Conductor Sizing Examples REFRESHER

Following are some examples that show how to confirm that the ampacity of the conductor, when adjusted for conditions of use, is sufficient for the current.

Conductor Ampacity

Conductor ampacity adjustment factors; conditions of use

Condition 1
Ambient temperature correction factors (TCF) per NEC Table 310.15 (B) (2) (a) or (b).

Condition 2
Wire fill adjustment factors (AF) for more than 3 current-carrying conductors per NEC Table 310.15 (B) (3) (a).

Determine if the specified conductor is sized correctly according to ambient temperature correction factors NEC Table 310.15 (B) (2) (a) or (b) and fill adjustment factors NEC Table 310.15 (B) (3) (a).

Condition 1
Is #10 AWG THHN compliant for (3) or less current-carrying conductors installed in a raceway with an ambient temperature of 132-140 degrees F?

#10 THHN ampacity = 40 amps
40 A x .71 TCF = 28 amps

Condition 2
Is #10 AWG THHN compliant for (6) current-carrying conductors installed in a raceway with an ambient temperature of 132-140 degrees F?

#10 THHN ampacity = 40 amps
40A x.71 TCF x .8 AF = 22.7 amps

Notes

Use of #10 (ampacity = 40 A) or larger string conductors will always comply for a single string.

For systems utilizing dc-dc converters, the dc-dc converter output continuous current rating is used, not Isc. See 690.8 (A) (5).

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DC Conductor Sizing

Confirm the shown calculations of the size of DC conductors per NEC 690.8. The minimum DC conductor size shall be the larger of the two methods below:

Method 1

1.25 (continuous use) x 1.25 (irradiance) x module short circuit current (Isc) before the application of adjustment and correction factors (raceway wire fill and ambient temperature).

Method 2

1.25 x Isc x module short circuit current after application of adjustment and correction factors. (See 'C' below for an example of how to apply ampacity adjustment and correction factors).

Check the plan for compliance:

- Module short circuit current (Isc) = 7.81 A
- Proposed conductor size #10 AWG

Method 1

7.81 A x 1.25 x 1.25 = 12.2 A
#10 ampacity = 40 amps
40 amps > 12 amps; **therefore #10 AWG OK**

Method 2

7.81 A x 1.25 = 9.76 amps
#10 ampacity after temperature correction factor (0.71) applied = 40 amps x .71 TCF = 28 amps 28 amps > 9.76 amps;
therefore #10 AWG OK

TCF = Temperature Correction Factor from NEC Table 310.15(B)(2)(a)

Inverter Overcurrent Protection/AC Conductor Sizing

Calculate the inverter overcurrent protection size and AC conductor size per NEC 705.60.

Inverter Overcurrent Protection Size

Inverter output (ac) conductors and overcurrent devices shall be sized to carry not less than 125% of the inverter continuous output rating.

AC Conductor Size

Use conductor ampacity adjustment factors for raceway wire fill and ambient temperature as applicable.

Check the plan for compliance:

- Inverter maximum current (AC output) = 14.5 A
- Proposed conductor size #10 AWG (ampacity = 40 A)

Inverter Overcurrent Protection Size

Inverter output current = 14.5 A
14.5 A x 1.25 = 18.125 A; **therefore inverter circuit breaker = 20 A**

AC Conductor Size

#10 ampacity after temperature correction factor (0.71) applied =
40 amps x .71 TCF = 28.4 amps
Inverter (AC) output conductor = #10
28.4 amps > 18 amps; **therefore #10 AWG for AC conductors is OK**

TCF = Temperature Correction Factor from NEC Table 310.15(B)(2)(a)

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