

## End Insulators for DCA310

TS-SSC 91-107  
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Inspection reports I12940, 12946, 12948, and 12949 give Cordax measurement results for G10-CR lead and non-lead end insulators to be used in magnet DCA310. Figure 1 shows schematically which measurements are found to be out of tolerance. These measurements and their minimum and maximum deviations from specified values are given in Table 1. The first column of the table gives the specified tolerance range for each of these measurements.

Measurement # (See Figure 1)	Lead End Low	Lead End High	Non-lead End Low	Non-lead End High
1 (+2, -0mils)	-28	-18	-27	-22
2 (+5, -0mils)	-40	-18	-40	-25
3 (+5, -0mils)	-23	-13	-32	-15
4 ( $\pm 10$ , mils)	-22	-13	-21	-16
5 ( $\pm 0.02$ degrees)	-.103	.034	-.067	.061
6 ( $\pm 2$ mils)	-33	-16	-30	-13
7 (+10, -0mils)	-22	-12	-23	-16

Table 1. Measurement Deviations (Low and High Values)

**Inner and Outer Radii:** Figures 2a and 2b show the deviations in mils from the specified values of all radius measurements. These measurements are seen to be consistent with a fairly uniform "bowing" of the part, which has been seen before in G10-CR end insulators. This bowing is expected, since the four insulator quadrants are cut from a cylinder with the correct dimensions<sup>1</sup>, thereby allowing built-in stresses to relax. The uniformity of the radius decrease from inner to outer radii implies that the parts have the correct thickness.

**x and y Plane Offsets:** These offsets from the datum coordinate x and y axes are meant to provide 32 mils of clearance at each quadrant boundary. The negative values for the offsets reported by the Cordax measurements are due to the bowing inward of the parts, which unfortunately renders these measurements virtually meaningless.

**Taper Angle:** The range of deviations from desired taper angle implies a range in the difference between reference dimension 3.211 inches and the dimension 3.496 inches (see Figure 1) of + 9, -15 mils. It is not immediately clear to me what should happen to this taper angle when the insulators bow in.

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<sup>1</sup>Such a cylinder has actually been received from Spaulding Fibre, Inc. and measured on the Cordax, and was found to have the correct dimensions. (Dennis Graham, private communication.)

I would like to understand the taper angle issue better. The specified range in taper angle ( $\pm 0.02$  degrees) implies a  $\pm 4.9$  mil range in the 3.211" reference dimension if the  $\pm 2$  mil tolerance in the 3.496" dimension is taken into account. I don't know what the taper angle tolerance should be.

**DISPOSITION:** Since the bowing of the parts will probably disappear upon installation, I recommend going ahead with installation of these parts. We might consider cutting radial grooves in the parts to allow them to conform more easily. This has been recommended on several occasions by John Carson, but I have never tried it.

### DCA310 Lead End Insulators

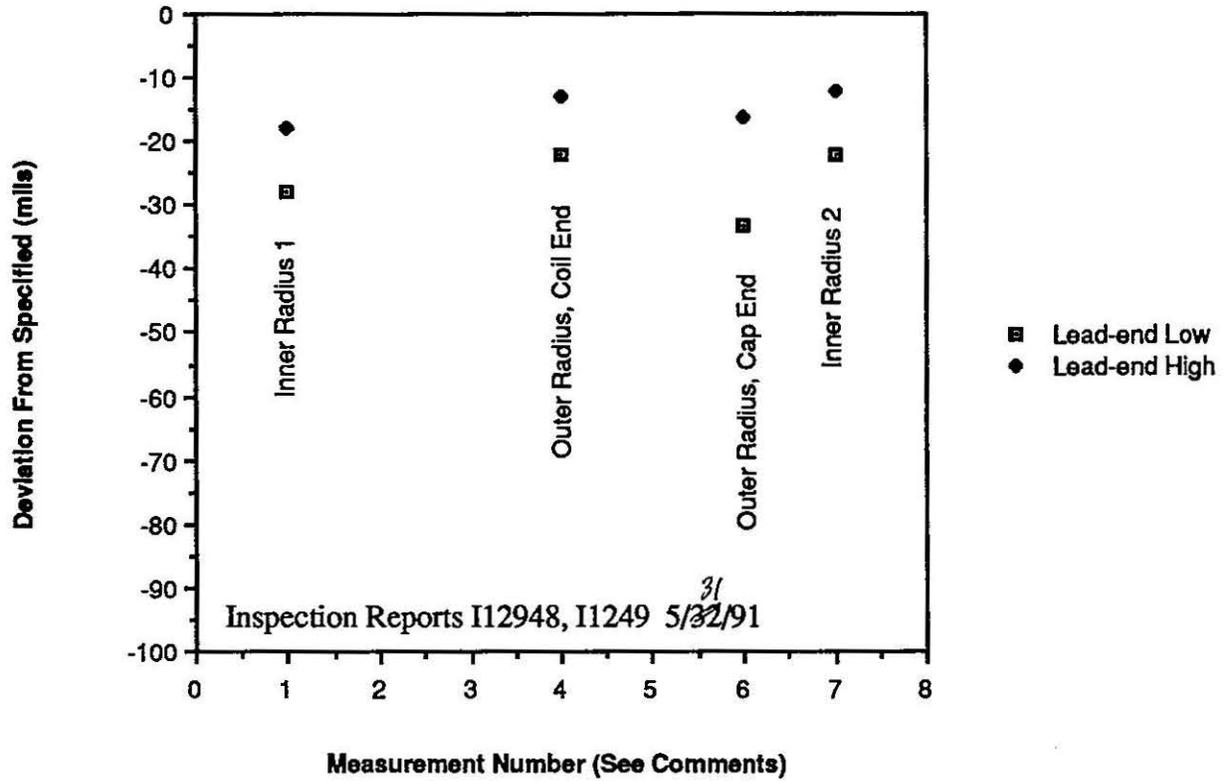
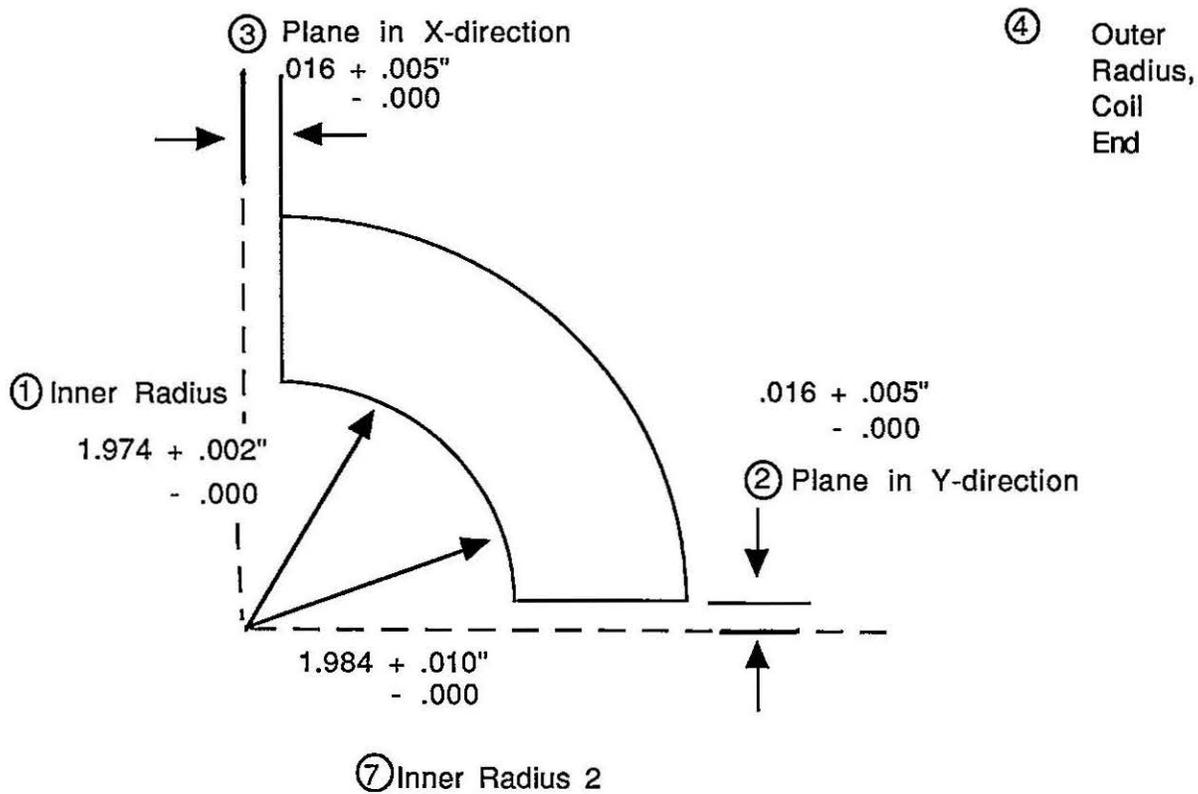
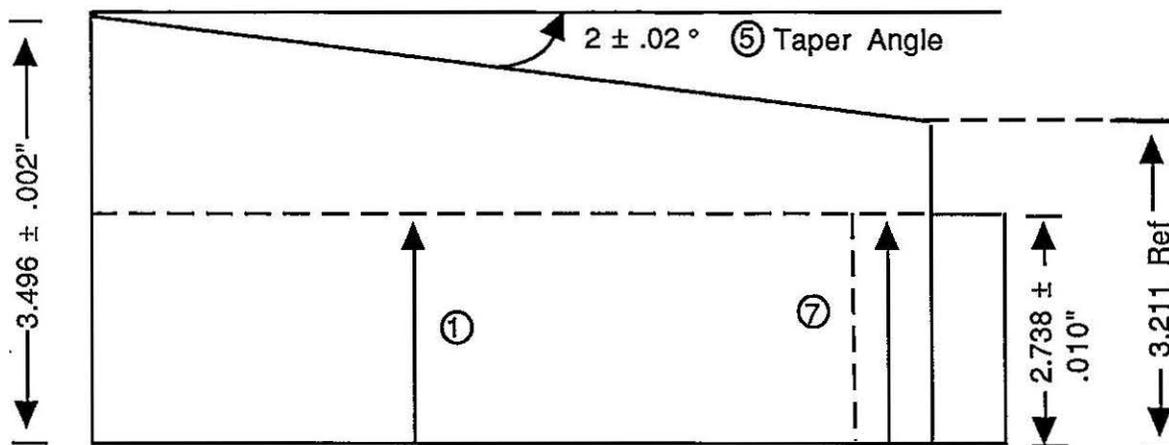


Figure 2a.

⑥ Outer Radius, Cap End



Specified values and tolerances for critical measurements (circled numbers refer to Table 1.)

Figure 1.

### DCA310 Non-Lead End Insulators

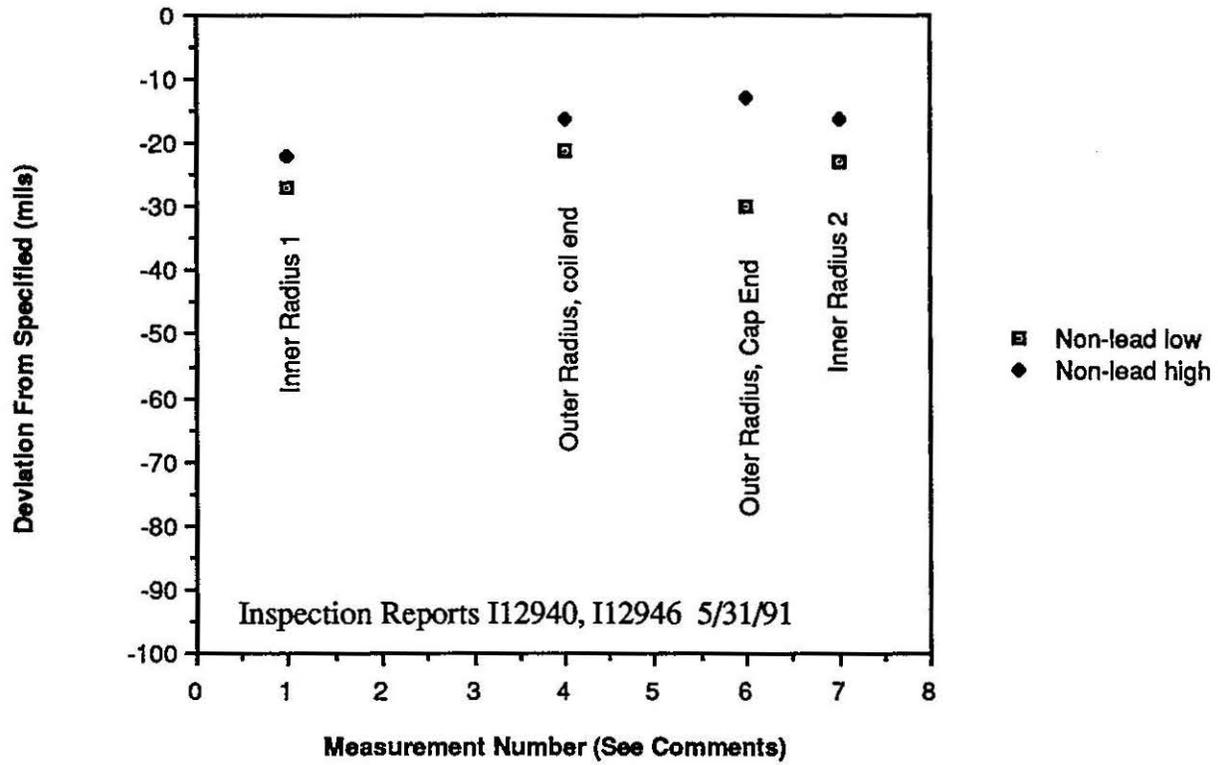


Figure 2b.