



#### A.8.4.

### On-site AC testing and PD measurement of 345 kV/2500 mm<sup>2</sup> XLPE cable systems for bulk power transmission

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**Abstract:** Taiwan's first EHV underground cables turnkey project consists of eight 345 kV XLPE cable systems which show pre-fabricated joints leading to a very short installation period. The total scope describes 62 km of 345 kV/2500 mm<sup>2</sup> XLPE cables, 122 pieces pre-fabricated joints and 48 pieces of in- and outdoor terminations and includes both, cable laying and assembly of accessories.

To ensure the quality of the installation an on-site AC test including a partial discharge (PD) measurement was performed on the XLPE cable systems.

A new PD measuring and analysing technique was able to reduce the external noise level to 1–2 pC for the joints during PD testing even under on-site testing conditions.

**Keywords:** 345 kV XLPE cable system, extreme project, on-site testing, PD measurement

#### 1. Introduction

Quality aspects play an important role within EHV cable systems as these systems are part of the backbone of the electrical transmission system. The quality of all pre-fabricated components is ensured by routine and sample tests during production in the factory. AC voltage and PD measurement tests are essential parts of this quality check.

But the functionality of the total system, which is emphasized in IEC 62067, can only be verified by an AC on-site test after installation. A selective PD-measurement on all accessories supports this approach and is able to detect even small installation deviations. This closes the final gap in the quality check of the cable system, the installation work.

Even within extreme large EHV cable projects, described below, this approach supports keeping the project schedule in time. As the PD measurement is able to detect installation defects without destroying main insulation parts, even defects can be repaired within short time without the need to replace cable parts.

A suitable PD measurement system which takes into account the on-site situation is necessary to follow this quality approach. A new PD measurement system, which fulfils these requirements, is described below.

**Résumé:** Le 1<sup>er</sup> projet de câbles souterrains EHV livré clé en main à Taiwan consiste en huit systèmes de câble XLPE 345 kV avec boîtes de jonction pré-fabriquées permettant ainsi une très courte durée d'installation. L'ensemble du projet comprend 62 km 345 kV/2500 mm<sup>2</sup> de câbles XLPE, 122 boîtes de jonction pré-fabriquées et 48 accessoires d'extrémité ainsi que la pose de câbles et l'installation de tous les accessoires. Pour assurer la qualité de l'installation, un dispositif d'essai électrique/tension alternative avec mesure de décharge partielle (DP) a été mis en place à même le système de câble ; un nouveau test/tension alternative et une analyse technique a été en mesure de réduire le niveau de bruit externe de 1-2 pC pendant le test sur les boîtes de jonction et ceci malgré les conditions d'essai sur site.

**Mots clés:** Systèmes de câble PRC 345 kV, projet extrême, essai sur site, mesure de décharges partielles

#### 2. Project Description

ABB Energiekabel was awarded and has successfully completed a turn-key project of 345 kV XLPE cables and accessories for bulk power underground transmission line in the south of Taiwan. The engineering, system design, manufacturing of XLPE cables, accessories and installations to follow respectively commissioning of all EHV cable systems, consists of:

62 km	345 kV XLPE Cables, 2500mm <sup>2</sup> conductor cross section (146 individual cable lengths, 450m/drum)
24 pcs	Cable terminations for GIS switchgear
24 pcs	Cable terminations for outdoor application (porcelain insulator)
122 pcs	Pre-fabricated cable joints (including two spare joints)
400 tons	Steelwork (supporting structures for cables and accessories)

Including:

- Differential protection system (DPS) for the EHV cable system
- Temperature monitoring system (DTS) for the EHV cable system
- Cable laying and accessories installation
- On-site HV testing incl. PD measurement and commissioning test.