# 1 - 30 kV cables with PVC or cross-linked polyethylene insulation

**Technical Description - KG4073**

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COORDINATOR
**L-AB / L-AH / NB**

PUBLISHER
**Volkmar Ulewski**

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## 1 Changes and revisions

None

## 2 General points

This Technical Description (TB) is intended for use as a supplement to the applicable versions of the DIN VDE provisions and the DIN standards.

This version replaces all previous issues of the Stromnetz Berlin, requirements for 1 - 30 kV cables with PVC or cross-linked polyeth-ylene insulation.

## 3 Scope of application

The Technical Description applies to 1, 10 and 30 kV cables with PVC or cross-linked polyethylene insulation.

### 3.1 1 kV PVC cables

**NAYY-J 4x35 re**

### 3.2 1 kV cross-linked polyethylene cables

NA2XY-J 4 x 150 se

### 3.3 10 kV cross-linked polyethylene cables

NA2XS(F)2Y 1 x 240 rm / 25

NA2XS(F)2Y 3x1 x 240 rm / 25, stranded

## 3.5 30 kV cross-linked polyethylene cables

N2XS(F)2Y 1x150 rm / 25

# 4 General requirements

## 4.1 Technical acceptance of cables

The supplier must give due advance notice of the delivery of the cables for acceptance and approval
( Stromnetz Berlin: 3 weeks).

## 4.2 Transport and storage of cables

The following requirements must be met in addition to DIN VDE 0276, Parts 603 and 620:

The starts and ends of the cables must be sealed with watertight shrink-fit caps which are coated with adhesive and must be sufficiently secured to the shipping drum. The inner cable end must not be routed out of the side of the drum disk but should be secured on a continuous screw. Only drums conforming to DIN EN 46391 are to be used. The following information must be affixed to the shipping drum in a watertight and clearly legible manner: exact cable designation, cross section (conductor, screen), voltage, cable length, drum number and direction of rotation of drum.

# 5 Technical requirements

## 5.1 Technical requirements for cables with PVC insulation, rated voltage 1 kV

### 5.1.1 The cables must conform to DIN VDE 0276-603.

## 5.1.2 Additional requirements:

| | |
|---|---|
| Conductor: | Without welding points. |
| Core sheath: | It must be possible to remove the common core sheath for the extruded version and the fillers from the conductor insulation easily without leaving any residues, including after aging in the warming cabinet according to DIN VDE 0276-603, Table 1. No stripping agents are permitted. |
| Strand length: | For NAYY-J 4 x 35 re: 0.5 m to 0.8 m |
| Filler: | Non-hygroscopic and rubbery-elastic, free from stripping agents; must be removable without tools. |

## 5.2 Requirements for cables with cross-linked polyethylene insulation, rated voltage 1 kV

## 5.2.1 The cables must conform to DIN VDE 0276-603.

## 5.2.2 Additional requirements:

| | |
|---|---|
| Conductor: | Without welding points. |
| Insulation: | Free from separating agents, capable of adhesion to PUR resins through modification (cf. 5.5.1), stripping possible after thermal aging (cf. 5.5.2), with conductor cross section of 150 mm² max. thickness of insulating wall 2 mm (single value). |
| Cores: | Winding with tape permissible, must be removable without tools. |
| Strand length: | With conductor cross section of 150 $mm^2$ 1.0 m - 1.5 m. |
| Core sheath: | It must be possible to remove the common core sheath for the extruded version and the fillers from the conductor insulation easily without leaving any residues, including after thermal aging in the warming cabinet (cf. 5.5.2). |
| Filler: | Non-hygroscopic and rubbery-elastic, free from stripping agents; must be removable without tools. |

## 5.3 Requirements for cables with cross-linked polyethylene insulation, rated voltage 10 - 30 kV

### 5.3.1 The cables must conform to DIN VDE 0276-620.

### 5.3.2 Additional requirements:

| | |
|---|---|
| Insulation: | Cross-linked dry,<br>inner screen, insulation and outer screen triple-extruded and permanently bonded. |
| Longitudinal watertightness: | For versions with longitudinal watertightness:<br>Longitudinal watertightness in the screen area must be verified by testing for conformity with DIN VDE 0276-605, section 2.4.9.3 f, and HD 605, note 3. |
| Strand length: | On delivery in stranded version 1.2 m - 1.6 m. |

Type tests must be carried out according to DIN VDE 0276-620 and the test reports submitted to the customer. The results of the long-term aging tests must be submitted to the customer annually.

## 5.4 Markings

| | |
|---|---|
| Outer sheath: | The outer sheath must be marked with the following information: VDE test mark, manufacturer, year of manufacture, model code, rated voltage, cross section (conductor and screen) and embossing of length in metres. In addition, a cable code number that can be used to trace all manufacturing processes must be embossed on the sheath. |

## 5.5 Special tests

### 5.5.1 Evidence of adhesion capability

Table 1: Test requirements

| Seq-uence | Test procedures according to DIN EN 50393 | Test statistics | Analysis |
|---|---|---|---|
| 1 | AC voltage test in air, section 8.3 | Test voltage: 4 kV Test duration: 1 min. | No breakdown |
| 2 | Alternating load test in air, section 8.6 | Mean heater current 335 A Heating time: 5 hours Cooling time: 3 hours Number of load changes: 63 | No breakdown |
| 3 | Thermal short-circuit strength, DIN EN 61442 section 11 | Test current: acc. to HD 628 S1 section 11 Short-circuit current: 14.2 kA/1s Number of short circuits: 2 per conductor | No breakdown |
| 4 | Alternating load test in water, section 8.6 | Mean heater current: 335 A Heating time: 5 hours Cooling time: 3 hours Number of load changes: 63 | No breakdown |
| 5 | Testing of insulation resistance in water bath, section 8.4 | Measuring DC voltage Ut= 1000 V | Insulation resistance ≥ 50 MΩ |
| 6 | AC voltage test in water bath, section 8.3 | Test voltage: 4 kV Test duration: 1 min. | No breakdown |

Table 2: Cables to be used for testing

| Specifications | Main conductor | Branch conductor |
|---|---|---|
| Standard | DIN VDE 0276-603 | DIN VDE 0276-603 |
| Cable type | NA2XY-J | NAYY-J |
| Rated voltage | 0.6/1 kV | 0.6/1 kV |
| Material | Aluminium | Aluminium |
| Waveform | se | re |
| Cross section | 150 mm² | 35 mm² |
| Insulation | Cross-linked polyethylene | PVC |
| Sheath | PVC | PVC |
| Number of cores | 4 | 4 |
| Longitudinal watertightness | No | No |
| Main dimensions of cable | Compliant with VDE 0276-603 | Compliant with VDE 0276-603 |

The test must be performed with **one** of the PUR casting compound housing combinations listed below:

Table 3: Fittings/casting compounds which can be used for testing

| Manufacturer | Fitting | Casting compound |
|---|---|---|
| Höhne | HSM 260/130 | PU 500/2 |
| | | |
| TE Connectivity | MM 5-3D160-DE04 | Rapid 3010 (Rapid 3-D160 |

## 5.5.2 Aging test in warming cabinet

Test requirement

The test cable should be 500 mm long. The test is to be conducted at a temperature of 100°C and for a period of 168 hours in accordance with DIN VDE 0276-603, Table 2A.

Analysis

Once the test cables have cooled down, these must be shortened to a length of 160 mm from the middle of the cable.
To spread the cores, it must be possible to drive in an insulating wedge by hand at an angle of 90° centrically to the longitudinal axis of the cable for working when the cable is in operation.

The test is regarded to have been passed if:

- the core insulation is not damaged;
- the rubbery-elastic filling can be removed without the use of tools and without leaving residues;
- there are no cracks (embrittlement) in the core sheath.

## 6 Approval

Prior to use in the distribution network, cables must be approved by the relevant departments ( Stromnetz Berlin ).

| | Issued: | Checked: | Approved: |
|---|---|---|---|
| Date:<br>Name: | 12.08.2005<br>Volkmar Ulewski | 12.08.2005<br>Dietmar Obst | 12.08.2005<br>Frank Michelsen |

| | Approved: | Signed off: |
|---|---|---|
| Date:<br>Name: | 12.08.2005<br>Jürgen Lembke | 12.08.2005<br>Claus-Georg Henningsen |