The stainless steel TP347H FG is a candidate material for the final stage tubing of superheater and reheater sections of ultra supercritical boilers operated at steam temperatures up to 620°C in the mild corrosion environments of coal-firing. A series of field tests has been conducted with the aforementioned steel in coal-fired boilers and this paper focuses on the steam oxidation behaviour for specimens tested at various metal temperatures for exposure times of 7700, 23000 and 30000 hours as investigated by light optical and scanning electron microscopy. The oxide present on the specimens is a duplex oxide, where the outer layer consists of two sub-layers, an iron oxide layer and an iron-nickel oxide layer; the inner layer is chromium rich chromium-iron-nickel oxide. Microstructure examination showed that for all these samples the varying grain size of subsurface metal affected the oxide thickness, where the larger the metal grain size, the thicker the oxidation scale. This gave the appearance of uneven inner oxides with a varying pit thickness. Comparison of the pit thickness measurement and oxide composition reveals that the oxidation rate is fast during the initial oxidation stage, but the subsequent growth of oxide from further exposure is slower due to the formation of a healing layer consisting of chromium rich oxide near original alloy grain boundaries. At a temperature region above 600°C a thin oxide rich in chromium and manganese is formed. In addition precipitation of secondary carbides in the base metal also occurs at this temperature region.