

Technical evolution of high power EHV systems 2500 mm² aluminium screwed connectors according to IEC 61238-1 and safety of 420 kV AC oil filled terminations

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ABSTRACT

In view of offering the maximum safety while transmitting high power in AC 420 kV networks, new screwed connectors have been developed for 2500 mm² Milliken Aluminium conductors.

- Safe technology, no risk of fire (case of welded connection),
- Easy mounting, no specific tools needed.

The current capability has been validated using a scope of tests aligned with IEC 61238-1 [1] (short circuits, tensile test, load cycles).

For the same safety purpose, a new 420 kV oil filled termination has been developed.

- No risk of SF₆ leakage,
- Internal arcing test resistant.

KEYWORDS

Connectors, Safety, Anti-explosion system.

INTRODUCTION

The need to increase AC power transmission has led to the design of large conductor (up to 2500 mm²) for high voltage XLPE cable systems especially with aluminum conductors.

The transmission of current is performed by the cable conductor, and at accessories a connector is needed to ensure the current flows to another cable. The main requirements for a connector are a low resistance and enough mechanical tensile strength to ensure the reliability of the connected cable sections. A bad design of connector leads to an overheat at the accessory site, with a risk of the accessory breakdown. [2]

Screwed connectors offer technical and practical advantages that crimped or welded connections cannot provide. For instance, neither special tools as hydraulic press nor welding devices are needed.

An innovative connector for 2500 mm² Milliken aluminium conductor was developed and qualified according to IEC 61238-1 to offer the maximum safety for operators and the requested reliability for the cable system.

To achieve more safety for the cable system additional measures are taken to offer reliable and safe accessories such as outdoor fluid filled termination.

Indeed, anti-explosion protections system integrated into the oil filled outdoor composite terminations was developed, to reduce the risk of projections in case of internal failure.

Nexans 420 kV outdoor composite oil filled termination with new anti-explosion resistant system provide your application with the optimum degree of safety for operators and assets.

This paper presents the different steps of the development and qualification tests which were performed to reach the safety level for both topics. It highlights the results of the qualification steps of:

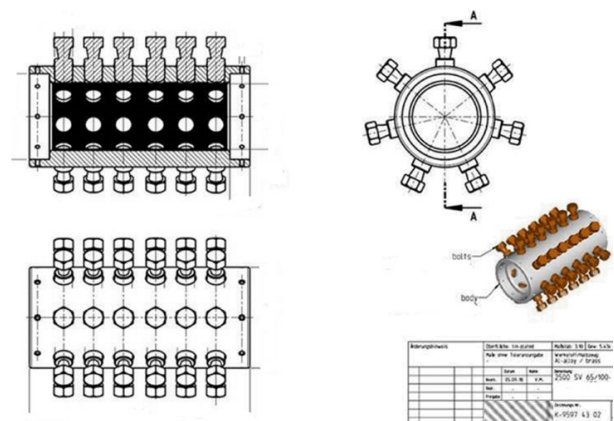
- The 2500 mm² Al screwed connector,
- The 420 kV oil filled outdoor composite termination.

QUALIFICATION OF SCREWED CONNECTORS FOR MILLIKEN 2500 MM² AL

Based on the positive experience and the knowledge accumulated since the development of screwed connectors for high voltage application, a new design was established considering:

- The geometrical constraints as the connector is limited in length and diameter,
- Thermomechanical forces generated by the cable expansion/contraction during thermal cycles.

The challenge for the development of a mechanical solution to connect large cross section cable such 2500 mm² Al was not only focused on the connector body but also the screws designs.



Picture 1: 2500 mm² Al screwed connector

CONDUCTOR DESIGN:

A 2500 mm² watertight Milliken aluminium conductor was selected for this qualification, more construction detail is given in picture 2: