

Circuit Calculations, M215 Microinverter

Overview

This document serves as a reference guide for properly sizing conductors for **center-fed** M215 microinverter branch circuit home runs. This document is also a summarized addendum to the Technical Brief: *Calculating AC Line Voltage Drop for M215 Microinverters with Engage™ Cables*. The goal of the conductor sizing summarized below is to have 2% or less of voltage drop between the junction box at the end of the Engage Cable coming from the **(center-fed)** microinverter branch and the main load center. With the less than 1% voltage drop in a fully populated **(center-fed)** branch circuit of microinverters and the less than 1% voltage drop from all connectors and circuit breakers in various switchgear, this will yield a total voltage drop of about 3.5%, which is the goal of this exercise.

240 Vac Split Phase

The table below provides recommendations for wire size from the junction box at the end of the Engage Cable coming from the **(center-fed)** microinverter branch to the main load center based on distance.

External Branch (Home Run) Wiring (for Full Branch) Maximum Distance in Feet									
	Microinverters per sub-branch (in a center-fed system)								
Wire	2	3	4	5	6	7	8	9	
10 AWG	591	386	281	216	171	137	111	89	
8 AWG	943	615	448	344	272	219	177	142	
6 AWG	1493	975	710	545	431	347	280	225	
4 AWG	2382	1554	1131	870	688	553	447	360	

Circuit Current Calculation

- Maximum Output Power = 215 Watts AC
- $215 \text{ W} \div 240 \text{ V} = 0.9 \text{ Amps}$
- $0.9 \text{ Amps} \times 17 \text{ microinverters} = 15.3 \text{ Amps} / \text{branch}$

Overcurrent Protection Calculation

- $15.3 \times 1.25 = 19.1 \text{ Amps}$

Conclusions

- Install one to 17 M215 Microinverters per branch circuit, up to 3655 Watts AC
- Maximum 2 Pole 20 Amp circuit breaker
- Minimum 10AWG wire size
- Engage Cable required

208 Vac Three Phase

The table below provides recommendations for wire size from the junction box at the end of the Engage Cable coming from the **(center-fed)** microinverter branch to the main load center based on distance.

External Branch (Home Run) Wiring Maximum Distance in Feet									
Wire	Microinverters per sub-branch (in a center-fed system)								
	4	5	6	7	8	9	10	11	12
10 AWG	217	165	129	102	80	67	53	44	39
8 AWG	347	263	205	161	126	116	103	92	84
6 AWG	550	417	325	255	201	164	146	127	109
4 AWG	877	665	518	407	319	254	213	185	164

Circuit Current Calculation

- Maximum Output Power = 215 Watts AC
- $215 \text{ W} \div 208 \text{ V} = 1.03 \text{ Amps}$
- $(1.03 \text{ Amps} \times 24 \text{ microinverters}) \div 1.732 \text{ (square root of 3, for 3-phase)} = 14.32 \text{ Amps / branch}$

Overcurrent Protection Calculation

- $14.32 \times 1.25 = 17.9 \text{ Amps}$

Conclusions

- Install three to 24 M215 Microinverters per branch circuit, up to 5160 Watts AC
- Maximum 3 Pole 20 Amp circuit breaker
- Minimum 10 AWG wire size
- Engage Cable Required

Summary

To minimize any installation difficulties, please adhere to the tables in this document and the information in Enphase's Technical Brief: *Calculating AC Line Voltage Drop for M215 Microinverters with Engage™ Cables* (found at www.enphase.com/support/downloads).