Exhaust Fan Temperature Switch

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May 11, 1989

D0 Engineering Note 3740.000-EN-210

Approved:

The 13000 cfm "emergency" vent fan must be protected from over cooling which would result in a mechanical failure. Over cooling could result from a catastrophic cryogen release from the cryostat(s) or Argon Storage Dewar. In order to protect the fan, a VPT has been calibrated for -31°C to open a switch which sends a signal to allow warm gas to enter the sump by means of a motor controlled louver installed at "sidewalk level" in the ductwork between the assembly hall and the Argon Dewar Enclosure. The bulb of the VPT is enclosed in a thermal well and will be placed in the gas stream directly above the fan. The switching unit will be mounted nearby on the wall in order to isolate it from vibrational effects. Should the fan be activated due to a cryogen release, it should not experience any problems when operating above -40°C (see attached fax from the manufacturer). The switch was set and checked in a saturated calcium chloride solution cooled to -31°C by running cold gaseous Nitrogen through a copper tube coiled in a dewar. Switching temperature was measured by a thermocouple tied to the VPT bulb. The thermocouple was checked in LN₂, in an ice water bath, and against an ordinary thermometer (which was assumed to be accurate to plus or minus 0.3°C) at room temperature. The results are shown below in "Table 1". By interpolation of the data, thermocouple error at -31.0°C was found to be 0.43°C on the warm side. Since this error was small, it was ignored. "Table 2" shows the results of the tests. Ten readings were taken with the switch wired in the "normally open" mode. This results in a signal at room temperature. The worst deviation was 2.5°C . Three readings were then taken from the "normally closed" wiring arrangement (the way it will be wired for installation). The greatest deviation was 1.2°C . The next day, the switch was checked five times wired in the "normally open" configuration. The greatest error was 1.1°C . A graph has been prepared showing the switching and resetting temperatures. The errors these tests bore out do not threaten the exhaust fan and are therefore acceptable.

Vent Fan VPT Switching Temps

Table 1
T.C. Calibration Check (°C)

	T.C.	Actual
LN2	-193.3	-196
Ice Water	0.0	0.0
Air	21.0	21.0 (see text)

Calc. Error < 0.5 °C at -31 °C
(unreflected in reported temperatures)

Table 2
Switching Temperatures (°C)
Throw Temp. Reset Temp.

Taken 02/21/89:		
"Normally Open" Configuration:		
1.	-31.9	-28.5
2.	-32.0	-31.0
3.	-31.5	-30.4
4.	-32.0	-31.0
5.	-31.2	-28.7
6.	-31.3	-29.2
7.	-31.0	-29.1
8.	-33.1	-30.4
9.	-31.3	-31.2
10.	-31.0	-30.8
"Normally Closed" Configuration:		
11.	-32.2	-30.8
12.	-31.5	-30.7
13.	-31.9	-30.8
Taken 02/22/89:		
"Normally Open" Configuration:		
14.	-31.4	-30.5
15.	-31.6	-30.6
16.	-31.8	-29.9
17.	-31.1	-30.5
18.	-31.3	-30.4

GSB

04/18/89

05/15/89

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DATE 5-2-89
FROM John R. NelsonPage 1 of 1 (INCLUDING THIS PAGE)
FAX # 312-520-9220MESSAGE: 40" LB Buffalo Forge Vaneapal Fan
CDF COLLISION HALL
FERMI P.O. 940160
Buffalo S.O. 88312044MINIMUM OPERATING TEMP.
15 - 40°F