

## FURTHER DEVELOPED FULLY INSULATED HIGH VOLTAGE AERIAL CABLES

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### ABSTRACT

*The Universal Cable System is a well proven and unique system that gives the user the flexibility to install 10-30 kV power lines in the air, in the ground or in water, using the same cable. The improved service – no loss of supply for customers in affected areas, and the cost savings for the utilities. Excellent safety – robust fully insulated, screened cable is safer for both engineers and local residents*

*The growing use of the internet and broadband communications, have escalated the need for optical connections. The AXCES-O cable system provides a combined power and optic solution where a duct for optical cable is integrated into the power cable. A new cable design and new floating techniques for installing the optic cable have made this system solution a reality.*



**Fig.1. Universal cable installation**

#### Keywords

AXCES; AXCES-O; Medium voltage cable; Duct; Optical cable; Aerial cable; floating; three-core cable.

### 1. THE UNIVERSAL CABLE CONCEPT

The development of the Universal Cable System was a response to demands for efficient installation methods and the need to increase cable life expectancy and reliability. Power cables are normally buried in the ground or suspended in the air by poles. If the terrain requires it, the cable may also be laid in water. Traditionally, the most common and economical installation method has been aerial installation, where the cable is suspended by poles. But in many cases, this solution has proven to be

unprofitable in the long term, both for the utility and the power consumer, because long-term maintenance and failure costs are considerable. Failure of overhead power lines are most often caused by trees and branches falling down on the cables, which can result in considerable repair and power interruption costs. The key idea with the cable-design is to offer a single cable that can be installed in several ways, which increases the reliability of the 10-30 kV power lines.

From a safety point of view, a universal cable system can be compared with a conventional underground cable system. The cables are fully insulated and can be touched without any personal risk.

Compared with alternative systems, such as bare or covered overhead conductors, the universal cables are protected by a full screen. A cable lying on the ground is of no risk and if the cable should break there will be a short circuit to the screen, which will cause a disconnection.

For aerial installation, the cable has to be self-supporting even for a long pole span. To ensure high reliability and increased safety, the cable should also be able to withstand heavy ice loads and falling trees.



**Fig.2. Universal cable from coming up from ground and with snowy branches on**

The first fully insulated cables have been in operation for fifteen years. Installed in over 20 countries they have shown exceptionally high operation reliability compared to other systems. During a large storm in Sweden 2005, "Gudrun," when thousands of fallen trees gave several long electrical power interruptions, the Universal Cable System was the only aerial cable system without any power interruptions.

The Universal Cable System includes three different cable types, EXCEL, FXCEL and AXCES. For smaller cable areas, copper is preferable because of less creepage in copper compared to aluminium; in this case EXCEL or FXCEL is used. However, for larger conductor areas, it is more cost-efficient and environmentally friendly to use aluminium as the conductive material. The AXCES-cables are used for the larger areas, three core up to 3x95 mm<sup>2</sup> 12-36 kV and one core cables 1x240 and 1x400 36 kV.