

Calculating Wire Lengths for Short Circuit Current Ratings

While calculating the voltage drop involves a simple equation (Ohm's Law: $V=IR$) where the voltage drop is directly affected by the conductor's resistance, calculating the number of wire-feet required to impede a short circuit current is much more complex:

For 120/277VAC Loads:

$$\text{Conductor length} = \frac{(\text{Breaker AIC Rating} - \text{Relay SCCR Rating}) \times (\# \text{ of Conductors per Phase}) \times (\text{Conductor Constant}) \times \text{Voltage (l-n)}}{2 \times (\text{Relay SCCR Rating}) \times (\text{Breaker AIC Rating})}$$

For 208/480VAC Loads:

$$\text{Conductor length} = \frac{(\text{Breaker AIC Rating} - \text{Relay SCCR Rating}) \times (\# \text{ of Conductors per Phase}) \times (\text{Conductor Constant}) \times \text{Voltage (l-l)}}{1.73 \times (\text{Relay SCCR Rating}) \times (\text{Breaker AIC Rating})}$$

Wire Gauge (AWG)	Voltage (VAC)	Breaker AIC Rating (A)	Short Circuit Current Rating (SCCR) of Relay				
			1,500	5,000	10,000	14,000	18,000
Required Conductor Length (ft.) between Breaker & Relay							
10	120 (l-n)	14,000	35	8	2	0	N/A
		22,000	37	9	3	2	1
		65,000	38	11	5	3	2
12	120 (l-n)	14,000	22	5	1	0	N/A
		22,000	23	6	2	1	0
		65,000	24	7	3	2	1
14	120 (l-n)	14,000	14	3	1	0	0
		22,000	14	4	1	1	0
		65,000	15	4	2	1	1
10	277 (l-n)	14,000	81	17	4	0	N/A
		22,000	84	21	7	4	1
		65,000	88	25	11	8	5
12	277 (l-n)	14,000	51	11	2	0	N/A
		22,000	53	13	5	2	1
		65,000	56	16	7	5	3
14	277 (l-n)	14,000	32	7	2	0	N/A
		22,000	33	8	3	1	1
		65,000	35	10	5	3	2
10	208 (l-l)	14,000	70	15	3	0	N/A
		22,000	73	18	6	3	1
		65,000	77	22	10	7	5
12	208 (l-l)	14,000	44	10	2	0	N/A
		22,000	46	11	4	2	1
		65,000	48	14	6	4	3
14	208 (l-l)	14,000	28	6	1	0	N/A
		22,000	29	7	3	1	0
		65,000	30	9	4	3	2
10	480 (l-l)	14,000	162	35	8	0	N/A
		22,000	169	42	15	7	3
		65,000	177	50	23	15	11
12	480 (l-l)	14,000	102	22	5	0	N/A
		22,000	106	26	9	4	2
		65,000	110	32	14	10	7
14	480 (l-l)	14,000	64	14	3	0	N/A
		22,000	67	17	6	3	1
		65,000	70	20	9	6	4

Even with the relay panel mounted right next to the breaker panel, approximately 5-6 feet of wire is needed to connect the devices.

The above table shows that Douglas Lighting Controls relays rated at 14,000 SCCR need virtually no additional length of wire to impede the short circuit current. The table also shows there is no advantage in rating a relay to exceed a 14,000 amp SCCR.

Douglas WR-6161 Relays are Fully Compliant with NEC 2005 Article 409