

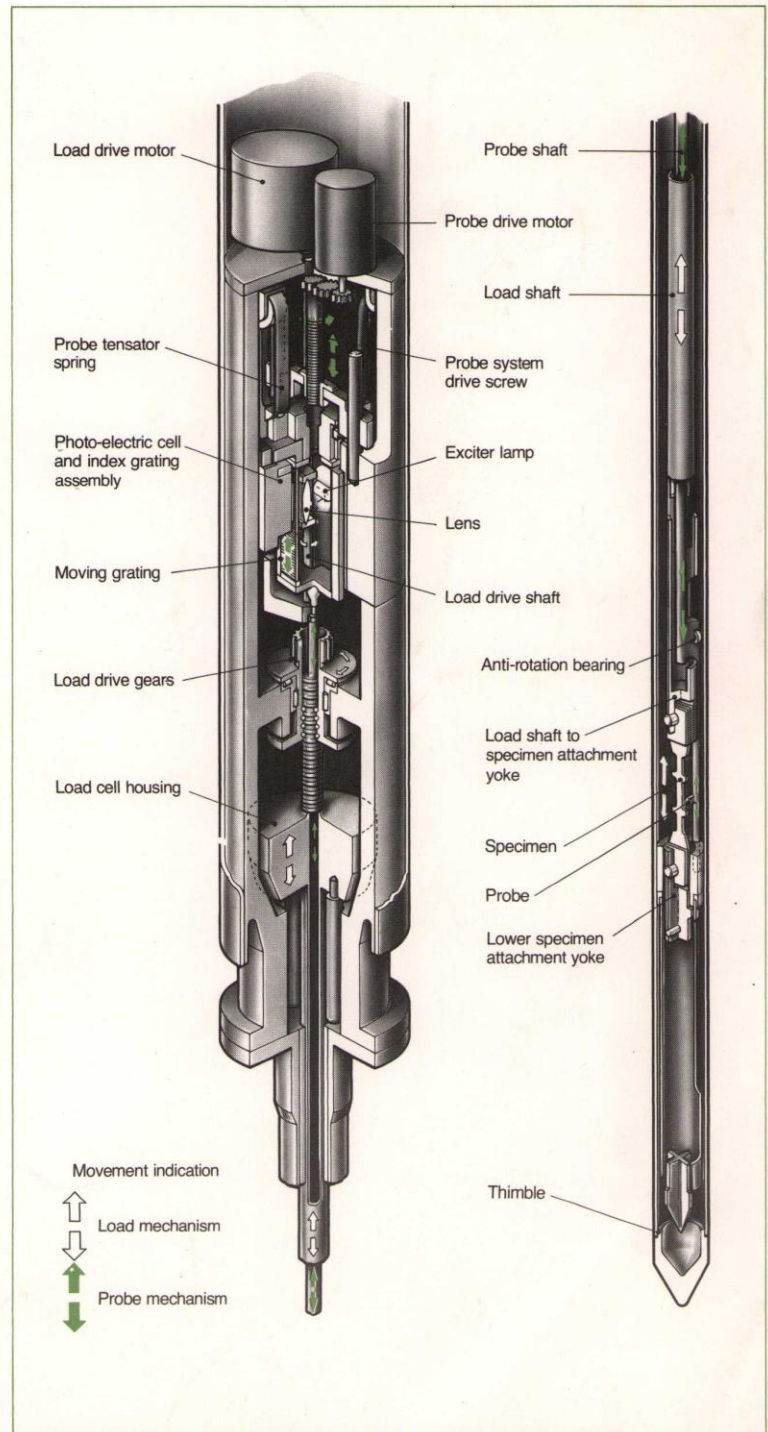
High Neutron Dose In-Reactor Metals Creep Tests

The precise measurement of the creep of structural and fuel-cladding materials under fast-neutron irradiation has been the subject of investigation for many years for the fast-reactor programme. The development culminated in the design and successful operation of a rig to measure dimensional changes to an accuracy of $\pm 1 \mu m$ ($\pm 4 \times 10^{-5}$ in.) on a 25 mm gauge length.

The rig design provides for the irradiation of strip specimens (currently 0.5 mm thick) under closely controlled temperature and load and the instrumentation automatically prints out, every few minutes, measurements of the specimen gauge length made by a traversing probe and out-of-reactor optical-grating transducer. The precision and repeatability of measurement, coupled with close temperature and load control, enables the experimenter to establish reliable creep rates quickly, and the effect of changes in temperature or load can therefore be studied on one specimen.

In a simple variant of the basic rig a number of specimens subjected to the same load and temperature may be irradiated in series, but the measurement of extension applies to one only; the other specimens may be measured before and after irradiation to the same accuracy. A unique feature of the design permits specimens to be unloaded for examination at the end of each reactor cycle and renewed or returned to the rig for further irradiation, thus greatly enhancing the experimental output.

Rigs of this design have operated successfully in the Dounreay fast reactor and in DIDO and PLUTO materials-testing reactors at Harwell. Satisfactory performance has been demonstrated in-reactor for over 13,000 hours with a rig lifetime better than 6,000 hours.



Simplified schematic arrangement of MkII DFR Creep Rig

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