

How to Test the Voltage Drop of Any Length of Wire

All wire has a “specific resistance”, however, the wire sizes used in vehicles today have a resistance value, relative to causing voltage drops, that is insignificant as engineered. Their resistance as manufactured should not cause any voltage drop in any circuit where they are used either on the voltage feed, or on the ground return.

Understanding the above statement, when calculating ohms law, we “pretend” that wire has no resistance.

WIRE GAUGE METRIC / AWG mm ²		DIAMETER (Millimeters)	OHMS Per 1000 ft.	SAFE CURRENT CAPACITY	MAXIMUM CURRENT CAPACITY
5.0	10	2.588mm	0.998Ω	14.8A	30A
3.0	12	2.053mm	1.588Ω	9.3A	20A
2.0	14	1.628mm	2.525Ω	5.8A	15A
1.0	16	1.291mm	4.016Ω	3.6A	10A
.8	18	1.024mm	6.385Ω	2.3A	7A
.5	20	0.812mm	10.15Ω	1.4A	5A
.35	22	0.644mm	16.14Ω	.918A	2A
.22	24	0.511mm	25.67Ω	.577A	1A

Note: The above chart is for 25°C still air ambient conditions for copper wire.

When the wire gage is decreased by 3 gage numbers, its cross sectional area is doubled and its resistance is cut in half.

The copper strands that make up a length of wire can sometime be the source of a voltage drop. The mating surfaces of the connections on the ends of the wire may not show a voltage drop if you are checking the connection by itself. I have seen copper strands discolored the length of a piece of wire, yet the connections were not a problem. Cutting the insulation off the entire length of the wire exposed a discolored copper, possible due to porosity of insulation. I am convinced that good and sometimes “not so good” chemistry goes into the insulation that surrounds the copper strands.

You might have to fight a problem caused by a voltage drop either on the feed or the groundside as a result of wire insulation failure. Don’t try to find it with your ohmmeter, keep the wire plugged into the load, and voltage drop test the entire length of wire.

To test the voltage drop of any length of wire, do the following:

1. Set the voltmeter to read millivolts or on the lowest volt scale.
2. Put the voltmeter positive lead on the end of the wire closest to the battery.
3. Put the voltmeter negative lead on the other end of the wire.
4. Operate the circuit.
5. If the voltage drop is more than .100V (100mV), the wire, or connections are bad.
6. If excessive, remove the wire at both ends and clean the connections, retest.
7. If still excessive, replace the wire.