

Application Notes

Core and Terminal Selection for Type 200, 270, 400 and 470 Tubular Resistors

Free Air Wattage Rating	Nominal Core Dimensions			Code for Core Dia.	VITREOUS ENAMEL COATED					OHMICONE® SILICONE COATED						
					Critical Resistance Limiting Factors					Critical Resistance Limiting Factors						
					Min. Ohms	For Ohms Over	Limit Watts and Working Voltage to	Max. Possible Ohms	Standard Terminal**	Min. Ohms	For Ohms Over	Limit Working Voltage to	Max. Possible Ohms			
3*	0.438" (11.1mm)	0.210" (5.25mm)	0.130" (3.17mm)	AA	0.13	Limits controlled by free air watts and max. possible ohms	3.48K	48, 58	0.1	8.0K	155	15.8K				
5.25*	0.625" (15.9mm)	0.250" (6.35mm)	0.135" (3.43mm)	CA	0.19								7.06K	48, 58	0.1	15.0K
6.5	1.0" (25.4mm)	0.250" (6.35mm)	0.125" (3.18mm)	CA	0.10	2.30K	27.3K	57	0.1	21.6K	375	45.4K				
8*	1.0" (25.4mm)	0.313" (7.95mm)	0.188" (4.76mm)	D	0.10	2.16K	17.1K	48, 57	0.1	9.87K	281	42.8K				
12*	1.75" (44.5mm)	0.313" (7.95mm)	0.188" (4.76mm)	D	0.10	6.52K	51.6K	48, 57					50.0K	775	50.4K	
11	1.0" (25.4mm)	0.438" (11.1mm)	0.250" (6.35mm)	H	0.10	3.02K	28.2K	57	0.1	7.18K	281	35.3K				
15	1.5" (38.1mm)				6.03K	56.4K	40	21.1K					563	70.5K		
20*	2.0" (50.8mm)				10.1K	94.0K	48-40	44.0K					938	118.0K		
26	3.0" (76.2mm)				18.1K	169.0K	40	110.0K					1690	212.0K		
25*	2.0" (50.8mm)				0.563" (14.3mm)	0.313" (7.95mm)	K	0.15					12.9K	100.0K	40	0.1
35	3.0" (76.2mm)	0.750" (19.1mm)	0.50" (12.7mm)	M	0.26	23.2K	180.0K	40	0.1	11.1K	516	73.6K				
50*	4.0" (101.6mm)				33.5K	260.0K	81.6K						1690	272.0K		
60	5.0" (127.0mm)				43.8K	340.0K	119.0K						2440	393.0K		
75*	6.0" (152.4mm)				54.1K	420.0K	170.0K						3190	340.0K		
24	1.5" (38.1mm)				9.49K	12.2K	21.1K						40	26.6K	893	127.0K
30	2.0" (50.8mm)				16.4K	21.1K	38.8K						40	59.8K	1640	234.0K
45	3.0" (76.2mm)				30.2K	38.8K	47.6K						40	80.0K	2020	288.0K
51	3.5" (88.9mm)				37.1K	47.6K	56.5K						40	93.6K	2390	341.0K
61	4.0" (101.6mm)				44.0K	56.5K	65.3K						40	118.0K	2770	395.0K
65	4.5" (114.3mm)				50.9K	65.3K	74.2K						40	130.0K	3140	448.0K
76	5.0" (127.0mm)	57.8K	74.2K	91.9K	40	168.0K	3890	555.0K								
90	6.0" (152.4mm)	71.6K	91.9K	101.0K	40	182.0K	4270	609.0K								
100*	6.5" (165.1mm)	78.5K	101.0K	25.3K	40	0.1	49.2K	1600	305.0K							
52	3.0" (76.2mm)	0.11	37.2K	78.9K						2350	448.0K					
70	4.0" (101.6mm)	0.17	49.1K	113.0K						3100	591.0K					
85	5.0" (127.0mm)	0.22	61.0K	141.0K						3850	734.0K					
105	6.0" (152.4mm)	0.27	67.1K	159.0K						4220	805.0K					
112	6.5" (165.1mm)	0.30	72.9K	176.0K						4600	877.0K					
120	7.0" (177.8mm)	0.33	84.8K	204.0K						5350	1.02M					
140	8.0" (203.2mm)	0.38	109.0K	267.0K						6850	1.31M					
176	10.0" (254.0mm)	0.49	9.63K	46	0.1	6.66K	516	89.3K								
40	2.0" (50.8mm)	1.125" (28.6mm)	0.75" (19.1mm)	P	0.10	37.7K	51.0K	2020	328.0K							
80	4.0" (101.6mm)	1.125" (28.6mm)	0.75" (19.1mm)	P	0.10	51.7K	80.8K	2770	450.0K							
95	5.0" (127.0mm)				65.7K	102.0K	3520	572.0K								
121	6.0" (152.4mm)				72.7K	116.0K	3890	633.0K								
130	6.5" (165.1mm)				93.7K	158.0K	5020	816.0K								
160	8.0" (203.2mm)				101.0K	166.0K	5390	877.0K								
175*	8.5" (215.9mm)				129.0K	211.0K	6890	1.12M								
225*	10.5" (266.7mm)				139.0K	237.0K	7460	1.21M								
235	11.25" (285.8mm)				150.0K	257.0K	8030	1.31M								
251	12.0" (304.8mm)				0.19	34.2K	45	0.1	44.4K	2580	433.0K					
150	5.0" (127.0mm)				1.5" (38.1mm)	1.125" (28.6mm)	Q	0.10	75.0K	45	0.1	123.0K	5210	351.0K		
220	8.5" (215.9mm)	1.625" (41.3mm)	1.125" (28.6mm)	R	0.18	96.6K	164.0K	6710	452.0K							
275	10.5" (266.7mm)	1.625" (41.3mm)	1.125" (28.6mm)	R	0.23	110.0K	195.0K	7650	516.0K							
300	11.75" (298.5mm)				0.26	6.11K	45	0.1	35.0K	2960	86.3K					
250	6.0" (152.4mm)				2.5" (63.5mm)	1.75" (44.5mm)	S	0.15	15.4K	111.0K	7460	218.0K				
500	12.0" (304.8mm)	2.5" (63.5mm)	1.75" (44.5mm)	S	0.38	20.0K	125.0K	9680	283.0K							
750	15.0" (381.0mm)				0.50	180.0K	13400	392.0K								
1000	20.0" (508.0mm)				0.69	27.7K										

*These core sizes are used for the standard items. See the listing of the resistance values under Types 200, 210 and 270

**See Application Note "Resistor Terminals for Tubular Cores," page 35.

Tolerance on Nominal Core Dimensions

Length	Tolerance
0.438 (11.113mm) to 4.00 (101.60mm)	±0.031 (0.794mm)
Over 4.00 (101.60mm) to 6.50 (165.10mm)	±0.047 (1.191mm)
Over 6.50 (165.10mm) to 11.25 (285.575mm)	+0.063 (1.588mm) / -0.094 (2.381mm)
Over 11.25 (285.575mm) to 20.0 (508.0mm)	±0.125 (3.175mm)

Tolerances do not include effect of longitudinal camber.

I.D.	Tolerance
To 0.500 (12.700mm)	±0.016 (0.397mm)
Over 0.500 (12.700mm) to 1.125 (28.575mm)	±0.031 (0.794mm)
Over 1.125 (28.575mm) to 1.750 (44.450mm)	±0.063 (1.588mm)

Maximum Diameter Over Coating: The overall diameter of a finished resistor includes the build-up due to wire diameter, coating and terminal material. This results in a possible maximum increase in diameter of 0.188 (4.763mm) for low resistance, 1.125 (28.575mm) O.D. core resistors and larger; 0.156 (3.969mm) for resistors with smaller diameter cores. On all high resistance units the increase is generally less than 0.125 (3.175mm).

Other Core Sizes: Many other specials are available including cores with special inside diameter listed at right.

Cores with Non-standard I.D. (or O.D.)

O.D.	I.D.	Code
0.313" (7.938mm)	0.219" (5.556mm)	DA
0.438" (11.113mm)	0.313" (7.938mm)	HA
0.563" (14.288mm)	0.391" (9.922mm)	KA
0.625" (15.875mm)	0.453" (11.509mm)	LA
0.750" (19.050mm)	0.547" (13.891mm)	MA
0.938" (23.813mm)	0.563" (14.288mm)	UA
1.125" (28.575mm)	0.875" (22.225mm)	PA

Application Notes

Core and Terminal Selection for Type 210 and 410 Tubular Resistors

Free Air Wattage Rating	Nominal Core Dimensions			Code for Core		Min. Ohms	VITREOUS ENAMEL COATED		OHMICONE® SILICONE COATED		Max. Possible Ohms							
	Length	Outside Diameter	Inside Diameter	Core Dia.	Std. Term.**		Critical Resistance Limiting Factors		Critical Resistance Limiting Factors									
							For Ohms Over	Limit Watts and Working Voltage to	Limit Watts and Working Voltage to	Limit Watts and Working Voltage to								
3*	0.438" (11.1mm)	0.210" (5.25mm)	0.130" (3.17mm)	AA	48, 58	These core sizes not available as adjustable resistors												
5.25*	0.625" (15.9mm)	0.250" (6.35mm)	0.135" (3.43mm)	CA	48, 58													
6.5	1.0" (25.4mm)	0.250" (6.35mm)	0.125" (3.18mm)	CA	57													
8*	1.0" (25.4mm)	0.313" (7.95mm)	0.188" (4.76mm)	D	48, 57	0.95	4.47K	10W; 316V	12W; 345V	10.0K								
12*	1.75" (44.5mm)	0.313" (7.95mm)	0.188" (4.76mm)	D	48, 57													
11	1.0" (25.4mm)	0.438" (11.1mm)	0.250" (6.35mm)	H	57	These core sizes not available as adjustable resistors												
15	1.5" (38.1mm)				40													
20*	2.0" (50.8mm)				48-40													
26	3.0" (76.2mm)				40													
25*	2.0" (50.8mm)				40													
35	3.0" (76.2mm)	0.563" (14.3mm)	0.313" (7.95mm)	K	0.24	Limit wattage to 78% of free air watts and working volts to 500V per inch of winding space between terminal edges	8.88K	Limits controlled by free air watts and working volts to 500V per inch of winding space between terminal edges	25.0K									
50*	4.0" (101.6mm)				0.43					16.0K	45.6K							
60	5.0" (127.0mm)				0.62					23.1K	100.0K							
75*	6.0" (152.4mm)				0.81					30.2K	86.2K							
75*	6.0" (152.4mm)				1.00					37.3K	100.0K							
24	1.5" (38.1mm)				0.750" (19.1mm)					0.50" (12.7mm)	M	0.24	Limit wattage to 78% of free air watts and working volts to 500V per inch of winding space between terminal edges	6.16K	Limits controlled by free air watts and working volts to 500V per inch of winding space between terminal edges	8.73K		
30	2.0" (50.8mm)											0.42					10.7K	15.1K
45	3.0" (76.2mm)											0.77					19.6K	27.8K
51	3.5" (88.9mm)											0.95					24.1K	34.1K
61	4.0" (101.6mm)											1.10					28.6K	40.5K
65	4.5" (114.3mm)	1.30	33.0K	46.8K														
76	5.0" (127.0mm)	1.50	37.5K	53.2K														
90	6.0" (152.4mm)	1.80	46.5K	65.9K														
100*	6.5" (165.1mm)	1.00	50.9K	100.0K														
52	3.0" (76.2mm)	1.0" (25.4mm)	0.625" (15.9mm)	N		0.18	Limit wattage to 78% of free air watts and working volts to 500V per inch of winding space between terminal edges	6.16K	Limits controlled by free air watts and working volts to 500V per inch of winding space between terminal edges			25.3K						
70	4.0" (101.6mm)					0.26											37.2K	37.2K
85	5.0" (127.0mm)					0.34											49.1K	49.1K
105	6.0" (152.4mm)					0.42											61.0K	61.0K
112	6.5" (165.1mm)				0.47	67.0K				67.0K								
120	7.0" (177.8mm)				0.51	72.9K				72.9K								
140	8.0" (203.2mm)				0.59	84.8K				84.8K								
176	10.0" (254.0mm)				0.75	109.0K				109.0K								
40	2.0" (50.8mm)				1.125" (28.6mm)	0.75" (19.1mm)				P	0.10		Limit wattage to 78% of free air watts and working volts to 500V per inch of winding space between terminal edges	6.16K	Limits controlled by free air watts and working volts to 500V per inch of winding space between terminal edges	9.57K		
80	4.0" (101.6mm)	0.25	37.4K	37.4K														
95	5.0" (127.0mm)	0.34	51.3K	51.3K														
121	6.0" (152.4mm)	0.44	65.2K	65.2K														
130	6.5" (165.1mm)	0.48	72.2K	72.2K														
160	8.0" (203.2mm)	0.62	93.0K	93.0K														
175*	8.5" (215.9mm)	0.67	100.0K	100.0K														
225*	10.5" (266.7mm)	0.86	100.0K	100.0K														
235	11.25" (285.8mm)	0.93	138.0K	138.0K														
251	12.0" (304.8mm)	1.00	148.0K	148.0K														
150	5.0" (127.0mm)	1.5" (38.1mm)	1.125" (28.6mm)	Q			45	0.41	29.4K		29.4K							
220	8.5" (215.9mm)	1.625" (41.3mm)	1.125" (28.6mm)	R	45	0.91	64.6K	64.6K										
275	10.5" (266.7mm)				1.20	83.2K	83.2K											
300	11.75" (298.5mm)				1.30	94.8K	94.8K											
250	6.0" (152.4mm)	2.5" (63.5mm)	1.75" (44.5mm)	S	45	0.61	6.11K	6.11K										
500	12.0" (304.8mm)				1.50	15.4K	15.4K											
750	15.0" (381.0mm)				2.00	20.0K	20.0K											
1000	20.0" (508.0mm)				2.80	27.7K	27.7K											

*These core sizes are used for the standard items. See the listing of the resistance values under Types 200, 210 and 270

**See Application Note "Resistor Terminals for Tubular Cores," page 35.