

Creep of RF-contact Slide Finger Due to Baking

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In vacuum chambers for the SPring-8 storage ring, bellows assemblies are set in order to accommodate thermal expansion of the chambers due to baking and compensate for installation errors in the longitudinal and the transverse directions between chambers. RF-contact slide fingers, which are made from BeCu (C1720P-1/4HT), are attached for smooth streams of wall current. Two types of finger are 5 mm wide, 0.7 mm thick and 107 mm long, and 5 mm, 0.6 mm and 87 mm, respectively. In order to decrease the contact resistance, the contact force of a finger must be larger than a certain force, 30 gf per finger when using this finger. The contact force of a finger is set above 50 gf in our design of the bellows assemblies. Since there is a fear that the contact force is reduced owing to baking, we estimate the creep of BeCu using test strips similar to the slide fingers.

The test strips made from BeCu were 5 mm wide, 0.7 mm thick and 115 mm long. The experiments were carried out under twelve conditions by combining the conditions of heating temperature and of setting contact force shown in Table 1.

Table 1. Experimental conditions for the creep of BeCu (C1720P-1/4HT).

heating temperature	• room temperature
	• 120 °C
	• 150 °C
	• 250 °C
setting contact force	• 50 gf/strip
	• 150 gf/strip
	• 200 gf/strip

The experiments at room temperature were made as a reference, and the reductions of contact force were not observed.

The representative data, which are an average of three strips on the same condition, for setting contact force

of 200 gf/strip are shown in Fig.1. We defined the time, when the temperature of strips reached the required value, as start time of measurements ($t=0$). Therefore, contact forces somewhat were decreased during the temperature of strips rose. There was lack of the data at 250 °C on the initial stage of measurements because we could not measure the contact force owing to a defect of measuring device. The contact force at 120 °C was constant during experiments. That at 150 °C slowly decreased and was reduced to about 165 gf/strip after 9000 hours. That at 250 °C rapidly decreased particularly more than 10 hours and was reduced to about 50 gf/strip after 1000 hours.

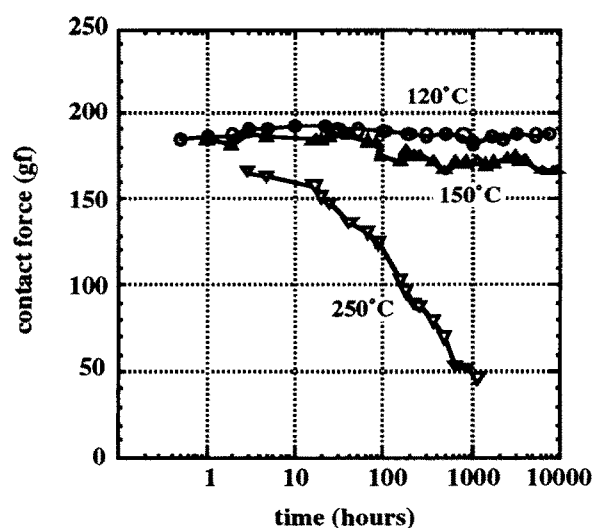


Fig.1. Creep of the test strips to 200 gf/strip at 120, 150 and 250 °C.

It was planned that the aluminum alloy parts and stainless steel (SUS) parts of the vacuum chambers were baked out at 150 °C and 250 °C, respectively. However, since a creep of BeCu finger at 250 °C is large, we suspect that the vacuum chamber, which is made from SUS, with RF-contact slide fingers must be also baked out at 150 °C. Assuming that the baking at 150 °C for 50 hours are performed several times per one year for 30 years, the total baking time is about

500 hours at most. The contact force after the 150 °C baking procedure of 500 hours is reduced to about 85 % of initial value. Thus, when the setting contact force of a finger is minimum, 50 gf, the force may decrease to about 42.5 gf. However, this value is enough larger than 30 gf, even taking account of the safety.

Therefore, it is planned that the vacuum chambers with an electron beam channel are baked out at 150 °C in the actual ring.