



**Optimizing your aerial transmission network
through high-performance cabling solutions**

Secure power transmission depends on...

With electrical power consumption growing annually approximately 3.5% worldwide, utilities and Transmission System Operators (TSOs) are faced with increasing congestion management, overloading, bottlenecks, and even costly blackouts. Moreover, additional power generation (like wind-farms) are further straining available network links. It is therefore becoming essential to upgrade the existing network with optimized solutions and/or to expand it with new lines to improve the reliability of the grid while respecting the design criteria and assuring sustainable energy supply far into the future.

Refurbishment and upgrade of existing lines

Since the objective is to increase capacity and transmission network reliability at reasonable cost, transmission planners want to re-use existing towers and installations to save time, and avoid very long right-of-way authorizations. Therefore, to do more with the same structures means that you have to replace lines with new conductors that can deliver higher ampacity, operate safely at higher temperatures, without straining towers and pylons, or generating dangerous sag. Moreover, real-time monitoring systems, installed directly on the lines are a good solution to further improve the operating capacity and reliability of the network.

New lines and interconnections

To achieve higher capacity with reduced capital investment, it is now feasible to use fewer towers and longer conductor spans. This means incorporating the latest generation of carbon core conductors which are lighter and offer higher mechanical strength. These new conductors can also be designed to operate at higher temperatures, thus allowing temporary or permanent increases in capacity, and strengthening the reliability of the network.

What you expect from a cable expert:

- Global solutions to assure a long life cycle and easy upgrades
- Engineering support in network design, conductor type and line monitoring
- Wide range of fully-tested conductors, fittings and hardware for safe operations
- Integration of solutions for a secure and reliable “meshed” grid
- World references for optimized power line projects



...integrated solutions for high capacity and reliability



Nexans does more than just sell bare conductors to connect two points for aerial transmission; it offers highly integrated solutions that optimize your power network for years to come, while assuring its evolution to meet the growing energy needs of your customers.

Phase 1. Our enriched offer begins with preliminary studies which take into account fundamental parameters, like designed capacity, environmental limitations, system losses, operating and maintenance costs, reliability and upgradeability to determine a target network configuration.

Phase 2. For upgrading, upgrading and creating new networks, Nexans recommends the use of high-end technologies which add value for the customer by offering a wide choice of enhanced conductors, incorporating special alloys or composite materials and with designs that allow:

- improved capacity and less energy loss
- improved capacity and lower sag
- fewer towers, and longer distances between them

Phase 3. All solutions are validated with worldwide hardware and fittings manufacturers and standards, and come with pre-tested and adapted accessories, and detailed stringing and laying instructions. We can even propose stringing or laying supervision with local or international partners.

Phase 4. On existing lines for upgrades or for new installed lines, our CAT-1 Transmission Line Monitoring System provides real-time monitoring of the actual capabilities of the overhead transmission lines by measuring mechanical tension at the dead-ends of the conductor and local weather parameters, and feeding the information on additional capacity and time until maximum sag is reached back to your Network Control Center for increased efficiency, safety and reliability.

Phase 5. As an environmentally responsible company (ISO14001), we can also manage the recycling of old conductors by removing old lines when our high-end technologies are installed.

Phase 6. Nexans continues to safeguard your future by ongoing innovation in overhead design, and providing a continuous supply of products from our plants around the world, and contributing with our monitoring systems to obtain the best operational results for your network.

From advanced conductors...

CONVENTIONAL CONDUCTORS WITH DESIGN TEMPERATURE UP TO 90°C

ACSR: Aluminum Conductor Steel Reinforced

A conductor with a steel core and outer layers of pure aluminum; widely used, this conductor assures reliable, and durable performance. *Nexans has provided this conductor to many operators in countries with long distances to cover, like in North America, South America and South-East Asia.*

ACAR: Aluminum Conductor Aluminum Reinforced

A customized conductor with an aluminum alloy core and an outer layer of pure aluminum, it offers high ampacity (i.e. current rating). However, its lower mechanical strength does not allow it to be unduly stretched. *ACAR is much appreciated in parts of South America where there are no snow/ice or violent storms to cause dangerous sagging or line tension.*

AAAC: All Aluminum Alloy Conductors

By replacing both steel core and outer layers of pure aluminum with aluminum alloys, this conductor is stronger than conventional ACSR, and more resistant to corrosion. *Developed in Europe, and widely used in Belgium and France, these conductors are also deployed in many African countries, like Algeria, Congo and Niger.*

Lo-Sag ZW: aluminum conductor composite core

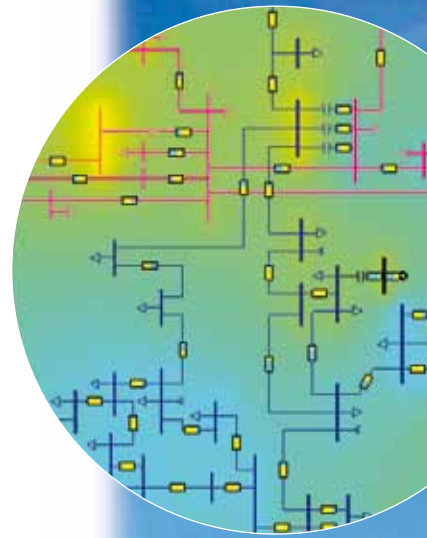
An innovative lighter conductor with a core made of carbon fibers embedded in an epoxy matrix and outer layers made of annealed aluminum or aluminum alloy. This conductor has high tensile strength and low linear expansion with extremely low sag and no galvanic corrosion of the core. Its high breaking load allows longer spans between pylons. Particularly suited for river-crossing and to decrease the height or the number of towers on long transmission lines. *A state-of-the-art conductor, this composite system allows for spans of up to 2.5 km, reducing the number of pylons in the landscape and significantly lowering the height (and cost) of towers when spanning broad rivers.*

Nexans advanced Aero-Z® design

For all the foregoing conductors, in addition to the conventional design with round wires, Nexans can also supply a compact design with Z-shaped interlocking wires. It reduces drag (i.e. pressure on lines due to strong winds), minimizes "galloping," lowers grease loss (impedes corrosion) and snow accretion, and raises ampacity by 10% in an equivalent diameter, or reduces Joule losses by 15% at the same ampacity. Aero-Z® has equivalent accessories, and can be installed in the same way and with the same equipment as conventional conductors.

An African premiere: Nexans installed 132 kV AAAC Aero-Z conductors on a 264-km-long line between Nigeria and Niger. Combined with capacitive compensation, this allows a total increase of electrical capacity by 75% between the two countries. Nearly 900 km of the same conductor were also recently installed in Peru to resolve problems related to Joule losses and the corona effect.

ACSR: Aluminum Conductor Steel Reinforced



TACSR: Thermal Aluminum Conductor Steel Reinforced

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**CAR: Aluminum
Conductor Aluminum
Reinforced**



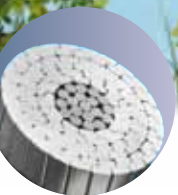
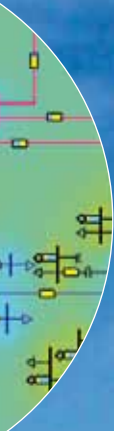
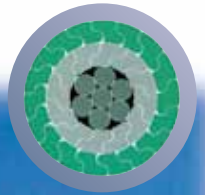
**AAAC: All Aluminum
Alloy Conductors**



**Lo-Sag ZW: aluminum
conductor composite core**



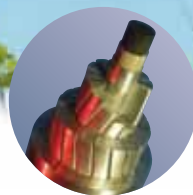
**Nexans advanced
Aero-Z® design
(conventional conductors)**



**CIR: Super Thermal
Aluminum Conductor
Invar Reinforced**



**ACSS: Aluminum
Conductor Steel
Supported**



**High Capacity
Lo-Sag TW**



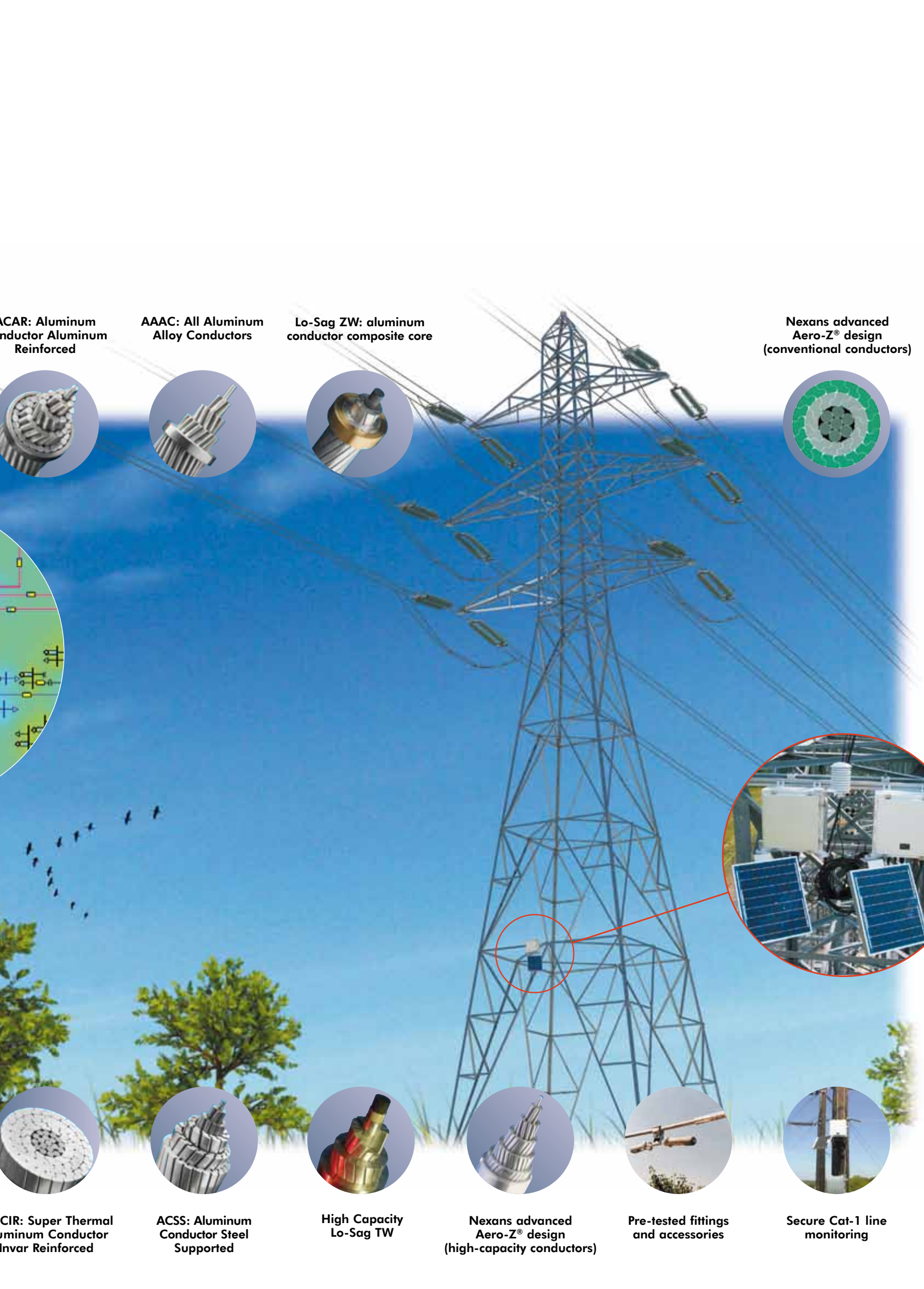
**Nexans advanced
Aero-Z® design
(high-capacity conductors)**



**Pre-tested fittings
and accessories**



**Secure Cat-1 line
monitoring**



...to accessories, fittings and monitoring systems

HIGH-CAPACITY CONDUCTORS WITH DESIGN TEMPERATURE UP TO 250°C

TACSR: Thermal Aluminum Conductor Steel Reinforced

By being able to operate at temperatures up to 150°C, this aluminum-zirconium alloy conductor with steel cores makes lines more secure by significantly increasing capacity on overhead lines.

Since 2003, Nexans has supplied some 600 km of 230 kV TACSR conductor to South Brazilian utilities, reinforcing their grid's reliability and security.

STACIR: Super Thermal Aluminum Conductor Invar Reinforced

This low sag conductor incorporates a strong Invar steel core and ZTAL aluminum-zirconium alloy in its outer layer which can handle temperatures of up to 210°C.

With over 10 years of experience in this type of alloy design, Nexans has sold over 800 km of STACIR conductors in Korea, where low sags are often mandatory in densely populated areas, for security reasons.

ACSS: Aluminum Conductor Steel Supported

With a core of high tensile strength, protected with a coating of zinc-5% aluminum (Mischmetal), and an outer layer of annealed aluminum or aluminum alloy compact wires, this conductor offers low sag, even when operating at up to 250°C.

Nexans has provided hundreds of kilometers of various cross-sections of ACSS to European and North-American Transmission System Operators (TSOs) to increase the reliability and the security of refurbished lines.

High Capacity Lo-Sag TW: aluminum conductor composite core

An innovative lighter conductor, with outer layers in aluminum or aluminum alloy, usually using outer compact design. It has high tensile strength, low linear expansion coefficient carbon fibers in epoxy matrix as its cores, which can withstand temperatures up to 180°C (according to overload duration) with extremely low sag and no galvanic corrosion of the core, and high breaking load (i.e. longer spans between distant pylons). High Capacity Lo-Sag TW is a unique, high-value replacement for any overhead conductor.

A state-of-the-art conductor, this composite system allows for spans of up to 2.5 km, reducing the number of pylons in the landscape and significantly lowering the height (and cost) of towers when spanning broad rivers. Under overloaded conditions, it allows more reliability and security (low sag).

Nexans advanced Aero-Z® design

The compact Z-shaped wire design can also be applied to all the above high-capacity conductors.

FITTINGS

Pre-tested fittings and accessories


Because conductors and accessories must work perfectly together to deliver line security and grid reliability, Nexans checks, tests and certifies accessory suppliers according to international standards and to our own rigorous specifications. Our compatibility tests cover joints and tension sets (dead end clamps, joints sleeves, pulling sleeves), suspension clamps, shunts, spacers, repair armor rods, and aeolian vibration damping systems).

MONITORING SYSTEMS

Secure Cat-1 line monitoring

CAT-1 real-time Transmission Line Monitoring systems can be very quickly installed on existing or new lines. They measure ambient weather parameters and collect mechanical line-tension information. This vital information is then computed and forwarded in real time to the operator's Control System (SCADA), indicating the actual additional available capacity and sag that the line can safely accept within the conductor's design temperature. By providing advanced warnings when approaching limit conditions, CAT-1 helps to increase the reliability of network and gives information to quickly react and avoid severe problems.

Over 300 CAT-1 systems have already been deployed in North American and European transmission grids to provide information on conductor behavior and improve the reliability and the capacity of the grids.



SERVICES to meet your overhead power goals

GLOBAL EXPERTISE

By paying close attention to the actual needs of Energy Transmission System Operators, Nexans has striven to improve network capacity, security, reliability, and cost-effectiveness. Our integrated overhead solutions add value to today's and tomorrow's energy networks.

LOCAL PRESENCE

Not only do we have a manufacturing, distribution and commercial presence around the world, we have long-established contacts with Transmission Operators, allowing us to better understand and tailor our aerial solutions to local needs. Also, we can provide global solutions with local or international contractors for installation whom we vigorously support, or via national and international energy consortiums.

TECHNICAL LEADERSHIP

Whether it is conductor types using new alloys and high-performance designs, or advanced services and software, we have continued to improve overhead technologies. Our combined expertise in underground and undersea cable technologies means that we can supply a complete energy network package and provide customized combinations of aerial, underground and submarine links to optimize the transmission and the distribution energy grids.

INNOVATION is at the core of our overhead lines

Nexans has engineers and technicians working in energy transmission and distribution in both our research center in Lyon (France) and in our Metallurgy Center in Lens (France). They draw on the collective knowledge of the 600 researchers and engineers group wide. Our metallurgy experts are continuing to experiment with new, cheaper and more efficient alloys. Nexans constantly adds value to conductors in terms of technical know-how and electrical engineering, while supporting complete networks from design, line management, to fully integrated accessories.



Global expert in cables and cabling systems

With energy as the basis of its development, Nexans, worldwide leading expert in the cable industry, offers an extensive range of cables and cabling systems. The Group is a global player in the infrastructure, industry, building and Local Area Network markets. Nexans addresses a series of market segments: from energy, transport and telecom networks to shipbuilding, oil and gas, nuclear power, automotives, electronics, aeronautics, material handling and automation. Nexans is a responsible industrial company that regards sustainable development as integral to its global and operational strategy. Continuous innovation in products, solutions and services, employee development and engagement, and the introduction of safe industrial processes with limited environmental impact are among the key initiatives that place Nexans at the core of a sustainable future. With an industrial presence in 40 countries and commercial activities worldwide, Nexans employs 23,700 people and had sales in 2010 of more than 6 billion euros. Nexans is listed on NYSE Euronext Paris, compartment A.

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