

DSA332 Quench Heater Test Results

There are two sets of heaters in DSA332 installed in the following configuration.

Quadrant Names in quotation marks are manufacturer's identification.

I	SHELDAHL "331-B"
II	LARS "332-B"
III	SHELDAHL "331-A"
IV	LARS "332-A"

According to manufacturer's specification sheet, Lars type are insulated with 1-mil kapton and 1.6 mil adhesive, and Sheldahl heaters are encapsulated with 2-mil Upilex film coated with modified 3P polyimide tape (0.5-mil adhesive).

Two heaters in diagonally opposite quadrants were hooked up in series. These heaters were fired with same system RC constant of ~172 ms. Here are the results from DSA332 heater tests at two different currents. The table below shows:

- R_h = heater resistance (in ohms)
- R_{tot} = total resistance of the system including heaters
- v_{hfu} = heater firing unit voltage (in volts). The voltage is chosen in each case to give the same energy deposition in the heater strip as in the case R_{add} = 0.
- T_{fn} = total time between heater firing and appearance of coil becoming normal (in milli seconds)
- I_q = magnet current (2 kA, 5 kA)
- E_d = energy (J) deposited in the strip heater

Measured values are C=38.5 mF; RC=172 ms;

Heater Resistances (R_h) in ohms

	WARM	COLD(4.2K)
QI	0.8315	0.4520
QII	0.7938	not available
QIII	0.8059	not available
QIV	0.8376	0.4220

(1) DSA332 Heaters in quadrants 2 and 4 in series:

R_{tot}(4.2K) = 4.66 ohm

T _{fn} (msec)	I _q (A)	V _{hfu} (v)	E _d (joule)
165	2003.	170.	107.2
205	2003.	150.	83.5
241	2002.	130.	62.7
100	5004.	190.	134.0
106	5004.	170.	
110	5004.	150.	
119	5034.	130.	
154	5000.	100.	37.1

(2) DSA332 Heaters in quadrants 1 and 3 in series:

$$R_{\text{tot}}(4.2\text{K}) = 4.6 \text{ ohm}$$

T_{fn} (msec)	I_{q} (A)	V_{hfu} (v)
169	2003.	170.
211	2003.	150.
250	2002.	130.
100	5004.	190.
110	5004.	170.
136	5004.	130.

There is ~5 percent variation in heater voltages and roughly 10 msec uncertainty in finding quench start. The differences in T_{fn} are consistent with measurement uncertainties.

Distribution:
C. Haddock