

## MI VOLTAGE DROP CALCULATIONS

To calculate voltage drop for a three-phase line-to-line circuit, the following formula should be used with the appropriate Factor "A" from Table 2 or Table 3. These calculations are simplified for ease of use and give approximate results.

$$\text{Voltage drop} = \frac{(\text{Run length}) \times (\text{Circuit current}) \times (\text{Temp. const.}) \times (\text{Factor "A"})}{1000}$$

$$\text{Percentage voltage drop} = \frac{\text{Voltage drop} \times 100}{\text{Circuit voltage}}$$

**Note: Use the calculated load (not the fuse or breaker rating) to determine voltage drop.**

**TABLE 1 TEMPERATURE CONSTANT**

Cable at full rated current	1.00
Cable at 3/4 rated current	0.95
Cable at 1/2 rated current	0.91
Cable at 1/4 rated current	0.88

Note that these calculated voltage drops represent the line-to-line voltage drop in a three-phase system. To estimate the single-phase voltage drop, multiply the three-phase line-to-line voltage drop by 1.16. In those rare instances where the line-to-neutral voltage drop in a three-phase system is required, multiply the three-phase line-to-line voltage drop by 0.58.

**TABLE 2 VOLTAGE DROP FACTOR "A" FOR SINGLE CONDUCTOR CABLE IN TREFOIL, 90°C CONDUCTOR TEMPERATURE**

Cable reference	Conductor size AWG/kcmil	Lagging power factor in percent						
		100	95	90	85	80	75	30
1/6-340	6	0.894	0.867	0.892	0.790	0.749	0.708	0.323
1/4-402	4	0.576	0.565	0.543	0.519	0.494	0.469	0.225
1/3-449	3	0.45	0.444	0.429	0.411	0.393	0.373	0.187
1/2-449	2	0.355	0.353	0.341	0.328	0.314	0.299	0.154
1/1-496	1	0.285	0.286	0.278	0.268	0.257	0.246	0.132
1/1/0-512	1/0	0.226	0.229	0.223	0.216	0.208	0.200	0.111
1/2/0-580	2/0	0.181	0.187	0.183	0.178	0.173	0.166	0.098
1/3/0-621	3/0	0.146	0.153	0.151	0.148	0.144	0.139	0.086
1/4/0-684	4/0	0.119	0.127	0.126	0.124	0.121	0.118	0.077
1/250-746	250	0.104	0.112	0.112	0.111	0.109	0.107	0.073
1/350-834	350	0.077	0.086	0.088	0.087	0.087	0.085	0.063
1/500-1000	500	0.061	0.071	0.073	0.073	0.073	0.073	0.058

**TABLE 3 VOLTAGE DROP FACTOR "A" FOR THREE CONDUCTOR CABLE, 90°C CONDUCTOR TEMPERATURE**

Cable reference	Conductor size AWG	Lagging power factor in percent						
		100	95	90	85	80	75	30
3/14-387	14	5.746	5.463	5.179	4.895	4.611	4.328	1.766
3/12-480	12	3.600	3.424	3.248	3.071	2.895	2.718	1.122
3/10-480	10	2.279	2.169	2.058	1.947	1.836	1.725	0.721
3/8-590	8	1.459	1.389	1.320	1.250	1.180	1.110	0.475
3/6-621	6	0.920	0.877	0.834	0.790	0.747	0.704	0.309
3/4-746	4	0.591	0.565	0.538	0.511	0.484	0.457	0.210
3/3-834	3	0.476	0.455	0.434	0.413	0.392	0.371	0.175

**Example:**

Run length      500'  
 Circuit current    100 A  
 Voltage          600 V, three-phase

$$\text{Voltage drop} = \frac{500 \times 100 \times 0.91 \times 0.216}{1000} = 9.8 \text{ V}$$

Power factor      85%  
 Initial cable size   1/0 AWG

$$\text{Percent voltage drop} = \frac{9.8 \times 100}{600} = 1.63\%$$

If the voltage drop is over the desired limit, select a larger cable and repeat. Alternatively, use parallel runs of smaller cable, calculating voltage drop on the reduced current carried by each run.

For fire pump motors, check that the voltage drop does not exceed 5% @ 115% rated current, and does not equal or exceed 15% at locked rotor current, including the drop in the motor/generator.

**Note: Ensure all the applicable requirements of national and local electrical codes are met.**

**North America**

Tel +1.800.545.6258  
 Fax +1.800.527.5703  
 thermal.info@nVent.com

**Europe, Middle East, Africa**

Tel +32.16.213.511  
 Fax +32.16.213.604  
 thermal.info@nVent.com

**Asia Pacific**

Tel +86.21.2412.1688  
 Fax +86.21.5426.3167  
 cn.thermal.info@nVent.com

**Latin America**

Tel +1.713.868.4800  
 Fax +1.713.868.2333  
 thermal.info@nVent.com



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