

# CHALLENGES AND SOLUTIONS FOR POWER CABLES WITH LOW SMOKE HALOGEN FREE POLYMERS REQUIREMENTS AND REACTION TO FIRE PERFORMANCE

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## ABSTRACT

Since 1<sup>st</sup> of July 2017 power, control and communication cables, which are permanently installed in buildings, are regulated by the European Construction Products Regulation (CPR). This European Standard regulates in general harmonised requirements for commercialisation of construction products and refers to product related standards. In terms of power, control and communication cables the European Standard EN 50575 specifies reaction to fire performance requirements, test and assessment methods, if they are intended for use in construction works and subject to performance requirements on reaction to fire. In this standard the test methods are classified for reaction to European Fire Classes. They are assigned to these fire classes according to their fire behaviour, which is tested in accordance with the test procedures established under the mandate of CENELEC. Flame retardance, smoke density and halogen-free properties are the main requirements to classify cables.

Based on given fire classes cables have to be certified. In general, products are certified by notified bodies in the sense of EU product certification and have to be labelled with the CE identification marking. The prerequisite for product marking with the CE mark according to CPR is a succeeded conformity procedure. The CE marking documents a classification into the corresponding achieved Euro Fire Class. This enables for users, that compliance with the demanding fire performance class is proven and the European Fire Classes are easily recognizable.

Regarding the fire classes new solutions for power cables with low smoke halogen free polymers requirements and reaction to fire performance are needed.

At the moment a new revision of IEC 60840 ED5: "Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) - Test methods and requirements" is worked out and expected to be published in 2020. In this first circulated committee draft of the standard a new material class for cable oversheathing compounds, based on low smoke halogen free polymer (LSHF) requirements, has been introduced. However, it should be noticed, that a link to the European Construction Products Regulation (CPR) and European Standard EN 50575 cannot and will not be addressed in IEC 60840.

All these trends need fundamental understanding of reaction to fire performance requirements in terms of regulation by law on the one hand and in terms of test methods and requirements in standards on the other hand, in order to make the right choice for the application and meet the demanding of the user.

This paper describes challenges and solutions for medium voltage, high voltage and extra high voltage power cables in terms of power cables with low smoke halogen free polymers requirements and reaction to fire performance. Designs for recently certified cable constructions and solutions matching legal requirements by consideration of the new cable oversheathing compounds from CD IEC

60840 ED5 and test results performed with notified bodies are presented.

## KEYWORDS

CPR, low smoke, halogen free cable sheath, flame-retardant cable sheath properties

## INTRODUCTION

Challenges and solutions for power cables from 10 kV up to 500 kV having low smoke halogen free polymers properties and reaction to fire performance are considered in terms of CPR, IEC/EN standards and customer requirements.

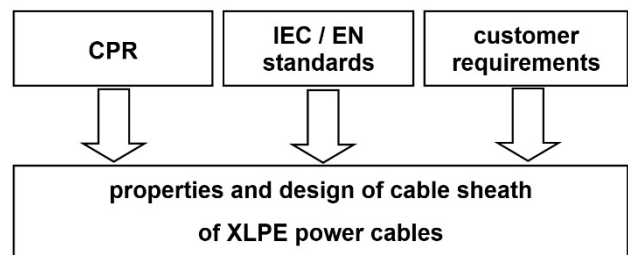


Fig. 1: Requirements for cable sheath of power cables

## GENERAL REQUIREMENTS OF CABLE SHEATHS OF XLPE POWER CABLES

In general the cable sheath of XLPE power cables has to meet and fulfill a huge number of properties.

Table 1: Cable sheath properties

|                          |                                  |
|--------------------------|----------------------------------|
| 1. withstand voltage     | 13. UV radiation resistance      |
| 2. mechanical resistance | 14. processability in production |
| 3. low smoke             | 15. bacteriological resistivity  |
| 4. halogen free          | 16. life time > 40 years         |
| 5. fire resistance       | 17. recyclability                |
| 6. rodent resistance     | 18. cost-efficient               |
| 7. termite resistance    | 19. legal requirements e.g. CPR  |
| 8. water resistance      | 20. requirements of standards    |
| 9. oil resistance        | 21. customer requirements        |
| 10. chemical resistance  | 22. conductive layers            |
| 11. heat resistance      | 23. colours and stripes          |
| 12. cold resistance      | 24. ....                         |