# Instructions for the preparation and use of

CHANCE®

# Protective Grounding-Set Tester

## Catalog No. C403-3220 (115/120V) and PSC4033220003 (230V)

**These instructions do not claim to cover all details or variations in equipment, nor to provide for all possible conditions to be met with concerning installation, operation, or maintenance of this equipment. If further information is desired or if particular problems are encountered which are not sufficiently covered in this guide, contact Hubbell Power Systems.**

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HUBBELL®

P403-3222 Rev. N 8/21

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## FUNCTIONAL DESCRIPTION

The PROTECTIVE GROUNDING SET TESTER uses a 5 volt direct current (dc) source to measure resistances in grounding sets. Output current through the grounding set is limited to a maximum of 10 amps by an internal current limiting resistor. The tester switches the 5 volt power supply on, makes a measurement, and switches the power off again for a minimum of 500 milliseconds.

The tester uses a 4 wire resistance measurement approach to obtain accurate resistance measurements. The measurement system is auto ranging to give +/-1% accurate resistance measure from 1m * to 6.5 Ω.

## FEATURE DESCRIPTION

The following list of features are referenced with number 1 - 19, and the location of the feature is shown on Figure 1.

1. <u>Test Probes</u>
   Probes are used in troubleshooting mode to locate high resistance area of the ground set.

3. <u>Fixed Input Connections</u>
   When the 'INPUT SELECT' switch is in the fixed position. The resistance measurement shown will be the value of resistance from one fixed connection through the ground set to the other fixed connection.

4. <u>Power Entry Module</u>
   Main power switch illuminates when power to the tester is on, and includes the fuse holder compartment.

5. <u>Preset Resistance Threshold</u>
   This number, shown on the display, is the pass/fail resistance threshold. The '<' symbol displayed means less than. For example, when '<3.333' (mΩ*) is displayed, it means that a ground set resistance which is less than 3.333 mΩ*.

6. <u>Measured Ground Set Resistance</u>
   When the 'INPUT SELECT SWITCH' is in the 'FIXED' position. The value shown will be the resistance measured from one fixed connection (3) through the ground set to the other fixed connection (3). When the 'INPUT SELECT SWITCH' is in the 'PROBE' position. The value shown will be the resistance measured between the probe contact points.

7. <u>Selected Cable Size</u>
   Indicates size of cable under test. This must be changed for each new size cable used.

* mΩ (milli ohm) = 0.001ohm

8. Continuous Test Switch
When switched to the 'ON' position, the ground set tester will continuously make measurements at the rate of 1 per second. When switched to the 'OFF' position, the ground set tester will hold the last measurement made.

9. Fail LED (Red)
Due to changes to ASTM F2249, the LED (Red) is no longer an accurate indicator. Reference the readout on the display. Refer to the latest ASTM F2249 resistance chart for allowable resistance.

10. Cable Size Switch
Used to select the size of cable to be tested. (#2, 1/0, 2/0, 4/0)

11. Pass LED (Green)
Due to changes to ASTM F2249, the LED (Green) is no longer an accurate indicator. Reference the readout on the display. Refer to the latest ASTM F2249 resistance chart for allowable resistance.

12. Power Cord
For connection to AC power supply.

13. Probe Input
When the 'INPUT SELECT' switch is in the 'PROBE' position, the resistance measurement shown will be the value of resistance between probe contact points.

14. Input Select Switch
Allows selection of measurement input between the probes or the fixed connections to the ground set.

15. Single Test Switch
Causes the Ground set tester to make a single resistance measurement and hold the value.

16. Attachment Studs
These tin plated copper studs (P4033120) are threaded into the fixed connection (3), and the ground set clamps can then be attached to the studs.

17. Elbow adapter
Used to adapt ground set with grounding elbow to threaded fixed connection. 15kV elbow adapter (C403-3449) is available as an option.

18. Grounded Parking Stand Adapter
Used to adapt ground set with grounded parking stand to threaded fixed connection. Parking stand adapter (T403-3159) is available as an option.

19. Self Test Cable
Used for testing the functionality of the Protective Ground Set Tester.

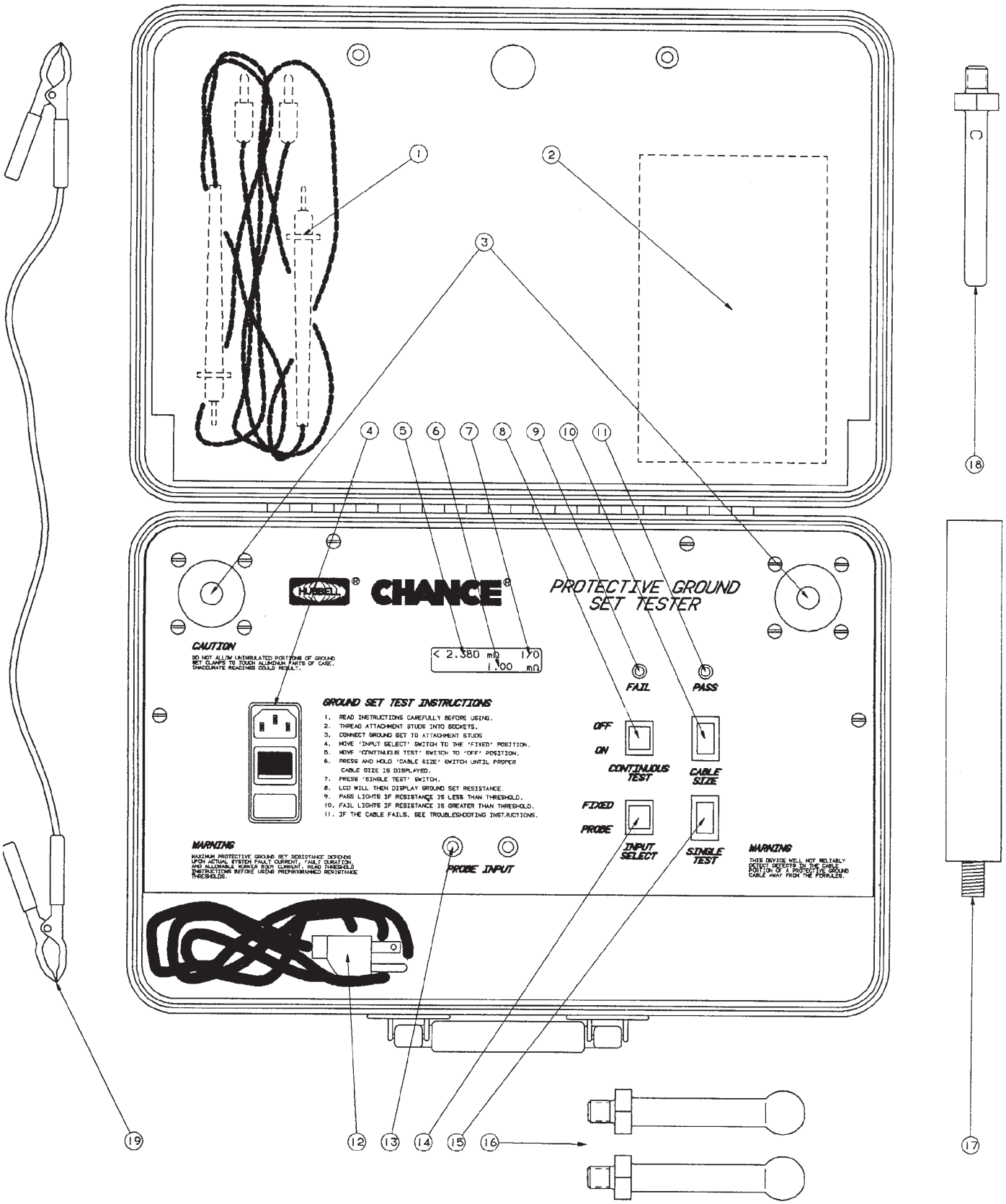


Figure 1: Front Panel of Protective Ground Set Tester Showing Feature Location

## SELF TEST PROCEDURE

The operation of the Protective Ground Set Tester can be verified using the Self Test Cable included with the tester. It is not designed to test accuracy.

1. Place the tester on a table of convenient height and plug it into an AC outlet, 110 (Cat. No. C403-3220) or 220 (Cat. No. PSC403-3220003) VAC.

2. Thread the attachment studs into fixed connection inputs.

3. Securely connect Self Test Cable to the attachment studs.

4. Turn on the unit. The power switch will illuminate when the power is on.

5. Place the 'INPUT SELECT' switch in the 'FIXED' position.

6. Place the 'CONTINUOUS TEST' switch in the 'OFF' position.

7. Press the 'SINGLE TEST' switch.

8. The display will show the measured resistance of the self test cable on line 2 of the display. The resistance measured should be between 3.0 and 7.5 mΩ**. If the measured resistance is outside these values, retighten the ball studs and check to make sure that the self test cable has good electrical connections. After retest, if the measured resistance is still not between 3.0 and 7.5 mΩ**, discontinue use of the tester. The Self Test Cable is not designed with tight tolerances for accuracy testing.

Note that the thresholds and pass/fail LEDs will function during the self test but do not pertain to the self test.

**mΩ (milliohm) = 0.001 ohm

## TEST SETUP

Figure 3 shows the test setup required to test a protective ground set. The protective ground set under test must always be connected between the fixed connection connections regardless of the mode of testing. The ground set carries the test current from one fixed input to the other during testing. Without the ground set, the resulting open circuit prevents the resistance measurement. If the ground set is left unconnected and the 'INPUT SELECT' is in the 'FIXED' position, the display will read 'OVER RANGE' after a test. If the ground set is left unconnected and the 'INPUT SELECT' is in the 'PROBE' position, the display will be erratic. The erratic display is unpredictable and does not indicate resistance.

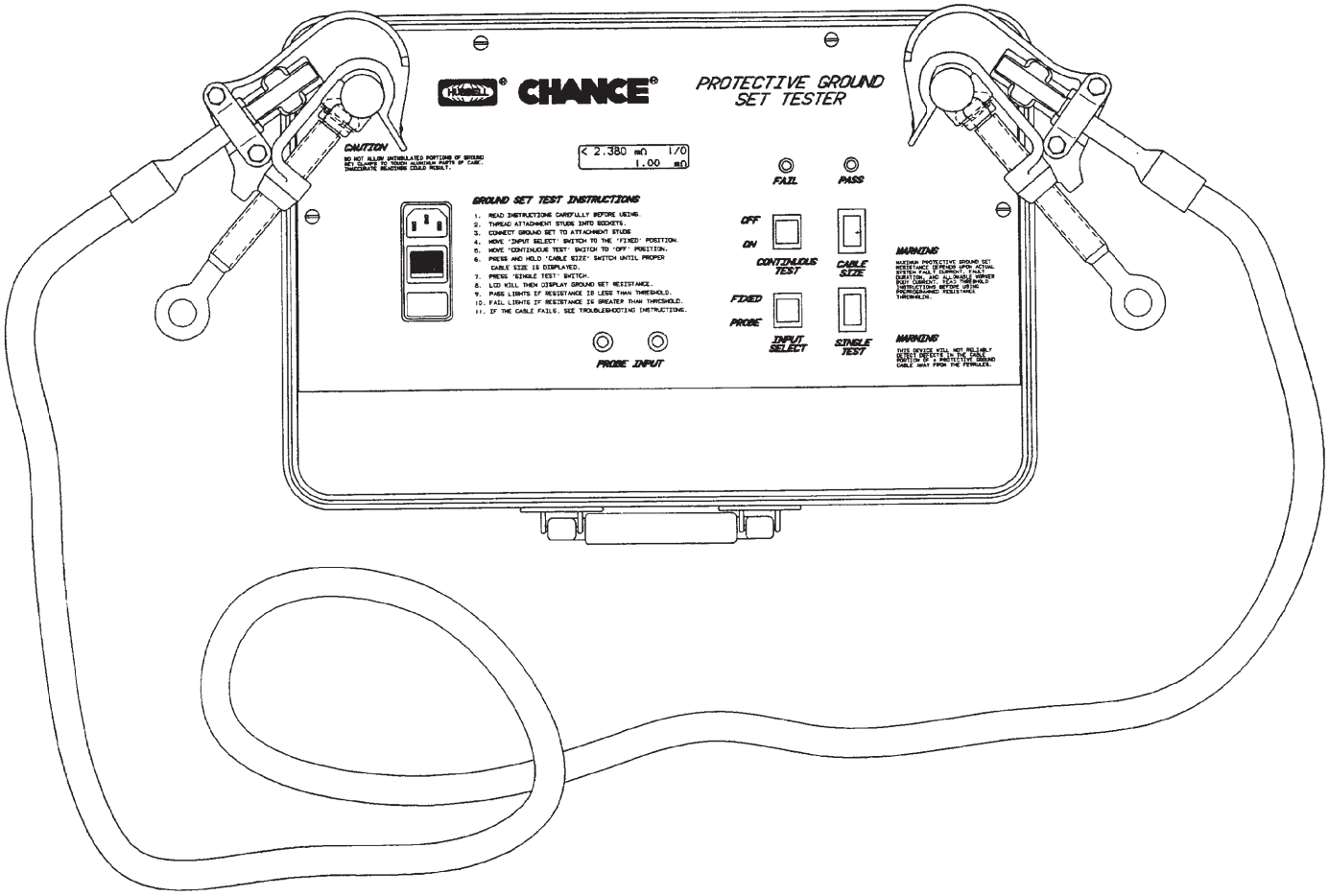


Figure 3: Ground Set Testing Setup

Note: When measuring the ground set, cable length is expressed in feet (ferrule to ferrule measurement to the nearest inch, not including shrouded portion of some ferrules which cover the cable insulation).

## GROUND SET TEST PROCEDURE

Use the Self Test Procedure to verify operation of the Ground Set Tester before testing Ground Sets.

1. Place the tester on a table of convenient height and plug it into a nominal 120/240V AC outlet.

2. Thread the attachment studs into the fixed connection inputs.

3. Brush the ground clamps to remove any oxidation or contamination and then securely connect the Grounding Set to be tested to the attachment studs. A low resistance connection must be maintained while testing the ground set. (Figure 3 shows typical test setup.)

4. Turn on the unit. The power switch will illuminate when the power is on.

5. Use the 'CABLE SIZE' switch to select the cable size being tested. The cable size is displayed at the end of the first line of the display.

6. Place the 'INPUT SELECT' in the 'FIXED' position.

7. Place the 'CONTINUOUS TEST' switch in the 'OFF' position.

8. Press the 'SINGLE TEST' switch.

9. The display will show the measured resistance between fixed connections on line 2 of the display in mΩ.** When used in fixed mode the resistance displayed includes the contact resistance of the connection studs to the ground set. The value shown in line 2 of the display needs to be less than the maximum resistance value from the tables from the latest ASTM F2249 to be considered a passing ground set. If the measured resistance is higher than the allowable value from ASTM F2249, then probing can be used to locate the areas of high resistance in the ground set.

**mΩ (milli ohm) = 0.001 ohm

**⚠ WARNING**

**Chance protective ground set tester is not designed nor recommended for detecting cable flaws. Problems with the cable, away from the ferrule exit area, are often intermittent in nature.**

**NOTICE**

**If the ground set fails, there are two possibilities.**

1. **The ground set has a problem. Use probes to identify the high resistance section. See section GROUND SET TROUBLESHOOTING WITH PROBES.**

2. **Cable is improperly sized for the application (AWG or length).**

## GROUND SET TROUBLESHOOTING WITH PROBES

The following sections describe how to use the probes in troubleshooting a ground set. Using the probes in this mode, the high resistance areas of the ground set can be identified.

1. Place the tester on a table of convenient height and plug it into a nominal 120/240V AC outlet.
2. Thread the attachment studs into the fixed connection inputs.
3. Connect the Grounding Set to be tested to the attachment studs. A low resistance connection must be maintained while testing the ground set. Figure 3 shows typical test setup.
4. Turn on the unit. The power switch will illuminate when the power is on.
5. Use the 'CABLE SIZE' switch to select the cable size being tested. The cable size is displayed at the end of the first line of the display.
6. Place the 'INPUT SELECT' in the 'PROBE' position.
7. Place the 'CONTINUOUS TEST' switch in the 'ON' position. This causes the ground set tester to repeatedly make measurements at a rate of about 1 per second.
8. In this mode the display will show the resistance across the part(s) of the ground set to which the probes are connected. Start from one end of the ground set. Take resistance readings between attachment stud and clamp body, clamp body to cable ferrule and cable ferrule to cable ferrule. Repeat test on opposite end.
9. The display will show the measured resistance from one probe to the other when contacting the ground set (on line 2 of the display in mΩ).

**⚠ WARNING**

**Chance protective ground set tester is not designed nor recommended for detecting cable flaws. Problems with the cable, away from the ferrule exit area, are often intermittent in nature.**

## EXPECTED GROUND SET RESISTANCE

The resistance through a Ground Set will be equal to the resistance of the cable itself and the resistance of the cable clamps and connections to the cable. The resistance of the cable is found by multiplying the resistance per foot for Class K copper cable by the number of feet of the cable. Table 2 supplies the resistance per foot for various Class K cable sizes. The cable clamps and connections should be less than 0.16 mΩ*. Since there are 2 clamps 0.32 mΩ* must be added for the clamps and connections. Pass/Fail DC resistance values for Class K, M, H and I copper grounding jumper assemblies can also be found in Tables X1.3, X2.3, X3.3 and X4.3 of ASTM F2249-18.

For example, the expected resistance for a 32 foot 1/0 Ground Set will be less than

1.05 x 32 ft x 0.1030 mΩ/ft + 0.32 mΩ = 3.7808 mΩ**

(See chart below)

| CABLE SIZE | 4/0 | 2/0 | 1/0 | #2 |
|---|---|---|---|---|
| mΩ** PER FOOT [11] | 0.0520 mΩ | 0.0826 mΩ | 0.1030 mΩ | 0.1640 mΩ |

Table 2: Resistance per foot for various sizes of Class K grounding cable at 68°F
** mΩ (milliohm) = 0.001 ohm
* Derived from ASTM F2249-18 Standard.

## ERROR MESSAGES

### CALIBRATE ERROR

The calibration factors have been corrupted. New calibration factors must be generated. Return to factory for repair.

### COP ERROR

Computer Operating Properly Error has occurred. A problem has occurred with the power supply, its connections or an electronics failure. Return to factory for repair.

**⚠ WARNING**

**It is the responsibility of the user to establish and maintain a maximum resistance threshold for the protective ground set to provide a safe working environment.**

P4033120
Replacement Ball Stud

PSC4034035
Ball Stud, 30MM

T4033159
Straight Stud Terminal

C4033449
Elbow Adapter,
15&25kV for .50″ Probe

PSC4032947
Elbow Adapter, 35kV
for .50″ Probe

PSC4033796
A Elbow Adapter, 35kV
for .75″ Probe

PST6003541
Bus Bar Clamp
Adapter

| TABLE X1.3 Class K Cable Rmax Limits — DC Resistance (mΩ) (Cable + Terminations) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cable Length (Ft.) | Maximum Resistance Pass / Fail - DC Resistance, mΩ | | | | | | | | | | | |
| | #2 Cable | | | 1/0 Cable | | | 2/0 Cable | | | 4/0 Cable | | |
| | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) |
| 1 | 0.48205 | 0.49220 | 0.50235 | 0.42178 | 0.42815 | 0.43452 | 0.40162 | 0.40673 | 0.41184 | 0.37138 | 0.37460 | 0.37782 |
| 2 | 0.64409 | 0.66440 | 0.68471 | 0.52355 | 0.53630 | 0.54905 | 0.48323 | 0.49346 | 0.50369 | 0.42275 | 0.42920 | 0.43565 |
| 3 | 0.80614 | 0.83660 | 0.86706 | 0.62533 | 0.64445 | 0.66357 | 0.56485 | 0.58019 | 0.59553 | 0.47413 | 0.48380 | 0.49347 |
| 4 | 0.96819 | 1.00880 | 1.04941 | 0.72711 | 0.75260 | 0.77809 | 0.64647 | 0.66692 | 0.68737 | 0.52551 | 0.53840 | 0.55129 |
| 5 | 1.13023 | 1.18100 | 1.23177 | 0.82888 | 0.86075 | 0.89262 | 0.72808 | 0.75365 | 0.77922 | 0.57688 | 0.59300 | 0.60912 |
| 6 | 1.29228 | 1.35320 | 1.41412 | 0.93066 | 0.96890 | 1.00714 | 0.80970 | 0.84038 | 0.87106 | 0.62826 | 0.64760 | 0.66694 |
| 7 | 1.45433 | 1.52540 | 1.59647 | 1.03244 | 1.07705 | 1.12166 | 0.89132 | 0.92711 | 0.96290 | 0.67964 | 0.70220 | 0.72476 |
| 8 | 1.61637 | 1.69760 | 1.77883 | 1.13421 | 1.18520 | 1.23619 | 0.97293 | 1.01384 | 1.05475 | 0.73101 | 0.75680 | 0.78259 |
| 9 | 1.77842 | 1.86980 | 1.96118 | 1.23599 | 1.29335 | 1.35071 | 1.05455 | 1.10057 | 1.14659 | 0.78239 | 0.81140 | 0.84041 |
| 10 | 1.94047 | 2.04200 | 2.14354 | 1.33777 | 1.40150 | 1.46524 | 1.13617 | 1.18730 | 1.23844 | 0.83377 | 0.86600 | 0.89824 |
| 11 | 2.10251 | 2.21420 | 2.32589 | 1.43954 | 1.50965 | 1.57976 | 1.21778 | 1.27403 | 1.33028 | 0.88514 | 0.92060 | 0.95606 |
| 12 | 2.26456 | 2.38640 | 2.50824 | 1.54132 | 1.61780 | 1.69428 | 1.29940 | 1.36076 | 1.42212 | 0.93652 | 0.97520 | 1.01388 |
| 13 | 2.42660 | 2.55860 | 2.68060 | 1.64309 | 1.72595 | 1.80881 | 1.38101 | 1.44749 | 1.51397 | 0.98789 | 1.02980 | 1.07171 |
| 14 | 2.58865 | 2.73080 | 2.87295 | 1.74487 | 1.83410 | 1.92333 | 1.46263 | 1.53422 | 1.60581 | 1.03927 | 1.08440 | 1.12953 |
| 15 | 2.75070 | 2.90300 | 3.05530 | 1.84665 | 1.94225 | 2.03785 | 1.54425 | 1.62095 | 1.69765 | 1.09065 | 1.13900 | 1.18735 |
| 16 | 2.91274 | 3.07520 | 3.23766 | 1.94842 | 2.05040 | 2.15238 | 1.62586 | 1.70768 | 1.78950 | 1.14202 | 1.19360 | 1.24518 |
| 17 | 3.07479 | 3.24740 | 3.42001 | 2.05020 | 2.15855 | 2.26690 | 1.70748 | 1.79441 | 1.88134 | 1.19340 | 1.24820 | 1.30300 |
| 18 | 3.23684 | 3.41960 | 3.60236 | 2.15198 | 2.26670 | 2.38142 | 1.78910 | 1.88114 | 1.97318 | 1.24478 | 1.30280 | 1.36082 |
| 19 | 3.39888 | 3.59180 | 3.78472 | 2.25375 | 2.37485 | 2.49595 | 1.87071 | 1.96787 | 2.06503 | 1.29615 | 1.35740 | 1.41865 |
| 20 | 3.56093 | 3.76400 | 3.96707 | 2.35553 | 2.48300 | 2.61047 | 1.95233 | 2.05460 | 2.15687 | 1.34753 | 1.41200 | 1.47647 |
| 21 | 3.72298 | 3.93620 | 4.14942 | 2.45731 | 2.59115 | 2.72499 | 2.03395 | 2.14133 | 2.24871 | 1.39891 | 1.46660 | 1.53429 |
| 22 | 3.88502 | 4.10840 | 4.33178 | 2.55908 | 2.69930 | 2.83952 | 2.11556 | 2.22806 | 2.34056 | 1.45028 | 1.52120 | 1.59212 |
| 23 | 4.04707 | 4.28060 | 4.51413 | 2.66086 | 2.80745 | 2.95404 | 2.19718 | 2.31479 | 2.43240 | 1.50166 | 1.57580 | 1.64994 |
| 24 | 4.20912 | 4.45280 | 4.69648 | 2.76264 | 2.91560 | 3.06856 | 2.27880 | 2.40152 | 2.52424 | 1.55304 | 1.63040 | 1.70776 |
| 25 | 4.37116 | 4.62500 | 4.87884 | 2.86441 | 3.02375 | 3.18309 | 2.36041 | 2.48825 | 2.61609 | 1.60441 | 1.68500 | 1.76559 |
| 26 | 4.5321 | 4.79720 | 5.06119 | 2.96619 | 3.13190 | 3.29761 | 2.44203 | 2.57498 | 2.70793 | 1.65579 | 1.73960 | 1.82341 |
| 27 | 4.69526 | 4.96940 | 5.24354 | 3.06797 | 3.24005 | 3.41213 | 2.52365 | 2.66171 | 2.79977 | 1.70717 | 1.79420 | 1.88123 |
| 28 | 4.85730 | 5.14160 | 5.42590 | 3.16974 | 3.34820 | 3.52666 | 2.60526 | 2.74844 | 2.89162 | 1.75854 | 1.84880 | 1.93906 |
| 29 | 5.01935 | 5.31380 | 5.60825 | 3.27152 | 3.45635 | 3.64118 | 2.68688 | 2.83517 | 2.98346 | 1.80992 | 1.90340 | 1.99688 |
| 30 | 5.18140 | 5.48600 | 5.79061 | 3.37330 | 3.56450 | 3.75571 | 2.76850 | 2.92190 | 3.07531 | 1.86130 | 1.95800 | 2.05471 |
| 31 | 5.34344 | 5.65820 | 5.97296 | 3.47507 | 3.67265 | 3.87023 | 2.85011 | 3.00863 | 3.16715 | 1.91267 | 2.01260 | 2.11253 |
| 32 | 5.50549 | 5.83040 | 6.15531 | 3.57685 | 3.78080 | 3.98475 | 2.93173 | 3.09536 | 3.25899 | 1.96405 | 2.06720 | 2.17035 |
| 33 | 5.66753 | 6.00260 | 6.33767 | 3.67862 | 3.88895 | 4.09928 | 3.01334 | 3.18209 | 3.35084 | 2.01542 | 2.12180 | 2.22818 |
| 34 | 5.82958 | 6.17480 | 6.52002 | 3.78040 | 3.99710 | 4.21380 | 3.09496 | 3.26882 | 3.44268 | 2.06680 | 2.17640 | 2.28600 |
| 35 | 5.99163 | 6.34700 | 6.70237 | 3.88218 | 4.10525 | 4.32832 | 3.17658 | 3.35555 | 3.53452 | 2.11818 | 2.23100 | 2.34382 |
| 36 | 6.15367 | 6.51920 | 6.88473 | 3.98395 | 4.21340 | 4.44285 | 3.25819 | 3.44228 | 3.62637 | 2.16955 | 2.28560 | 2.40165 |
| 37 | 6.31572 | 6.69140 | 7.06708 | 4.08573 | 4.32155 | 4.55737 | 3.33981 | 3.52901 | 3.71821 | 2.22093 | 2.34020 | 2.45947 |
| 38 | 6.47777 | 6.86360 | 7.24943 | 4.18751 | 4.42970 | 4.67189 | 3.42143 | 3.61574 | 3.81005 | 2.27231 | 2.39480 | 2.51729 |
| 39 | 6.63981 | 7.03580 | 7.43179 | 4.28928 | 4.53785 | 4.78642 | 3.50304 | 3.70247 | 3.90190 | 2.32368 | 2.44940 | 2.57512 |
| 40 | 6.80186 | 7.20800 | 7.61414 | 4.39106 | 4.64600 | 4.90094 | 3.58466 | 3.78920 | 3.99374 | 2.37506 | 2.50400 | 2.63294 |
| 41 | 6.96391 | 7.38020 | 7.79649 | 4.49284 | 4.75415 | 5.01546 | 3.66628 | 3.87593 | 4.08558 | 2.42644 | 2.55860 | 2.69076 |
| 42 | 7.12595 | 7.55240 | 7.97885 | 4.59461 | 4.86230 | 5.12999 | 3.74789 | 3.96266 | 4.17743 | 2.47781 | 2.61320 | 2.74859 |
| 43 | 7.28800 | 7.72460 | 8.16120 | 4.69639 | 4.97045 | 5.24451 | 3.82951 | 4.04939 | 4.26927 | 2.52919 | 2.66780 | 2.80641 |
| 44 | 7.45005 | 7.89680 | 8.34355 | 4.79817 | 5.07860 | 5.35903 | 3.91113 | 4.13612 | 4.36111 | 2.58057 | 2.72240 | 2.86423 |
| 45 | 7.61209 | 8.06900 | 8.52591 | 4.89994 | 5.18675 | 5.47356 | 3.99274 | 4.22285 | 4.45296 | 2.63194 | 2.77700 | 2.92206 |
| 46 | 7.77414 | 8.24120 | 8.70826 | 5.00172 | 5.29490 | 5.58808 | 4.07436 | 4.30958 | 4.54480 | 2.68332 | 2.83160 | 2.97988 |
| 47 | 7.93619 | 8.41340 | 8.89061 | 5.10350 | 5.40305 | 5.70260 | 4.15598 | 4.39631 | 4.63664 | 2.73470 | 2.88620 | 3.03770 |
| 48 | 8.09823 | 8.58560 | 9.07297 | 5.20527 | 5.51120 | 5.81713 | 4.23759 | 4.48304 | 4.72849 | 2.78607 | 2.94080 | 3.09553 |
| 49 | 8.26028 | 8.75780 | 9.25532 | 5.30705 | 5.61935 | 5.93165 | 4.31921 | 4.56977 | 4.82033 | 2.83745 | 2.99540 | 3.15335 |
| 50 | 8.42233 | 8.93000 | 9.43768 | 5.40883 | 5.72750 | 6.04618 | 4.40083 | 4.65650 | 4.91218 | 2.88883 | 3.05000 | 3.21118 |

*This chart is for Class K Cable only. For Class H, I, and M Cable, please reference the complete ASTM F2249-18 Standard*

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| TABLE X2.3 Class M Cable Rmax Limits — DC Resistance (mΩ) (Cable + Terminations) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cable Length (Ft.) | Maximum Resistance Pass / Fail - DC Resistance, mΩ | | | | | | | | | | | |
| | #2 Cable | | | 1/0 Cable | | | 2/0 Cable | | | 4/0 Cable | | |
| | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) |
| 1 | 0.48402 | 0.4943 | 0.50458 | 0.42276 | 0.4292 | 0.43564 | 0.4024 | 0.40757 | 0.41274 | 0.37178 | 0.37502 | 0.37826 |
| 2 | 0.64804 | 0.6686 | 0.68916 | 0.52553 | 0.5384 | 0.55127 | 0.48481 | 0.49514 | 0.50547 | 0.42355 | 0.43004 | 0.43653 |
| 3 | 0.81206 | 0.8429 | 0.87374 | 0.62829 | 0.6476 | 0.66691 | 0.56721 | 0.58271 | 0.59821 | 0.47533 | 0.48506 | 0.49479 |
| 4 | 0.97608 | 1.0172 | 1.05832 | 0.73105 | 0.7568 | 0.78255 | 0.64962 | 0.67028 | 0.69094 | 0.5271 | 0.54008 | 0.55306 |
| 5 | 1.1401 | 1.1915 | 1.2429 | 0.83382 | 0.866 | 0.89818 | 0.73202 | 0.75785 | 0.78368 | 0.57888 | 0.5951 | 0.61132 |
| 6 | 1.30412 | 1.3658 | 1.42748 | 0.93658 | 0.9752 | 1.01382 | 0.81442 | 0.84542 | 0.87642 | 0.63065 | 0.65012 | 0.66959 |
| 7 | 1.46814 | 1.5401 | 1.61206 | 1.03934 | 1.0844 | 1.12946 | 0.89683 | 0.93299 | 0.96915 | 0.68243 | 0.70514 | 0.72785 |
| 8 | 1.63216 | 1.7144 | 1.79664 | 1.14211 | 1.1936 | 1.24509 | 0.97923 | 1.02056 | 1.06189 | 0.7342 | 0.76016 | 0.78612 |
| 9 | 1.79618 | 1.8887 | 1.98122 | 1.24487 | 1.3028 | 1.36073 | 1.06164 | 1.10813 | 1.15462 | 0.78598 | 0.81518 | 0.84438 |
| 10 | 1.96021 | 2.063 | 2.1658 | 1.34764 | 1.412 | 1.47637 | 1.14404 | 1.1957 | 1.24736 | 0.83776 | 0.8702 | 0.90265 |
| 11 | 2.12423 | 2.2373 | 2.35037 | 1.4504 | 1.5212 | 1.592 | 1.22644 | 1.28327 | 1.3401 | 0.88953 | 0.92522 | 0.96091 |
| 12 | 2.28825 | 2.4116 | 2.53495 | 1.55316 | 1.6304 | 1.70764 | 1.30885 | 1.37084 | 1.43283 | 0.94131 | 0.98024 | 1.01917 |
| 13 | 2.45227 | 2.5859 | 2.71953 | 1.65593 | 1.7396 | 1.82327 | 1.39125 | 1.45841 | 1.52557 | 0.99308 | 1.03526 | 1.07744 |
| 14 | 2.61629 | 2.7602 | 2.90411 | 1.75869 | 1.8488 | 1.93891 | 1.47366 | 1.54598 | 1.6183 | 1.04486 | 1.09028 | 1.1357 |
| 15 | 2.78031 | 2.9345 | 3.08869 | 1.86145 | 1.958 | 2.05455 | 1.55606 | 1.63355 | 1.71104 | 1.09663 | 1.1453 | 1.19397 |
| 16 | 2.94433 | 3.1088 | 3.27327 | 1.96422 | 2.0672 | 2.17018 | 1.63846 | 1.72112 | 1.80378 | 1.14841 | 1.20032 | 1.25223 |
| 17 | 3.10835 | 3.2831 | 3.45785 | 2.06698 | 2.1764 | 2.28582 | 1.72087 | 1.80869 | 1.89651 | 1.20018 | 1.25534 | 1.3105 |
| 18 | 3.27237 | 3.4574 | 3.64243 | 2.16974 | 2.2856 | 2.40146 | 1.80327 | 1.89626 | 1.98925 | 1.25196 | 1.31036 | 1.36876 |
| 19 | 3.43639 | 3.6317 | 3.82701 | 2.27251 | 2.3948 | 2.51709 | 1.88568 | 1.98383 | 2.08198 | 1.30373 | 1.36538 | 1.42703 |
| 20 | 3.60041 | 3.806 | 4.01159 | 2.37527 | 2.504 | 2.63273 | 1.96808 | 2.0714 | 2.17472 | 1.35551 | 1.4204 | 1.48529 |
| 21 | 3.76443 | 3.9803 | 4.19617 | 2.47803 | 2.6132 | 2.74837 | 2.05048 | 2.15897 | 2.26746 | 1.40729 | 1.47542 | 1.54355 |
| 22 | 3.92845 | 4.1546 | 4.38075 | 2.5808 | 2.7224 | 2.864 | 2.13289 | 2.24654 | 2.36019 | 1.45906 | 1.53044 | 1.60182 |
| 23 | 4.09247 | 4.3289 | 4.56533 | 2.68356 | 2.8316 | 2.97964 | 2.21529 | 2.33411 | 2.45293 | 1.51084 | 1.58546 | 1.66008 |
| 24 | 4.25649 | 4.5032 | 4.74991 | 2.78632 | 2.9408 | 3.09528 | 2.2977 | 2.42168 | 2.54566 | 1.56261 | 1.64048 | 1.71835 |
| 25 | 4.42051 | 4.6775 | 4.93449 | 2.88909 | 3.05 | 3.21091 | 2.3801 | 2.50925 | 2.6384 | 1.61439 | 1.6955 | 1.77661 |
| 26 | 4.58453 | 4.8518 | 5.11907 | 2.99185 | 3.1592 | 3.32655 | 2.4625 | 2.59682 | 2.73114 | 1.66616 | 1.75052 | 1.83488 |
| 27 | 4.74855 | 5.0261 | 5.30365 | 3.09461 | 3.2684 | 3.44219 | 2.54491 | 2.68439 | 2.82387 | 1.71794 | 1.80554 | 1.89314 |
| 28 | 4.91257 | 5.2004 | 5.48823 | 3.19738 | 3.3776 | 3.55782 | 2.62731 | 2.77196 | 2.91661 | 1.76971 | 1.86056 | 1.95141 |
| 29 | 5.07659 | 5.3747 | 5.67281 | 3.30014 | 3.4868 | 3.67346 | 2.70972 | 2.85953 | 3.00934 | 1.82149 | 1.91558 | 2.00967 |
| 30 | 5.24062 | 5.549 | 5.85739 | 3.40291 | 3.596 | 3.7891 | 2.79212 | 2.9471 | 3.10208 | 1.87327 | 1.9706 | 2.06794 |
| 31 | 5.40464 | 5.7233 | 6.04196 | 3.50567 | 3.7052 | 3.90473 | 2.87452 | 3.03467 | 3.19482 | 1.92504 | 2.02562 | 2.1262 |
| 32 | 5.56866 | 5.8976 | 6.22654 | 3.60843 | 3.8144 | 4.02037 | 2.95693 | 3.12224 | 3.28755 | 1.97682 | 2.08064 | 2.18446 |
| 33 | 5.73268 | 6.0719 | 6.41112 | 3.7112 | 3.9236 | 4.136 | 3.03933 | 3.20981 | 3.38029 | 2.02859 | 2.13566 | 2.24273 |
| 34 | 5.8967 | 6.2462 | 6.5957 | 3.81396 | 4.0328 | 4.25164 | 3.12174 | 3.29738 | 3.47302 | 2.08037 | 2.19068 | 2.30099 |
| 35 | 6.06072 | 6.4205 | 6.78028 | 3.91672 | 4.142 | 4.36728 | 3.20414 | 3.38495 | 3.56576 | 2.13214 | 2.2457 | 2.35926 |
| 36 | 6.22474 | 6.5948 | 6.96486 | 4.01949 | 4.2512 | 4.48291 | 3.28654 | 3.47252 | 3.6585 | 2.18392 | 2.30072 | 2.41752 |
| 37 | 6.38876 | 6.7691 | 7.14944 | 4.12225 | 4.3604 | 4.59855 | 3.36895 | 3.56009 | 3.75123 | 2.23569 | 2.35574 | 2.47579 |
| 38 | 6.55278 | 6.9434 | 7.33402 | 4.22501 | 4.4696 | 4.71419 | 3.45135 | 3.64766 | 3.84397 | 2.28747 | 2.41076 | 2.53405 |
| 39 | 6.7168 | 7.1177 | 7.5186 | 4.32778 | 4.5788 | 4.82982 | 3.53376 | 3.73523 | 3.9367 | 2.33924 | 2.46578 | 2.59232 |
| 40 | 6.88082 | 7.292 | 7.70318 | 4.43054 | 4.688 | 4.94546 | 3.61616 | 3.8228 | 4.02944 | 2.39102 | 2.5208 | 2.65058 |
| 41 | 7.04484 | 7.4663 | 7.88776 | 4.5333 | 4.7972 | 5.0611 | 3.69856 | 3.91037 | 4.12218 | 2.4428 | 2.57582 | 2.70884 |
| 42 | 7.20886 | 7.6406 | 8.07234 | 4.63607 | 4.9064 | 5.17673 | 3.78097 | 3.99794 | 4.21491 | 2.49457 | 2.63084 | 2.76711 |
| 43 | 7.37288 | 7.8149 | 8.25692 | 4.73883 | 5.0156 | 5.29237 | 3.86337 | 4.08551 | 4.30765 | 2.54635 | 2.68586 | 2.82537 |
| 44 | 7.5369 | 7.9892 | 8.4415 | 4.84159 | 5.1248 | 5.40801 | 3.94578 | 4.17308 | 4.40038 | 2.59812 | 2.74088 | 2.88364 |
| 45 | 7.70092 | 8.1635 | 8.62608 | 4.94436 | 5.234 | 5.52364 | 4.02818 | 4.26065 | 4.49312 | 2.6499 | 2.7959 | 2.9419 |
| 46 | 7.86494 | 8.3378 | 8.81066 | 5.04712 | 5.3432 | 5.63928 | 4.11058 | 4.34822 | 4.58586 | 2.70167 | 2.85092 | 3.00017 |
| 47 | 8.02896 | 8.5121 | 8.99524 | 5.14988 | 5.4524 | 5.75492 | 4.19299 | 4.43579 | 4.67859 | 2.75345 | 2.90594 | 3.05843 |
| 48 | 8.19298 | 8.6864 | 9.17982 | 5.25265 | 5.5616 | 5.87055 | 4.27539 | 4.52336 | 4.77133 | 2.80522 | 2.96096 | 3.1167 |
| 49 | 8.357 | 8.8607 | 9.3644 | 5.35541 | 5.6708 | 5.98619 | 4.3578 | 4.61093 | 4.86406 | 2.857 | 3.01598 | 3.17496 |
| 50 | 8.52103 | 9.035 | 9.54898 | 5.45818 | 5.78 | 6.10183 | 4.4402 | 4.6985 | 4.9568 | 2.90878 | 3.071 | 3.23323 |

*This chart is for Class M Cable only. For Class H, I, and K Cable, please reference the complete ASTM F2249-18 Standard*

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| TABLE X3.3 Class H Cable Rmax Limits — DC Resistance (mΩ) (Cable + Terminations) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cable Length (Ft.) | Maximum Resistance Pass / Fail - DC Resistance, mΩ | | | | | | | | | | | |
| | #2 Cable | | | 1/0 Cable | | | 2/0 Cable | | | 4/0 Cable | | |
| | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) |
| 1 | 0.48106 | 0.49115 | 0.50124 | 0.42178 | 0.42815 | 0.43452 | 0.40043 | 0.40547 | 0.41051 | 0.37059 | 0.37376 | 0.37693 |
| 2 | 0.64212 | 0.6623 | 0.68248 | 0.52355 | 0.5363 | 0.54905 | 0.48086 | 0.49094 | 0.50102 | 0.42118 | 0.42752 | 0.43386 |
| 3 | 0.80318 | 0.83345 | 0.86372 | 0.62533 | 0.64445 | 0.66357 | 0.56129 | 0.57641 | 0.59153 | 0.47177 | 0.48128 | 0.49079 |
| 4 | 0.96424 | 1.0046 | 1.04496 | 0.72711 | 0.7526 | 0.77809 | 0.64172 | 0.66188 | 0.68204 | 0.52236 | 0.53504 | 0.54772 |
| 5 | 1.1253 | 1.17575 | 1.2262 | 0.82888 | 0.86075 | 0.89262 | 0.72215 | 0.74735 | 0.77255 | 0.57295 | 0.5888 | 0.60466 |
| 6 | 1.28636 | 1.3469 | 1.40744 | 0.93066 | 0.9689 | 1.00714 | 0.80258 | 0.83282 | 0.86306 | 0.62353 | 0.64256 | 0.66159 |
| 7 | 1.44742 | 1.51805 | 1.58868 | 1.03244 | 1.07705 | 1.12166 | 0.88301 | 0.91829 | 0.95357 | 0.67412 | 0.69632 | 0.71852 |
| 8 | 1.60848 | 1.6892 | 1.76992 | 1.13421 | 1.1852 | 1.23619 | 0.96344 | 1.00376 | 1.04408 | 0.72471 | 0.75008 | 0.77545 |
| 9 | 1.76954 | 1.86035 | 1.95116 | 1.23599 | 1.29335 | 1.35071 | 1.04387 | 1.08923 | 1.13459 | 0.7753 | 0.80384 | 0.83238 |
| 10 | 1.9306 | 2.0315 | 2.13241 | 1.33777 | 1.4015 | 1.46524 | 1.1243 | 1.1747 | 1.2251 | 0.82589 | 0.8576 | 0.88931 |
| 11 | 2.09165 | 2.20265 | 2.31365 | 1.43954 | 1.50965 | 1.57976 | 1.20473 | 1.26017 | 1.31561 | 0.87648 | 0.91136 | 0.94624 |
| 12 | 2.25271 | 2.3738 | 2.49489 | 1.54132 | 1.6178 | 1.69428 | 1.28516 | 1.34564 | 1.40612 | 0.92707 | 0.96512 | 1.00317 |
| 13 | 2.41377 | 2.54495 | 2.67613 | 1.64309 | 1.72595 | 1.80881 | 1.36559 | 1.43111 | 1.49663 | 0.97766 | 1.01888 | 1.0601 |
| 14 | 2.57483 | 2.7161 | 2.85737 | 1.74487 | 1.8341 | 1.92333 | 1.44602 | 1.51658 | 1.58714 | 1.02825 | 1.07264 | 1.11703 |
| 15 | 2.73589 | 2.88725 | 3.03861 | 1.84665 | 1.94225 | 2.03785 | 1.52645 | 1.60205 | 1.67765 | 1.07884 | 1.1264 | 1.17397 |
| 16 | 2.89695 | 3.0584 | 3.21985 | 1.94842 | 2.0504 | 2.15238 | 1.60688 | 1.68752 | 1.76816 | 1.12942 | 1.18016 | 1.2309 |
| 17 | 3.05801 | 3.22955 | 3.40109 | 2.0502 | 2.15855 | 2.2669 | 1.68731 | 1.77299 | 1.85867 | 1.18001 | 1.23392 | 1.28783 |
| 18 | 3.21907 | 3.4007 | 3.58233 | 2.15198 | 2.2667 | 2.38142 | 1.76774 | 1.85846 | 1.94918 | 1.2306 | 1.28768 | 1.34476 |
| 19 | 3.38013 | 3.57185 | 3.76357 | 2.25375 | 2.37485 | 2.49595 | 1.84817 | 1.94393 | 2.03969 | 1.28119 | 1.34144 | 1.40169 |
| 20 | 3.54119 | 3.743 | 3.94481 | 2.35553 | 2.483 | 2.61047 | 1.9286 | 2.0294 | 2.1302 | 1.33178 | 1.3952 | 1.45862 |
| 21 | 3.70225 | 3.91415 | 4.12605 | 2.45731 | 2.59115 | 2.72499 | 2.00903 | 2.11487 | 2.22071 | 1.38237 | 1.44896 | 1.51555 |
| 22 | 3.86331 | 4.0853 | 4.30729 | 2.55908 | 2.6993 | 2.83952 | 2.08946 | 2.20034 | 2.31122 | 1.43296 | 1.50272 | 1.57248 |
| 23 | 4.02437 | 4.25645 | 4.48853 | 2.66086 | 2.80745 | 2.95404 | 2.16989 | 2.28581 | 2.40173 | 1.48355 | 1.55648 | 1.62941 |
| 24 | 4.18543 | 4.4276 | 4.66977 | 2.76264 | 2.9156 | 3.06856 | 2.25032 | 2.37128 | 2.49224 | 1.53414 | 1.61024 | 1.68634 |
| 25 | 4.34649 | 4.59875 | 4.85101 | 2.86441 | 3.02375 | 3.18309 | 2.33075 | 2.45675 | 2.58275 | 1.58473 | 1.664 | 1.74328 |
| 26 | 4.50755 | 4.7699 | 5.03225 | 2.96619 | 3.1319 | 3.29761 | 2.41118 | 2.54222 | 2.67326 | 1.63531 | 1.71776 | 1.80021 |
| 27 | 4.66861 | 4.94105 | 5.21349 | 3.06797 | 3.24005 | 3.41213 | 2.49161 | 2.62769 | 2.76377 | 1.6859 | 1.77152 | 1.85714 |
| 28 | 4.82967 | 5.1122 | 5.39473 | 3.16974 | 3.3482 | 3.52666 | 2.57204 | 2.71316 | 2.85428 | 1.73649 | 1.82528 | 1.91407 |
| 29 | 4.99073 | 5.28335 | 5.57597 | 3.27152 | 3.45635 | 3.64118 | 2.65247 | 2.79863 | 2.94479 | 1.78708 | 1.87904 | 1.971 |
| 30 | 5.15179 | 5.4545 | 5.75722 | 3.3733 | 3.5645 | 3.75571 | 2.7329 | 2.8841 | 3.0353 | 1.83767 | 1.9328 | 2.02793 |
| 31 | 5.31284 | 5.62565 | 5.93846 | 3.47507 | 3.67265 | 3.87023 | 2.81333 | 2.96957 | 3.12581 | 1.88826 | 1.98656 | 2.08486 |
| 32 | 5.4739 | 5.7968 | 6.1197 | 3.57685 | 3.7808 | 3.98475 | 2.89376 | 3.05504 | 3.21632 | 1.93885 | 2.04032 | 2.14179 |
| 33 | 5.63496 | 5.96795 | 6.30094 | 3.67862 | 3.88895 | 4.09928 | 2.97419 | 3.14051 | 3.30683 | 1.98944 | 2.09408 | 2.19872 |
| 34 | 5.79602 | 6.1391 | 6.48218 | 3.7804 | 3.9971 | 4.2138 | 3.05462 | 3.22598 | 3.39734 | 2.04003 | 2.14784 | 2.25565 |
| 35 | 5.95708 | 6.31025 | 6.66342 | 3.88218 | 4.10525 | 4.32832 | 3.13505 | 3.31145 | 3.48785 | 2.09062 | 2.2016 | 2.31259 |
| 36 | 6.11814 | 6.4814 | 6.84466 | 3.98395 | 4.2134 | 4.44285 | 3.21548 | 3.39692 | 3.57836 | 2.1412 | 2.25536 | 2.36952 |
| 37 | 6.2792 | 6.65255 | 7.0259 | 4.08573 | 4.32155 | 4.55737 | 3.29591 | 3.48239 | 3.66887 | 2.19179 | 2.30912 | 2.42645 |
| 38 | 6.44026 | 6.8237 | 7.20714 | 4.18751 | 4.4297 | 4.67189 | 3.37634 | 3.56786 | 3.75938 | 2.24238 | 2.36288 | 2.48338 |
| 39 | 6.60132 | 6.99485 | 7.38838 | 4.28928 | 4.53785 | 4.78642 | 3.45677 | 3.65333 | 3.84989 | 2.29297 | 2.41664 | 2.54031 |
| 40 | 6.76238 | 7.166 | 7.56962 | 4.39106 | 4.646 | 4.90094 | 3.5372 | 3.7388 | 3.9404 | 2.34356 | 2.4704 | 2.59724 |
| 41 | 6.92344 | 7.33715 | 7.75086 | 4.49284 | 4.75415 | 5.01546 | 3.61763 | 3.82427 | 4.03091 | 2.39415 | 2.52416 | 2.65417 |
| 42 | 7.0845 | 7.5083 | 7.9321 | 4.59461 | 4.8623 | 5.12999 | 3.69806 | 3.90974 | 4.12142 | 2.44474 | 2.57792 | 2.7111 |
| 43 | 7.24556 | 7.67945 | 8.11334 | 4.69639 | 4.97045 | 5.24451 | 3.77849 | 3.99521 | 4.21193 | 2.49533 | 2.63168 | 2.76803 |
| 44 | 7.40662 | 7.8506 | 8.29458 | 4.79817 | 5.0786 | 5.35903 | 3.85892 | 4.08068 | 4.30244 | 2.54592 | 2.68544 | 2.82496 |
| 45 | 7.56768 | 8.02175 | 8.47582 | 4.89994 | 5.18675 | 5.47356 | 3.93935 | 4.16615 | 4.39295 | 2.59651 | 2.7392 | 2.8819 |
| 46 | 7.72874 | 8.1929 | 8.65706 | 5.00172 | 5.2949 | 5.58808 | 4.01978 | 4.25162 | 4.48346 | 2.64709 | 2.79296 | 2.93883 |
| 47 | 7.8898 | 8.36405 | 8.8383 | 5.1035 | 5.40305 | 5.7026 | 4.10021 | 4.33709 | 4.57397 | 2.69768 | 2.84672 | 2.99576 |
| 48 | 8.05086 | 8.5352 | 9.01954 | 5.20527 | 5.5112 | 5.81713 | 4.18064 | 4.42256 | 4.66448 | 2.74827 | 2.90048 | 3.05269 |
| 49 | 8.21192 | 8.70635 | 9.20078 | 5.30705 | 5.61935 | 5.93165 | 4.26107 | 4.50803 | 4.75499 | 2.79886 | 2.95424 | 3.10962 |
| 50 | 8.37298 | 8.8775 | 9.38203 | 5.40883 | 5.7275 | 6.04618 | 4.3415 | 4.5935 | 4.8455 | 2.84945 | 3.008 | 3.16655 |

*This chart is for Class H Cable only. For Class K, M, and I Cable, please reference the complete ASTM F2249-18 Standard*

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| TABLE X4.3 Class I Cable Rmax Limits — DC Resistance (mΩ) (Cable + Terminations) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cable Length (Ft.) | Maximum Resistance Pass / Fail - DC Resistance, mΩ | | | | | | | | | | | |
| | #2 Cable | | | 1/0 Cable | | | 2/0 Cable | | | 4/0 Cable | | |
| | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) | 5°C (41°F) | 20°C (68°F) | 35°C (95°F) |
| 1 | 0.48106 | 0.49115 | 0.50124 | 0.42178 | 0.42815 | 0.43452 | 0.40083 | 0.40589 | 0.41095 | 0.37088 | 0.37408 | 0.37727 |
| 2 | 0.64212 | 0.6623 | 0.68248 | 0.52355 | 0.5363 | 0.54905 | 0.48166 | 0.49178 | 0.5019 | 0.42177 | 0.42815 | 0.43453 |
| 3 | 0.80318 | 0.83345 | 0.86372 | 0.62533 | 0.64445 | 0.66357 | 0.56249 | 0.57767 | 0.59285 | 0.47265 | 0.48223 | 0.4918 |
| 4 | 0.96424 | 1.0046 | 1.04496 | 0.72711 | 0.7526 | 0.77809 | 0.64332 | 0.66356 | 0.6838 | 0.52353 | 0.5363 | 0.54907 |
| 5 | 1.1253 | 1.17575 | 1.2262 | 0.82888 | 0.86075 | 0.89262 | 0.72415 | 0.74945 | 0.77476 | 0.57442 | 0.59038 | 0.60634 |
| 6 | 1.28636 | 1.3469 | 1.40744 | 0.93066 | 0.9689 | 1.00714 | 0.80497 | 0.83534 | 0.86571 | 0.6253 | 0.64445 | 0.6636 |
| 7 | 1.44742 | 1.51805 | 1.58868 | 1.03244 | 1.07705 | 1.12166 | 0.8858 | 0.92123 | 0.95666 | 0.67618 | 0.69853 | 0.72087 |
| 8 | 1.60848 | 1.6892 | 1.76992 | 1.13421 | 1.1852 | 1.23619 | 0.96663 | 1.00712 | 1.04761 | 0.72706 | 0.7526 | 0.77814 |
| 9 | 1.76954 | 1.86035 | 1.95116 | 1.23599 | 1.29335 | 1.35071 | 1.04746 | 1.09301 | 1.13856 | 0.77795 | 0.80668 | 0.8354 |
| 10 | 1.9306 | 2.0315 | 2.13241 | 1.33777 | 1.4015 | 1.46524 | 1.12829 | 1.1789 | 1.22951 | 0.82883 | 0.86075 | 0.89267 |
| 11 | 2.09165 | 2.20265 | 2.31365 | 1.43954 | 1.50965 | 1.57976 | 1.20912 | 1.26479 | 1.32046 | 0.87971 | 0.91483 | 0.94994 |
| 12 | 2.25271 | 2.3738 | 2.49489 | 1.54132 | 1.6178 | 1.69428 | 1.28995 | 1.35068 | 1.41141 | 0.9306 | 0.9689 | 1.0072 |
| 13 | 2.41377 | 2.54495 | 2.67613 | 1.64309 | 1.72595 | 1.80881 | 1.37078 | 1.43657 | 1.50236 | 0.98148 | 1.02298 | 1.06447 |
| 14 | 2.57483 | 2.7161 | 2.85737 | 1.74487 | 1.8341 | 1.92333 | 1.45161 | 1.52246 | 1.59331 | 1.03236 | 1.07705 | 1.12174 |
| 15 | 2.73589 | 2.88725 | 3.03861 | 1.84665 | 1.94225 | 2.03785 | 1.53244 | 1.60835 | 1.68427 | 1.08325 | 1.13113 | 1.17901 |
| 16 | 2.89695 | 3.0584 | 3.21985 | 1.94842 | 2.0504 | 2.15238 | 1.61326 | 1.69424 | 1.77522 | 1.13413 | 1.1852 | 1.23627 |
| 17 | 3.05801 | 3.22955 | 3.40109 | 2.0502 | 2.15855 | 2.2669 | 1.69409 | 1.78013 | 1.86617 | 1.18501 | 1.23928 | 1.29354 |
| 18 | 3.21907 | 3.4007 | 3.58233 | 2.15198 | 2.2667 | 2.38142 | 1.77492 | 1.86602 | 1.95712 | 1.23589 | 1.29335 | 1.35081 |
| 19 | 3.38013 | 3.57185 | 3.76357 | 2.25375 | 2.37485 | 2.49595 | 1.85575 | 1.95191 | 2.04807 | 1.28678 | 1.34743 | 1.40807 |
| 20 | 3.54119 | 3.743 | 3.94481 | 2.35553 | 2.483 | 2.61047 | 1.93658 | 2.0378 | 2.13902 | 1.33766 | 1.4015 | 1.46534 |
| 21 | 3.70225 | 3.91415 | 4.12605 | 2.45731 | 2.59115 | 2.72499 | 2.01741 | 2.12369 | 2.22997 | 1.38854 | 1.45558 | 1.52261 |
| 22 | 3.86331 | 4.0853 | 4.30729 | 2.55908 | 2.6993 | 2.83952 | 2.09824 | 2.20958 | 2.32092 | 1.43943 | 1.50965 | 1.57987 |
| 23 | 4.02437 | 4.25645 | 4.48853 | 2.66086 | 2.80745 | 2.95404 | 2.17907 | 2.29547 | 2.41187 | 1.49031 | 1.56373 | 1.63714 |
| 24 | 4.18543 | 4.4276 | 4.66977 | 2.76264 | 2.9156 | 3.06856 | 2.2599 | 2.38136 | 2.50282 | 1.54119 | 1.6178 | 1.69441 |
| 25 | 4.34649 | 4.59875 | 4.85101 | 2.86441 | 3.02375 | 3.18309 | 2.34073 | 2.46725 | 2.59378 | 1.59208 | 1.67188 | 1.75168 |
| 26 | 4.50755 | 4.7699 | 5.03225 | 2.96619 | 3.1319 | 3.29761 | 2.42155 | 2.55314 | 2.68473 | 1.64296 | 1.72595 | 1.80894 |
| 27 | 4.66861 | 4.94105 | 5.21349 | 3.06797 | 3.24005 | 3.41213 | 2.50238 | 2.63903 | 2.77568 | 1.69384 | 1.78003 | 1.86621 |
| 28 | 4.82967 | 5.1122 | 5.39473 | 3.16974 | 3.3482 | 3.52666 | 2.58321 | 2.72492 | 2.86663 | 1.74472 | 1.8341 | 1.92348 |
| 29 | 4.99073 | 5.28335 | 5.57597 | 3.27152 | 3.45635 | 3.64118 | 2.66404 | 2.81081 | 2.95758 | 1.79561 | 1.88818 | 1.98074 |
| 30 | 5.15179 | 5.4545 | 5.75722 | 3.3733 | 3.5645 | 3.75571 | 2.74487 | 2.8967 | 3.04853 | 1.84649 | 1.94225 | 2.03801 |
| 31 | 5.31284 | 5.62565 | 5.93846 | 3.47507 | 3.67265 | 3.87023 | 2.8257 | 2.98259 | 3.13948 | 1.89737 | 1.99633 | 2.09528 |
| 32 | 5.4739 | 5.7968 | 6.1197 | 3.57685 | 3.7808 | 3.98475 | 2.90653 | 3.06848 | 3.23043 | 1.94826 | 2.0504 | 2.15254 |
| 33 | 5.63496 | 5.96795 | 6.30094 | 3.67862 | 3.88895 | 4.09928 | 2.98736 | 3.15437 | 3.32138 | 1.99914 | 2.10448 | 2.20981 |
| 34 | 5.79602 | 6.1391 | 6.48218 | 3.7804 | 3.9971 | 4.2138 | 3.06819 | 3.24026 | 3.41233 | 2.05002 | 2.15855 | 2.26708 |
| 35 | 5.95708 | 6.31025 | 6.66342 | 3.88218 | 4.10525 | 4.32832 | 3.14902 | 3.32615 | 3.50329 | 2.10091 | 2.21263 | 2.32435 |
| 36 | 6.11814 | 6.4814 | 6.84466 | 3.98395 | 4.2134 | 4.44285 | 3.22984 | 3.41204 | 3.59424 | 2.15179 | 2.2667 | 2.38161 |
| 37 | 6.2792 | 6.65255 | 7.0259 | 4.08573 | 4.32155 | 4.55737 | 3.31067 | 3.49793 | 3.68519 | 2.20267 | 2.32078 | 2.43888 |
| 38 | 6.44026 | 6.8237 | 7.20714 | 4.18751 | 4.4297 | 4.67189 | 3.3915 | 3.58382 | 3.77614 | 2.25355 | 2.37485 | 2.49615 |
| 39 | 6.60132 | 6.99485 | 7.38838 | 4.28928 | 4.53785 | 4.78642 | 3.47233 | 3.66971 | 3.86709 | 2.30444 | 2.42893 | 2.55341 |
| 40 | 6.76238 | 7.166 | 7.56962 | 4.39106 | 4.646 | 4.90094 | 3.55316 | 3.7556 | 3.95804 | 2.35532 | 2.483 | 2.61068 |
| 41 | 6.92344 | 7.33715 | 7.75086 | 4.49284 | 4.75415 | 5.01546 | 3.63399 | 3.84149 | 4.04899 | 2.4062 | 2.53708 | 2.66795 |
| 42 | 7.0845 | 7.5083 | 7.9321 | 4.59461 | 4.8623 | 5.12999 | 3.71482 | 3.92738 | 4.13994 | 2.45709 | 2.59115 | 2.72521 |
| 43 | 7.24556 | 7.67945 | 8.11334 | 4.69639 | 4.97045 | 5.24451 | 3.79565 | 4.01327 | 4.23089 | 2.50797 | 2.64523 | 2.78248 |
| 44 | 7.40662 | 7.8506 | 8.29458 | 4.79817 | 5.0786 | 5.35903 | 3.87648 | 4.09916 | 4.32184 | 2.55885 | 2.6993 | 2.83975 |
| 45 | 7.56768 | 8.02175 | 8.47582 | 4.89994 | 5.18675 | 5.47356 | 3.95731 | 4.18505 | 4.4128 | 2.60974 | 2.75338 | 2.89702 |
| 46 | 7.72874 | 8.1929 | 8.65706 | 5.00172 | 5.2949 | 5.58808 | 4.03813 | 4.27094 | 4.50375 | 2.66062 | 2.80745 | 2.95428 |
| 47 | 7.8898 | 8.36405 | 8.8383 | 5.1035 | 5.40305 | 5.7026 | 4.11896 | 4.35683 | 4.5947 | 2.7115 | 2.86153 | 3.01155 |
| 48 | 8.05086 | 8.5352 | 9.01954 | 5.20527 | 5.5112 | 5.81713 | 4.19979 | 4.44272 | 4.68565 | 2.76238 | 2.9156 | 3.06882 |
| 49 | 8.21192 | 8.70635 | 9.20078 | 5.30705 | 5.61935 | 5.93165 | 4.28062 | 4.52861 | 4.7766 | 2.81327 | 2.96968 | 3.12608 |
| 50 | 8.37298 | 8.8775 | 9.38203 | 5.40883 | 5.7275 | 6.04618 | 4.36145 | 4.6145 | 4.86755 | 2.86415 | 3.02375 | 3.18335 |

*This chart is for Class I Cable only. For Class H, K, and M Cable, please reference the complete ASTM F2249-18 Standard*

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Hubbell / Chance, USA
210 N. Allen Street
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573-682-5521
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