



TF WIND CABLE SYSTEMS

TF Cable

TELE-FONIKA CABLE AMERICAS



ABOUT US

TELE-FONIKA CABLE AMERICAS CORP.

(TF Cable) is a U.S. firm with corporate offices and main warehouse located in Batavia, Illinois and is a wholly owned subsidiary of Tele-Fonika Kable S.A. (TFK). TFK, one of the largest manufacturers of wire and cable in the world is a fully integrated manufacturer, recognized by the industry as a world class producer of quality wire and cable products.

The company specializes in electrical wire and cable for heavy industry, mining, utility, and energy applications utilizing materials to meet strict mechanical and electrical performance requirements.

TFCABLE KEY STATISTICS

- ◆ 2.5 billion USD in annual turnover
- ◆ 14th largest wire and cable manufacturer in the world
- ◆ 4th largest wire and cable manufacturer in Europe
- ◆ No. 1 European POWER CABLE supplier
- ◆ 3000 Group employees
- ◆ 27 Global facilities
- ◆ 25,000 different types of wire and cable constructions
- ◆ Sales & Distribution Network stretching 90 countries



TELECOMMUNICATION



AMERICAS HEADQUARTERS



HEAVY DUTY INDUSTRIAL RUBBER

MEDIUM & HIGH VOLTAGE

Connect the **POWER** of the **WIND**

TELE-FONIKA TFWIND ADVANTAGES & BENEFITS:

- ◆ **Energy Systems** – Tele-Fonika understands the overall energy context, from generation, to transmission, and final distribution within the grid.
- ◆ **Engineering Support** – Tele-Fonika provides extensive engineering support during feasibility studies, the timely supply of quality products and product customization.
- ◆ **Range of Products** – A comprehensive range of high-quality Wind Turbine cables and accessories from one global supplier #18 AWG – 1111MCM and 1.0mm² – 500mm
- ◆ **Design of Products** – Compact, flexible and durable cables that can handle vibration, extreme temperatures -40°C to +105°C, while also offering supreme mechanical, thermal, chemical & torsion resistance
- ◆ **Green Advantage Option** – Complete ECO friendly cables (low smoke, zero halogen)
- ◆ **Delivery and Logistics** – Fast delivery times through dedicated logistics and local warehousing in all major markets
- ◆ **Assembly Services** – Complete low voltage cable system assembly services available



PRODUCT TECHNOLOGY:

- ◆ **Conductor** – In-house draw and stranding of conductor providing the most flexible product for extreme applications
- ◆ **Insulation/Jacket Compounding** – In-house formulation of conductor insulation and jacket materials resulting in compounds specifically designed for extreme-temperature, high flex cables. Most advanced solution in the market with the ability to customize chemical compounds.



TORSIONFLEX

TORSIONFLEX- Low Voltage Flexible Cables

These rubber-insulated or rigid cables run between the generator and the transformer, whether it is located at the base of the tower, or high above in the nacelle. They also provide energy for various motors and electronic devices. Tele-Fonika's TORSIONFLEX cables ensure Superior Performance under Extreme Environmental Conditions- Ensuring High strand conductors for superior flexibility

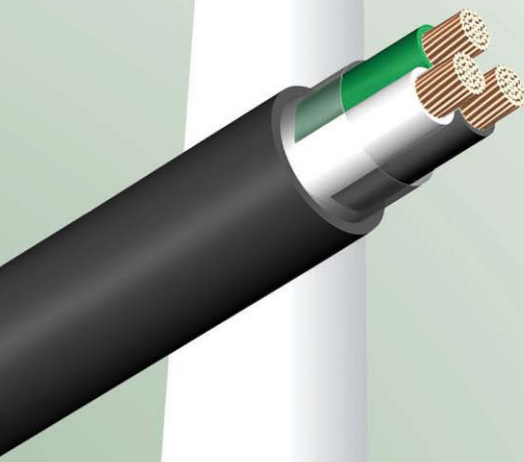
- ◆ H07RNF(XL)750V- HAR European Standards
- ◆ RHW2 (XL) 2000V RW90 1000V UL and CSA Wind Turbine Tray Cable Sun Res, Oil Res

CONTROLFLEX

CONTROLFLEX- Turbine Control & Instrumentation

TF control cables are used to carry both the energy (up to 1000 volts) and low-frequency signals to control the motor drive or the generator for breaking, positioning or optimizing rotor RPMs.

**Highest Performance
Tower Cable Available**



Connect the **POWER** of the **WIND**

Superior Performance under Extreme Environmental Conditions – Verified by Independent Test Labs

Single Conductor Torsion Test

◆ **Torsion Low Temperature Operating Test**

- -40° C Operating Temperature
- 1440 degree torsion twist (4 x 360 degree torsion)
- 3000 Cycles (clockwise / counter clockwise)

◆ **Torsion Frozen Test**

- 24 Hour Soak at -40°C in fixed position
- 1440 degree torsion twist (4 x 350 degree torsion)
- 100 Cycles (clockwise / counter clockwise)

Bundle Conductors Torsion Test

◆ **Torsion Heat Cycling 90°C conductor temperature**

- Energized Cable 8 hour on/ 16 hour off - 14 energized / de-energized cycles
- 720 degree / minute (360 degree clockwise / 360 degrees counter clockwise)
- 10,000 cycles
- 11KV / one minute submerged in water after torsion test

GLOBAL PRODUCT CERTIFICATIONS & APPROVALS

- ◆ UL - Underwriters Laboratory
- ◆ CSA - Canadian Standards Association
- ◆ HAR - European Harmonized Standards
- ◆ CE - European Product Conformity
- ◆ CCC - China Certification
- ◆ VDE - German certification
- ◆ RoHS - Restriction of Hazardous Substances Certification

GLOBAL RECOGNITION – EUROPE, NORTH/SOUTH AMERICA, ASIA

- ◆ Tele-Fonika has supplied cable systems to world's largest wind farm projects and to the top OEM Turbine manufacturers.

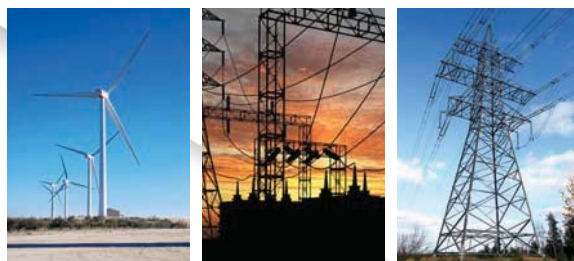




TELE-FONIKA TFWIND PRODUCT OFFERING:

Complete Electrical Cable Solution for:

- ◆ Power generation
- ◆ Control and Instrumentation
- ◆ Collection and Distribution
- ◆ Transmission
- ◆ Communications



Tower Power Generation Motor Supply Cable



TORSIONFLEX- Flexible Cables

These rubber-insulated cables run between the generator and the transformer, whether it is located at the base of the tower, or high above in the nacelle. They also provide energy for various motors and electronic devices. Tele-Fonika's TORSIONFLEX cables ensure Superior Performance under Extreme Environmental Conditions- Ensuring High strand conductors for superior flexibility

US Standards

RHW-2 DLO 2KV -40°C+90°C
UL 44 / ICEA / CSA-C 22.2 No38

FMSC 1KV -40°C+90°C
UL 2277

European Standards

H07RNF(XL)450/750V-40°C+90°C
VDE 0282-4 / BS 7919

H07ZZF LSZH 450/750V -20°+70°C
VDE 0282-13 / BS 7919

NSGZFOU 1KV
VDE 0250-062

SIF 300V / 500V 180°C

Control and Instrumentation



CONTROLFLEX- Turbine Control & Instrumentation

TF control cables are used to carry both the energy (up to 1000 volts) and low-frequency signals to control the motor drive or the generator for breaking, positioning or optimizing rot or RPMs. Universal flexxtreme SOOW/H07RNF 1kv Acc to both HAR and UL standards

US Standards

WTTC 1KV
UL 2277

SOOW 300/600V -40°+90°/105°C
UL 62 / CSA-C 22.2 No49

FR-EPR Tray Cable 600V
UL 1277 / UL 44 / ICEA

European Standards

H07RNF 450/750V -40°C+90°C
VDE 0282-4 / BS 7919

H07V-K 1KV -40°+90°C
VDE 0281-3 / BS 6004

H07ZZF LSZH 450/750V -20°+70°C
VDE 0282-13 / BS 7919

NSSHOU 1KV -45°C+90°C
VDE 0250-812

H07BQF 450/750V -20°+90° ZH
VDE 0282-10 / BS 7919

Connect the **POWER** of the **WIND**

Medium Voltage Collection and Distribution



Most of the inter-turbine connections are underground for land-based wind parks, which utilize medium voltage cables, typically 1-core 33kv, simultaneously linking to an onshore substation. Offshore submarine 3-core cable with integrated fiber optics and customized armor is designed to link the turbines.

For in tower use, cable rated between 18-35 kV, run between the generator and the transformer in larger (2-5 MW), often located offshore. They also power steering and switching equipment.

US Standards

MV90 / MV105 5KV - 35KV
AEIC CS8 / ICEA S-93-639 / UL1072

URD 5KV- 35KV
ICEA S-94-649 / AEIC CS8

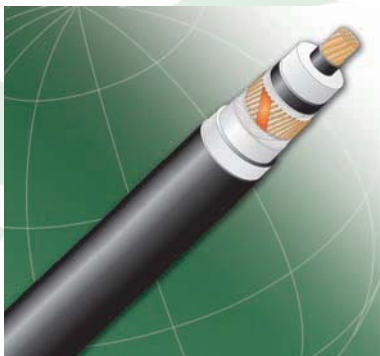
European Standards

N2XS(F)2Y 12-36KV
VDE 0275-620

NA2XSY 12-36KV
VDE 0275-620

(N)TSCGEWOEVY

High /Extra High Voltage Power Transmission



36KV - 420KV
VDE 0276-632 / NEK 395/ IEC 60840/ AEIC CS7-93

Tele-Fonika has the proven capability in delivering HIGH VOLTAGE CABLE SYSTEMS, which include the cables that range from 46KV up to 420KV in both aluminum and copper conductor. They are used for power transmission from the onshore wind park substation to the central grid as well as offshore transmission. The "Turn Key" solution includes the design of the system, site surveys, cable-laying, installation, and final testing.

Bare Overhead Power Transmission



Aluminum Conductor Steel Reinforced ACSR
EN / DIN / BS / IEC / GOST / ASTM / ZN

Overhead aluminum conductors are used to transmit power from a distant location to the domestic grid system



Global Logistics Providing warehouse and project support

Tele-Fonika Kable SA has 27 global operations that consist of cable production centers, stocking facilities and distribution centers providing full turn key project solutions, which are strategically positioned in the world's largest wind markets. With over 70% of production being exported out of the manufacturing regions and with supply chain logistics stretching 90 countries, Tele-Fonika has the knowledge and experience to manage the most complex energy projects. With local stock, engineering, marketing and distribution capabilities, Tele-Fonika is uniquely positioned to be the leading player in today's wind industry.



TF TOWER

KIT SERVICES Cable and Connectivity—Putting it all Together—Ship to Site

Tele-Fonika's TFWIND Cable Systems offers full solutions to today's complex wind farm projects, that consist of materials handling, kitting, warehousing and inventory management. With 27 global operations, Tele-Fonika is keen on providing value with every cable purchase. Tele-Fonika's inventory management system ensures on time delivery with local coiling and bundling services. TFWIND kits include the sourcing of accessories, assembly's and shipped to customer site as a complete package.



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