

Data Loggers To Test Sting Ray Torpedoes

Grant SQ2020 Portable Universal Input Data Logger

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CAS DataLoggers recently provided the data logging solution for global defense and security company BAE Systems Ltd., which was producing its sophisticated Sting Ray torpedoes to the British government's Ministry of Defence. Naturally the company had to thoroughly inspect and test the weapons to guarantee that every component had been shaken, heated, frozen and artificially aged to ensure perfect and predictable functioning if the time ever came for them to be used in action. BAE Systems also had to be able to vouch for the quality and life span of each component in its Sting Rays in order to provide the customer with accurate information on how often each torpedo should be serviced, how they should be stored, and how many spare parts should be in inventory. Specifically the torpedo circuit boards, the brains of these advanced weapons, needed to be artificially and accurately aged in conditioning ovens which raised and lowered the oven temperatures dramatically between 80° C and -40° C (176° F to -40° F) for several days in cycles lasting as short as 10 minutes. Therefore, BAE Systems needed a portable logging solution providing high accuracy for precise measurements as well as the flexibility to measure the several different values, including temperature and current.



A Grant Squirrel SQ2020 Portable Universal Input Data Logger was installed to monitor the oven and the torpedo circuit boards and was then connected to eight thermocouples. One thermocouple was attached to the oven and the other seven were attached to the circuit boards. When oven temperature rose up to 80°C (176°F), the circuit board could rise to 60°C(140°F), and when the oven temperature plummeted to -40°C(-40°F), the board could drop to -20°C (-4°F). These temperatures required constant temperature monitoring during the artificial aging process.

An additional two Squirrel 2020 data loggers were installed inside the Sting Ray undergoing testing, with 16 channels measuring the temperature of all its components and the other input logger's 16 channels measuring voltage changes within each torpedo's power supply. Planting the SQ2020s within the torpedoes enabled BAE Systems to accurately monitor the weapon under real launch conditions in the water.

These universal data loggers offered a high-quality, high accuracy (0.05%) battery-powered portable solution used to measure temperature, humidity, voltage, current and resistance. World-renowned for their ruggedness and reliability, the compact and lightweight SQ2020 featured 24 bit ADC's for precise measurements as well as a built-in display and keypad allowing them to be used in applications requiring

portability and stand-alone operation. Each data logger featured 8 to 16 universal analog plus 8 digital inputs as well as up to 16 derived /calculated channels and 4 pulse rate / counter inputs. 4 alarm outputs served to notify engineers when the torpedoes went out of specification, and each Squirrel logger could record up to 14 million readings and make use of a removable MMC / SD card. The SQ2020s were configured via integral interface or via PC and offered USB and RS232 connectivity.

Back on the test bench, the Grant Squirrel data loggers really highlighted their worth and versatility during the torpedo evaluation tests. One SQ2020 was modified and linked up to five others to provide 58 thermocouples to measure the temperature of every part of the circuit board while the Sting Ray was running in the laboratory. The aim of the test was to determine how long the torpedo could run on the test bench before it overheated and became damaged. The thermocouples also measured the cooling rate after each run. The Squirrel data loggers proved to be so sensitive that the graphs recorded temperature blips each time the laboratory air conditioning system switched on and off.

The Squirrel data loggers also played a key role in testing the scientists' calculations of how much jostling a Sting Ray could withstand in transit on the back of a truck. The SQ2020s were used to measure acceleration in three axes to establish what levels of vibration were safe for torpedo transport. Theoretical calculations established the likely frequency at which the torpedo would shake on a truck traveling at 50 MPH for 1000 miles, where the circumference of the vehicle's wheels was known. These measurements taken by the Grant data logger enabled scientists to test their theoretical calculations against reality to increase safety in transit.

BAE Systems benefitted immediately from installing the Grant Squirrel 2020 data loggers in their strenuous torpedo testing program. These robust and versatile data loggers played a vital role in testing the Sting Ray torpedo all the way through to detonation and were also the key to conducting accurate testing of the complex electronic components. Adrian Plumridge, the Instrument Design Authority at BAE Systems, explained: "All the Squirrel data loggers were incredibly versatile. We were able to take them out of the torpedoes after tests in sea water, download the data onto a PC in minutes, and reprogram them before putting them right back to work on measuring the vibration that torpedoes are subjected to on the back of a truck. We found them to be robust and easy to modify to suit the particular needs of a whole variety of experiments. We eventually had more than a dozen Grant Squirrels on the job in the development of the Sting Ray and they really proved their worth."

BAE Systems Ltd tested the data loggers' flexibility and durability to the limit during the many areas of the development of the Sting Ray. Company scientists were able to easily reconfigure the Squirrel loggers to do a variety of jobs in a variety of environments, whether it was underwater, on the back of a truck or in the laboratory.



For further information on the Grant Squirrel 2020 data logger, other Squirrel series data loggers, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Analyst at (800) 956-4437 or visit the website at www.DataLoggerInc.com.

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