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IN USE

## How Do Military Subs and Ships Avoid Detection?

*European subs built of stainless steel slip past airborne and subsea magnetic surveillance systems*



**SIX NEW SUBMARINES** are being made of an austenitic non-magnetic stainless steel containing 16% nickel



**GERMAN** minesweepers made of non-magnetic stainless

Nickel magazine, Sep. 99 -- **Whereas Stealth bombers** are virtually invisible to radar, submarines made of the austenitic non- magnetic stainless steel EN 1.3964 are virtually undetectable by airborne surveillance systems and undersea mines that work on magnetic principles. The German and Italian navies recently selected the material for six new submarines.

The subs are of the class 212 and will require a total of 4,500 tonnes of the material, which contains 16% nickel. Four are to be built in Germany, with completion scheduled for 2006. The Italian navy, meanwhile, will build two similar units under licence in Italy. The steel for both projects will be supplied by Krupp Thyssen Nirosta GmbH.

To avoid detection either by aircraft or from below by undersea mines, today's subs need a low magnetic and acoustic signature and, in this, the hull is the dominant design element. Much about the workings of these underwater threats is classified, but by any name -- moored, tethered, bottom or influence mines -- their function is to detect the magnetic signatures of passing ships or submarines and explode under them.

This particular stainless steel was chosen for several reasons including corrosion resistance, fire protection and a longer expected life than other hull materials. Stainless steel EN 1.3964 also maintains its high ductility and toughness even at high load rates, low temperatures and triaxial stresses, making it ideal for submarine construction. Since metallurgical quality can be specified and precisely controlled, safety factors can be as low as 1.5.

The new European submarines will not be the first to use this particular material, however. Twenty-four submarines of class 205 and class 206 have previously been built in Germany using a total of 4,000 tonnes of EN 1.3964. In addition, ten minesweepers of class 343 were built in Germany between 1989 and 1991 and twelve minehunters of class 332 between 1992 and 1998. About 4,400 tonnes of EN 1.3964 were used in these applications.

Significantly, the magnetic properties of EN 1.3964 are not affected during fabrication and extensive experience

has shown that the permeability of 1.01 specified on delivery does not change after the metal components have been subjected to hot and cold working.

Photo: Bildstelle der Marine

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