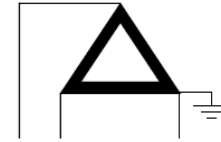


### Note:

- All devices having a slash rating with the indicated voltage or higher
- All devices having a straight rating with at least the higher of both voltages

# Most Important Network Types in Detail

## Corner grounded delta



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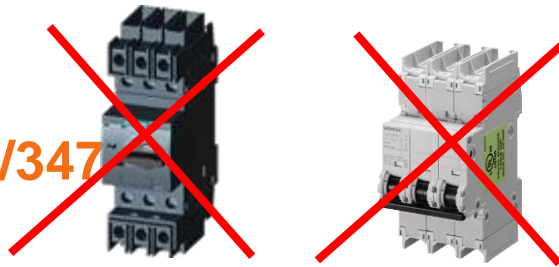
### Straight (Delta) rating:

- e.g.: 480V / 3 phase - 3 wire



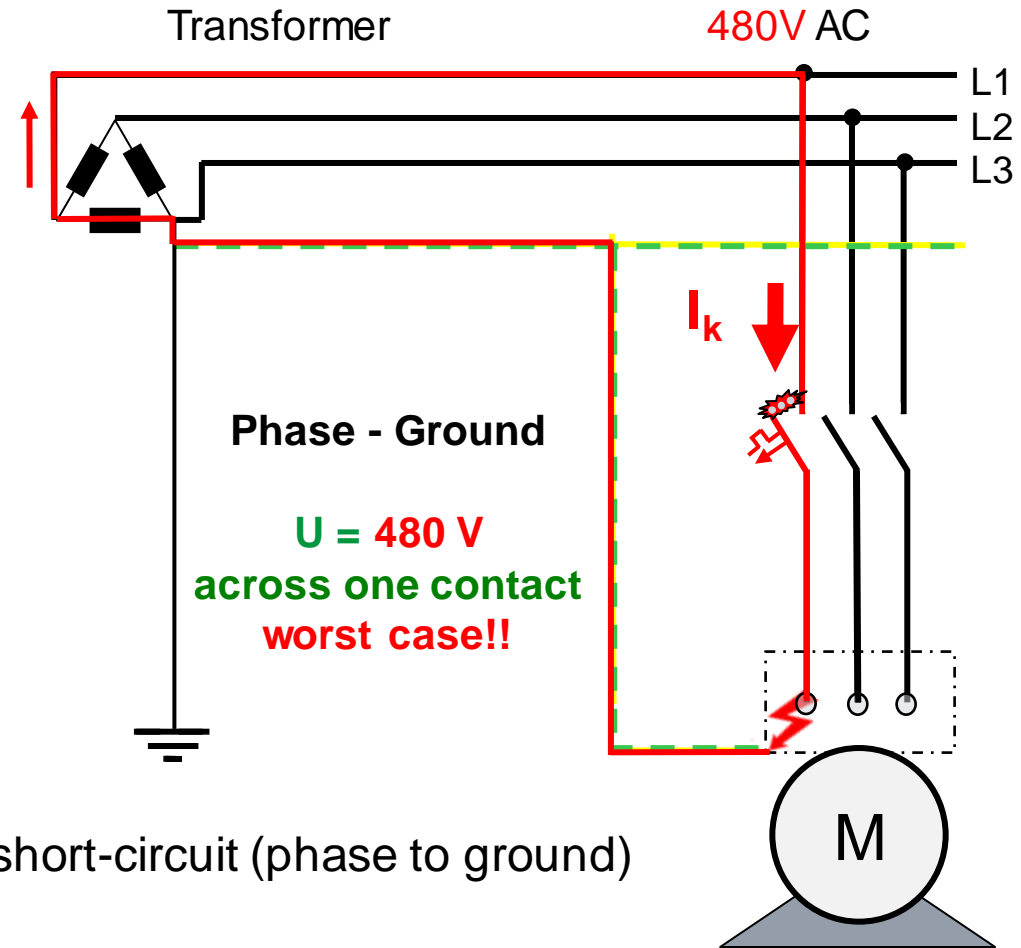
Possible devices in this example: 480V; 600v

Do not use: 480Y/277V; 600Y/347



### Note:

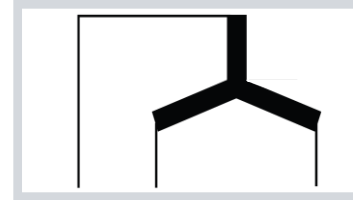
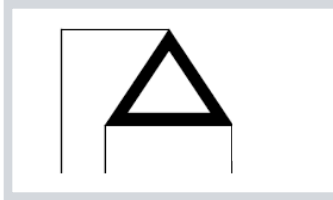
- The devices switch full (=high) voltage at the **first** single pole short-circuit (phase to ground)



The following applies to this network in principle: Only devices with *straight rating* must be used!

# Most Important Network Types in Detail

Ungrounded delta - Ungrounded wye



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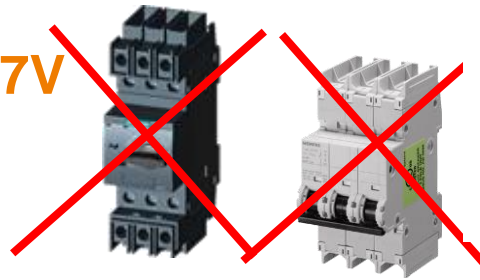
## Straight rating:

- e.g.: 480V / 3 phase - 3 wire



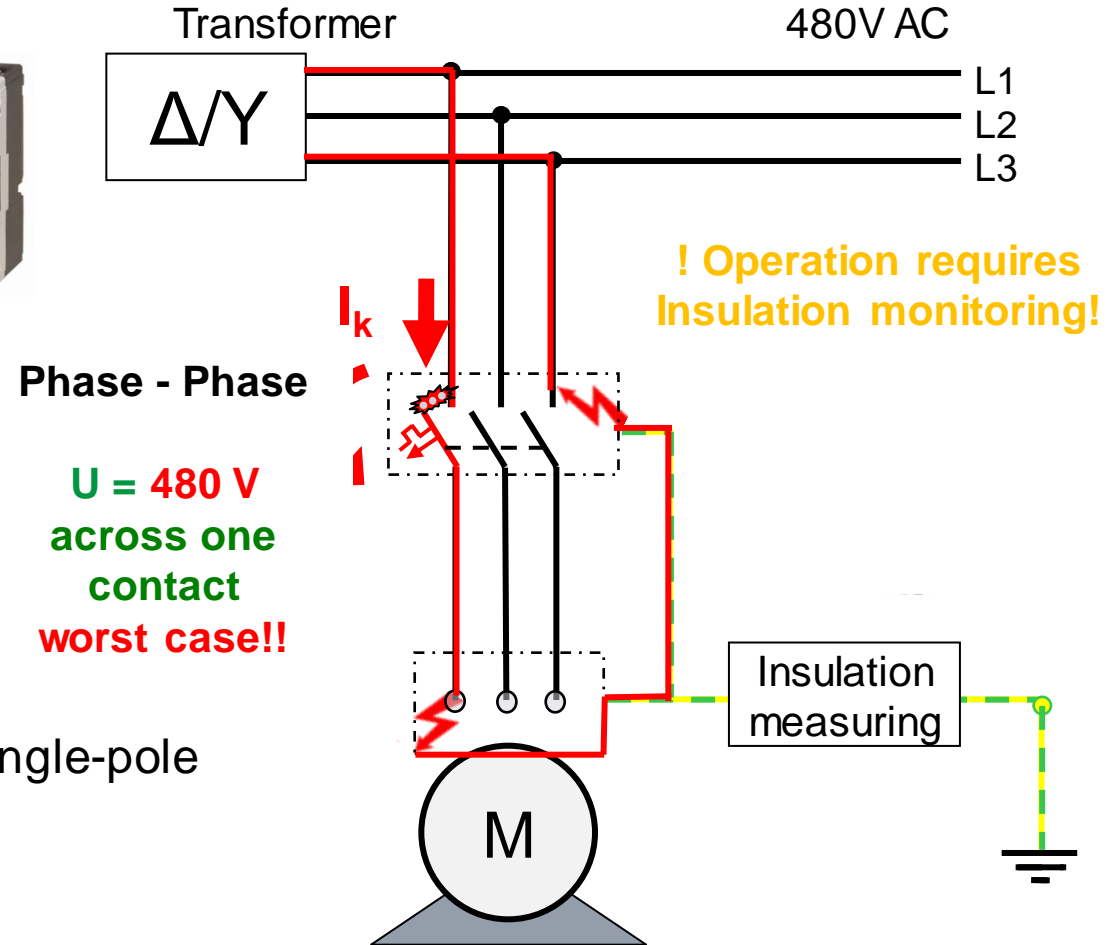
Possible devices in this example: 480V; 600V

Do not use: 480Y/277V; 600Y/347V



## Note:

- The devices switch the full (=high) voltage at the **second** single-pole short-circuit (phase to ground)



Phase - Phase

U = 480 V  
across one  
contact  
worst case!!

! Operation requires  
Insulation monitoring!

Insulation  
measuring

M

The following applies to this network in principle: Only devices with straight rating must be used!

## Questions?



### Note / Disclaimer

The circuit examples and interpretations of the standard are non-binding and do not claim completeness concerning configuration, equipping and contingencies. They do not represent customized solutions but merely provide support for typical tasks.

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