Low-Tc Superconductor wires

- NbTi and NbSn
NbTi Superconductors

NbTi superconductors are high performance superconductors and the workhorse of the world’s superconductor industry. Their major market is clinical MRI, with well over 1,000,000 km of NbTi wire produced to date. Other large markets include Nuclear Magnetic Resonance (NMR) Spectroscopy and particle accelerators for high energy physics research.

Nb3Sn Superconductors

Nb3Sn superconductors are high performance superconductors and the gold standard of the world’s superconductor industry. Their distinguishing characteristic among LTS conductors is the extraordinary performance ultra high magnetic fields. They are indispensable for the high field magnets in Nuclear Magnetic Resonance (NMR) and Mass Spectroscopy (FTMS), which today routinely exceed 20 Tesla. Large fusion projects also rely on Nb3Sn for magnets exceeding magnetic flux densities of 13 Tesla, paving the way to a future with clean and abundant energy.

Customized Superconductors

Our customized products include superconductors with highly specialized performance characteristics. We have delivered specially alloyed or reinforced conductors and conductors with ultra thin filaments to some of the most demanding customers worldwide. Between 2000 and 2005 we had delivered over 40,000 km of thin filament NbTi conductors to the LHC particle accelerator project at CERN. By 2007, we delivered over 60 km of aluminum clad NbTi cables with a total of 15,000 kilometers of NbTi wire to the Euratom 7-X Wendelstein 7-AS fusion project. For the ITER fusion project we are producing nearly 8,000 km of Nb3Sn wire.

Low Temperature Superconductors (LTS)

Our LTS products are used in a wide range of applications, including clinical MRI and ultra high field NMR as well as energy storage, high energy physics and fusion research, addressing the world’s energy needs.
NbTi for MRI application
High-Cu fraction wires

**Wire in Channel**

\[ a \times b = 1.10 \times 1.70 \text{ mm}^2 \text{ to } 2.15 \times 4.25 \text{ mm}^2 \]
Cu : NbTi = 20

**Monolith wires**

Number of filaments 17 to 36
Cu : NbTi = 4 to 10
NbTi for NMR and other applications

Low-Cu fraction wires

Monolith wires

- Number of filaments = 45 to 150
- Cu : NbTi = 1.3 to 2.6
NbTi for High Energy Physics application

Special wires

**ATLAS strand**
- F306 Ø 1.30 mm
- Cu : NbTi = 1.15
- Filament diameter ≈ 50 μm
- $I_c = 1700 \text{ A} \, @ \, 5\, \text{T} \,; \, 4.2\, \text{K}$

**LHC MQY quadrupole strand**
- F6360 Ø 0.735 mm
- Cu : NbTi = 1.25
- Filament diameter ≈ 6 μm
- $I_c = 550 \text{ A} \, @ \, 5\, \text{T} \,; \, 4.2\, \text{K}$

**LHC dipole strand**
- F8670 Ø 1.065 mm
- Cu : NbTi = 1.65
- Filament diameter ≈ 7 μm
- $I_c = 540 \text{ A} \, @ \, 7\, \text{T} \,; \, 4.2\, \text{K}$
NbTi for Fusion application
Fine filaments PF wires

Wire type 1
- Cu : NbTi ≈ 1.65
- Number of filaments = 4185
- wire diameter = 0.73 mm
- Filament diameter ≈ 8 μm

Wire type 2
- Cu : NbTi ≈ 2.35
- Number of filaments = 3282
- wire diameter = 0.73 mm
- Filament diameter ≈ 8 μm
- Jc NbTi ≈ 3100 A/mm² @ 5T, 4.2K
**NbSn wires for High Magnetic Field application**

Bronze process wires and Powder-in-Tube process wires

## Bronze
- Round and rectangular wires 0.8 mm² to 7 mm²
- Number of filaments 4000 to > 100000
- Cu fraction 20 % to 60 %
- Nb or Ta barrier fraction 6 % to 18 %
- Recommended magnetic field range 12 T to 23.5 T

## PIT (Powder-in-Tube) wire
- Round wires Ø 0.6 mm to 1.7 mm
- Number of filaments 54 to 288
- Cu fraction ≈ 50%
- Recommended magnetic field range 12 T to > 20 T
Range of Products

Materials
- Low Temperature Superconductors
- High Temperature Superconductors
- Cuponal™
- Metal Composites
- Customized Wire Products

Devices
- Superconducting Magnets & Devices
- Normal and Superconducting Accelerator Cavities
- Linear Accelerators and Particle Sources
- Circular Accelerators and Beamlines
- Synchrotron Instrumentation & X-ray Optics