

SPN1 Performance below -20°C

By Dr Nick Webb, Delta-T Devices 2015



Figure 1. SPN1 shown at right at -40°C on test in an environmental chamber at Delta-T

The temperature range of the SPN1 is specified as -40 to +70°C provided that the glass dome is frost free, and that the SPN1-RS232 cable is not flexed when less than -30°C and the SPN1/w-05 cable is not flexed when less than -5°C.

Within this range the environmental protection rating is IP67.

The lowest snow and ice free temperature (with the built-in heater in-use) is -20°C at 0 m/s wind speed and -10°C at 2 m/s.

The temperature coefficient of the sensitivity is typically $\pm 0.02\%$ over -20 to +70°C.

We have no test data on the resilience of the borosilicate glass dome to hailstones.

To date less than 0.3% of SPN1s sold have been returned with cracked or damaged glass domes. One, completely smashed, had been dropped onto the floor. The cause of damage for the others is believed to have been a manufacturing process error when fitting the glass dome into the aluminium case.

No SPN1s received back for repair or servicing have shown abrasion damage to the glass surface

No reports of hail damage have been received from MeteoSwiss who have about 100 SPN1s installed throughout Switzerland, many at altitude on Alpine mountains.

In preparation for a future trial at McMurdo in Antarctica an SPN1 was tested in a freezer, courtesy of The British Antarctic Survey, Cambridge, UK. It was logged for 8 days, of which 6 were at spent at -50°C, and during which, for 3 days, it had no internal heater or signal warmup power.

The unit survived the 3 days without power, restarting when power was reapplied, showing no sign of damage, and no significant change in calibration, being with 0.6% of its previous value.



Figure 2. Showing an SPN1 at left of centre, installed in a custom MeteoSwiss heated shroud, 1974 m above sea level at the MeteoSwiss "Le Moleson" field station in Switzerland. Photo Copyright © MeteoSwiss 2013.

Dr Chuck Long, a research scientist in the USA, tested an SPN1 over a winter at the Storm Peak Laboratory in Colorado, reporting that the “SPN1 did an excellent job of resisting snow, frost and rime”.



Figure 3. SPN1 radiometer (upper left), ventilated Eppley PSP radiometer lower left and a ventilated Eppley pyrgometer (upper right). A thin layer of frost is clearly visible on the PSP's dome.

Location: Storm Peak Laboratory at 3220 m a.s.l., Colorado, USA.

Photo Copyright ©Chuck Long (2012)

References

SPN1 -40°C Performance Report (2007) Unpublished Delta-T internal report by N.G.Webb

SPN1 -50°C Test Report (2015) Unpublished Delta-T internal report by N.G.Webb

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