Subject: ELPRESS Low Voltage Cold Shrink Inline Splice
KSC25-1-x to KSC240-1-x
For multicore polymeric insulated cables 0,6/1kV

Type of Test: Type Test without Impact Test

Specification: EN 50393 : 2006

Date of Test: May 15, 2006 to June 30, 2006

Test Summary: The test specimens passed the Type Test successfully according to the requirements

Date: July 21, 2006

Werner Roehling
Manager
Electrical Products

Jens Weichold
Test Services
Electrical Products
1. Description of Samples

Two test loops of about 5 m length each with ELPRESS Low Voltage Cold Shrink Inline Splices KSCxxx-1-4 were prepared according to the attached Installation Instruction Drawing XE-0091-2994-3 (Appendix B).

Used cable type: XLPE insulated, PVC jacketed cable 0.6/1 kV, N1XV-U 4G10 Ericsson
XLPE insulated, PVC jacketed cable 0.6/1 kV, N1XV-AS 4G240 Ericsson

Used Insulation: Connector Insulation: Scotch® 2228 Mastic Tape and Cold Shrink PST
Cable Jacket Insulation: Scotch® 2228 Mastic Tape and Cold Shrink PST

Loop 1: KSC25-1-4, 4 x 10 mm² Cu, round solid; ELPRESS mechanical connector SC25
Loop 2: KSC240-1-4, 4 x 240 mm² Al, sector stranded, ELPRESS mechanical connector SC240

Picture 1: Installed Test Loop 1

Picture 2: Installed Test Loop 2
2. Test Sequence

<table>
<thead>
<tr>
<th>Test</th>
<th>Type of Test according to EN 50393 sequence</th>
<th>I A1</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>AC Voltage Withstand Test in air</td>
<td>4 kV AC / 1 min</td>
<td>8.3</td>
</tr>
<tr>
<td>2.2</td>
<td>Insulation Resistance Test in air</td>
<td>with 1kVDC</td>
<td>8.4</td>
</tr>
<tr>
<td>2.3</td>
<td>AC Voltage Withstand Test in water</td>
<td>4 kV AC / 1 min</td>
<td>8.3</td>
</tr>
<tr>
<td>2.4</td>
<td>Insulation Resistance Test in water</td>
<td>with 1kVDC</td>
<td>8.4</td>
</tr>
<tr>
<td>2.5</td>
<td>Load Cycling Test, 5h/3h</td>
<td></td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>Loop1: $I_{heating} = 90,A$, $\theta_{conductor} = 95^\circ C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loop2: $I_{heating} = 350,A$, $\theta_{conductor} = 95^\circ C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td>AC Voltage Withstand Test in water</td>
<td>4 kV AC / 1 min</td>
<td>8.3</td>
</tr>
<tr>
<td>2.7</td>
<td>Insulation Resistance Test in water</td>
<td>with 1kVDC</td>
<td>8.4</td>
</tr>
<tr>
<td>2.8</td>
<td>Examination</td>
<td></td>
<td>8.8.</td>
</tr>
</tbody>
</table>
2.1 AC Voltage Withstand Test in air

An AC voltage of 4 kV was applied between phases and phases to neutral for 1 minute.

Requirement: no breakdown

Result: Loop 1: passed
        Loop 2: passed

Used Equipment: 3M No. 115 246

2.2 Insulation Resistance Test in air

The insulation resistance was checked between phases and phases to neutral with a test voltage of 1000 V DC.

Requirement: The insulation resistance must be > 50 MΩ

Result: Loop 1: Phase - Phase min. 10.000 MΩ
        Phase - Neutral min. 10.000 MΩ
        Loop 2: Phase - Phase min. 10.000 MΩ
        Phase - Neutral min. 10.000 MΩ

Used Equipment: 3M No. 71751
2.3 AC Voltage Withstand Test in water

An AC voltage of 4 kV was applied between phases and neutral and phases and neutral to water for 1 minute.

Requirement: no breakdown

Result:
Loop 1: passed
Loop 2: passed

Used Equipment: 3M No. 115 246

2.4 Insulation Resistance Test in water

The insulation resistance was checked between phases and neutral and phases and neutral to water with a test voltage of 1000 V DC.

Requirement: The insulation resistance must be > 50 MΩ

Result:
Loop 1:
- Phase - Phase: min. 10.000 MΩ
- Phase - Neutral: min. 10.000 MΩ
- Phase - Water: min. 10.000 MΩ
- Neutral - Water: min. 10.000 MΩ

Loop 2:
- Phase - Phase: min. 10.000 MΩ
- Phase - Neutral: min. 10.000 MΩ
- Phase - Water: min. 10.000 MΩ
- Neutral - Water: min. 10.000 MΩ

Used Equipment: 3M No. 71751
2.5 Load Cycling Test

Each thermal cycle consisted of a 5h heating and a 3h cooling period. During the heating period the conductors were heated up to the following temperatures using the following currents:

- Loop 1: $I_{\text{heating}} = 90 \text{ A}$, $\vartheta_{\text{conductor}} = 95^\circ\text{C}$
- Loop 2: $I_{\text{heating}} = 350 \text{ A}$, $\vartheta_{\text{conductor}} = 95^\circ\text{C}$

A total of 126 cycles was conducted of which the first 63 were performed in air, and for the remaining 63 cycles the joints were immersed in water.

A water level of 1000 mm above the joint was applied 50 mm apart from the splice end, the jackets of cable had been removed for a length of 50 mm.

After completion of thermocycling in water the AC Voltage Withstand Test was performed and the insulation resistance was checked.

Used Equipment: 3M No. 71544

2.6 AC Voltage Withstand Test in water

An AC voltage of 4 kV was applied between phases and neutral and phases and neutral to water for 1 minute.

Requirement: no breakdown

Result:
- Loop 1: passed
- Loop 2: passed

Used Equipment: 3M No. 115 246
2.7 Insulation Resistance Test in water

The insulation resistance was checked between phases and neutral and phases and neutral to water with a test voltage of 1000 V DC.

Requirement: The insulation resistance must be > 50 MΩ

Result:

<table>
<thead>
<tr>
<th>Loop 1</th>
<th>Phase - Phase</th>
<th>min. 10.000 MΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phase - Neutral</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td></td>
<td>Phase - Water</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td></td>
<td>Neutral - Water</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td>Loop 2</td>
<td>Phase - Phase</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td></td>
<td>Phase - Neutral</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td></td>
<td>Phase - Water</td>
<td>min. 10.000 MΩ</td>
</tr>
<tr>
<td></td>
<td>Neutral - Water</td>
<td>min. 10.000 MΩ</td>
</tr>
</tbody>
</table>

Used Equipment: 3M No. 71751

2.8 Examination:

Requirement: No deterioration that may affect its long term service life

Result:

<table>
<thead>
<tr>
<th>Loop 1</th>
<th>no evidence of deterioration ( Appendix A1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop 2</td>
<td>no evidence of deterioration ( Appendix A2 )</td>
</tr>
</tbody>
</table>

Conclusion: Both loops passed the Type Test successfully.
Appendix A1 :

Picture 1: Removed Jacket Insulation from Test Loop 1

No evidence of damaged, non functional jacket sealing

Picture 2: Removed Connector Insulation from Test Loop 1

No evidence of damaged, non functional connector sealing.
No evidence of corrosion on connector.
Appendix A2:

Picture 3: Removed Jacket Insulation from Test Loop 2

No evidence of damaged, non functional jacket sealing

Picture 4: Connector Insulation of Test Loop 2

No evidence of damaged, non functional, connector insulation.
Appendix B : Installation Instruction

3M Cold Shrink

KSC 25-1-4 (10-28 mm²)
KSC 70-1-4 (25-70 mm²)
KSC 95-1-4 (50-95 mm²)
KSC 150-1-4 (95-150 mm²)
KSC 240-1-4 (150-240 mm²)

3M ELECTRICAL PRODUCTS
XE-0091-2994-3
SE: OBS: För installation av 3+1 ledar kabel, fortsätt med steg 2a på sidan 5 av 7.
NO: Bemerk : For installation av kabler med 3 + 1 ledere gå til steg 2a på side 5 av 7.
FI: Huom: Kun hatuat asentaa 3⅓ - johdin koapelin, särty vaiheeeseen 2a sivulta 5/7.
GB: Note: For installation of 3 + 1 core cable proceed with step 2a page 5 of 7.
4-ledarkabel, 4-lederkabel, 4-johdinkaapeli, 4 core Cable

2a
KSC 25-1-4, KSC 70-1-4, KSC 95-1-4, KSC 150-1-4

2b
KSC 240-1-4

3

SE: Obs: För installation av hyllorna, se Elpress separata monteringsanvisningar för skruvkvarnar.
NO: Bemerk: For installation av koblinger, se separat veiledning for installasjon av ELPRESS.
FI: Huom: Kotaro löimien asennusohjeet offteeta ELPRESS:n asennusohjeesta ruuviliittimille.
OB: Note: for installation of the connectors see the separate ELPRESS connector installation instructions.
3+1 kabel, 3+1 lederkabel, 3½-johdin kaapeleille, 3+1 core Cable

<table>
<thead>
<tr>
<th>No.</th>
<th>L (mm)</th>
<th>A (mm)</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSC 25-1-4</td>
<td>25</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>KSC 70-1-4</td>
<td>65</td>
<td>260</td>
<td>300</td>
</tr>
<tr>
<td>KSC 95-1-4</td>
<td>65</td>
<td>260</td>
<td>380</td>
</tr>
<tr>
<td>KSC 150-1-4</td>
<td>70</td>
<td>260</td>
<td>490</td>
</tr>
<tr>
<td>KSC 240-1-4</td>
<td>70</td>
<td>260</td>
<td>490</td>
</tr>
</tbody>
</table>

**2a**

KSC 25-1-4, KSC 70-1-4, KSC 95-1-4, KSC 150-1-4

**2b**

KSC 240-1-4

---

SI: Observe the installation of nuts, use ELPRESS separata mounting screws for the screws in the area.

NO: Numerically for installation of bolts, use separate fixings for installation of ELPRESS.

FI: Huom: Kynnytten asennuksessa ottaa yhteyttä ELPRESSin asennusohjeeseen ympäristöön.

GB: Note: for installation of the connectors see the separate ELPRESS connector installation instruction.