Stainless steel grade AISI 316 was subjected to high temperature solution nitriding and low-temperature nitriding in order to dissolve various amounts of nitrogen in the bulk (up to approx. 0.45wt%) and in a surface layer (up to approx. 13wt%), respectively. Potentiodynamic polarization tests in a 0.1M NaCl solution and crevice corrosion immersion tests in 3wt% FeCl₃ solution were studied before and after the bulk and surface treatments. Nitrogen addition in the bulk proved to have a beneficial effect on the pitting resistance of the alloy. The formation of a zone of expanded austenite at the material surface through low-temperature nitriding resulted in a considerable improvement of the pitting potential and the crevice corrosion performance of the steels.