



Industrial Machinery

Large Hadron Collider Quadrupole Magnets

The European Organization for Nuclear Research (CERN) completed the installation of a 27 km long particle accelerator in mid 2008. Known as the Large Hadron Collider, the system is based on superconducting quadrupole magnets which function as magnetic lenses focussing a particle beam in both vertical and horizontal directions.

The 2 mm thick collars surrounding the coil conductors are an essential structural component of the magnets. They operate at cryogenic temperature (1.9 Kelvin) under high mechanical stresses (up to 600 MPa). The austenitic stainless steel NIROSTA 4375 used for the collars has the outstanding magnetic and mechanical properties required to ensure accurate positioning of the coils and uniformity of the magnetic fields. This chromium, manganese, nickel and nitrogen alloyed stainless steel is characterised by a minimum strength of 850 MPa and a relative permeability of 1.001-1.005 between 1.9 and 293 Kelvin.



Location/environment | FRANCE AND SWITZERLAND/100 M UNDERGROUND

Product | COLD ROLLED STAINLESS STEEL STRIPS

Fabrication process | STAMPING

Grade/surface | NIROSTA 4375/2B [CR MN NI N 20 9 7/EN 4375]

Material thickness/diameter | 2.00 MM

Weight | 860 T FOR 528 QUADRUPOLE MAGNETS

Competing material | NONFERROUS METAL

Date of completion | 2008

Manufacturer | ERNESTO MALVESTITI S.P.A., ACCEL INSTRUMENTS GMBH

Material supplier | THYSSENKRUPP NIROSTA

Source of information | THYSSENKRUPP NIROSTA

Remarks