

Grebbestad Elkonsult GEK AB
Kjell Bock
Box 53
457 02 GREBBESTAD

Testing of marking systems for cables

(5 appendices)

This is a translation from the Swedish original document. In the event of any dispute as to the content of the document, the Swedish text shall take precedence.

Test objects

Product	Material	Marking method	Marking text
Cable identification card type GK Injection moulded	Luran S 797 S	Thermotransfer	Luran S
Cable identification card type GK Injection moulded	Luran S 797 S	Thermotransfer	Luran S-Ow
Cable marking type SS Punched stainless steel plate	1:4404 EN 3:16 L ASTM 2348 (old SS)	Laser engraving	SS - PAST
Cable marking type SS Punched stainless steel plate	1:4404 EN 3:16 L ASTM 2348 (old SS)	Laser engraving	SS - FIB
Cable marking type SS Punched stainless steel plate	1:4404 EN 3:16 L ASTM 2348 (old SS)	Laser engraving	SS - FIBX

The test objects arrived to SP Technical Research Institute of Sweden in February, 2011.

Commission

Testing of marking systems according to selected parts of "SP-method 2171 "Marking sleeves for electrical equipment".

Section. 3.4 Ageing resistance

Section. 3.5 UV resistance

Section. 3.6 Abrasion resistance

Section. 3.7 Chemical resistance

SP Technical Research Institute of Sweden

Postal address
SP
Box 857
SE-501 15 BORÅS
Sweden

Office location
Västeråsen
Brinellgatan 4
SE-504 62 BORÅS

Phone / Fax / E-mail
+46 10 516 50 00
+46 33 13 55 02
info@sp.se

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Test methods

Section 3.5	UV resistance in Weatherometer 1000 h (ISO 4892-2). Exposure equivalent to 1 year outdoor exposure in southern Sweden
Section 3.7	The chemical resistance was controlled using the following fluids: 1. Diesel. 2. Acid (H_2SO_4 , 25 %) 3. Alkali (Detergent solution according to SS 92 36 14, 10 %) 4. Distilled water 5. Salt water (5 % NaCl) 6. Transformer oil (Nytro 10X) 7. Ethanol
Section 3.6	According to the method for testing of abrasion resistance, the load is calculated on the basis of the cable/mandrel diameter. As the sign in this case is not threaded on a cable/mandrel, a reasonable load was chosen; 600 g.

Test date

The tests were performed during February – June 2011 .

Test results

The complete test results are given in appendix 1-5.

**SP Technical Research Institute of Sweden
Chemistry and Materials Technology - Polymer Technology**

Performed by

Examined by



Anneli Burén



Elin Johnsson

Appendices

Appendix 1

Testing of marking system - GEKAB -

Test results: Cable identification card type GK **Marking text:** Luran S

Ageing 2000 h +90 °C

Requirement	Test result
Adhesion and dismounting shall be without remarks No cracks or other damages are allowed.	Function OK. No cracks or other visible damages. Colour and print are seemingly unchanged. The text is fully readable.

UV resistance

Requirement	Test result
Function OK. Colour and print: No important changes.	Function OK. The colour of the card is slightly pale. The text is seemingly unchanged and fully readable.

Abrasion resistance, marking

Requirement	Test result
Requirement: Print (abrasion 200+200 cycles)	The text is fully readable after 200+200 cycles.

Chemical resistance

Requirement: The sleeve should be without remark regarding function. There must be no cracks or other types of damage. Print (abrasion 200+200 cycles).

Chemical	Test result
Diesel	Function OK. The text is fully readable after 200+200 cycles.
Acid	Cable ties of PA are dissolved in acid. The card is OK and the text is fully readable after 200+200 cycles.
Alkali	Function OK. The text is fully readable after 200+200 cycles.
Distilled water	Function OK. The text is fully readable after 200+200 cycles.
Salt water	Function OK. The text is fully readable after 200+200 cycles.
Transformer oil	Function OK. The text is fully readable after 200+200 cycles.
Ethanol	Function OK. The text is fully readable after 200+200 cycles.

Appendix 2

Testing of marking system - GEKAB -

Test results: Cable identification card type GK **Marking text:** Luran S-Ow

Ageing 2000 h +90 °C

Requirement	Test result
Adhesion and dismounting shall be without remarks No cracks or other damages are allowed.	Function OK. No cracks or other visible damages. Colour and print are seemingly unchanged. The text is fully readable.

UV resistance

Requirement	Test result
Function OK. Colour and print: No important changes.	Function OK. The colour of the card is slightly pale. The text is seemingly unchanged and fully readable.

Abrasion resistance, marking

Requirement	Test result
Requirement: Print (abrasion 200+200 cycles)	The text is fully readable after 200+200 cycles.

Chemical resistance

Requirement: The sleeve should be without remark regarding function. There must be no cracks or other types of damage. Print (abrasion 200+200 cycles).

Chemical	Test result
Diesel	Function OK. The text is fully readable after 200+200 cycles.
Acid	Cable ties of PA are dissolved in acid. The card is OK and the text is fully readable after 200+200 cycles.
Alkali	Function OK. The text is fully readable after 200+200 cycles.
Distilled water	Function OK. The text is fully readable after 200+200 cycles.
Salt water	Function OK. The text is fully readable after 200+200 cycles.
Transformer oil	Function OK. The text is fully readable after 200+200 cycles.
Ethanol	Function OK. The text is fully readable after 200+200 cycles.

Appendix 3

Testing of marking system - GEKAB -

Test results: Cable identification card type SS Marking text: SS - PAST

Ageing 2000 h +90 °C

Requirement	Test result
Adhesion and dismounting shall be without remarks No cracks or other damages are allowed.	Function OK. No cracks or other visible damages. Card and print are seemingly unchanged. The text is fully readable.

UV resistance

Requirement	Test result
Function OK. Colour and print: No important changes.	Function OK. Card and print are seemingly unchanged. The text is fully readable.

Abrasion resistance, marking

Requirement	Test result
Requirement: Print (abrasion 200+200 cycles)	The text is fully readable after 200+200 cycles.

Chemical resistance

Requirement: The sleeve should be without remark regarding function. There must be no cracks or other types of damage. Print (abrasion 200+200 cycles).

Chemical	Test result
Diesel	Function OK. The text is fully readable after 200+200 cycles.
Acid	The card goes black due to corrosion. However the text is readable after 200+200 cycles.
Alkali	Function OK. The text is fully readable after 200+200 cycles.
Distilled water	Function OK. The text is fully readable after 200+200 cycles.
Salt water	Function OK. The text is fully readable after 200+200 cycles.
Transformer oil	Function OK. The text is fully readable after 200+200 cycles.
Ethanol	Function OK. The text is fully readable after 200+200 cycles.

Appendix 4

Testing of marking system - GEKAB -

Test results: Cable identification card type SS Marking text: SS - FIB

Ageing 2000 h +90 °C

Requirement	Test result
Adhesion and dismounting shall be without remarks No cracks or other damages are allowed.	Function OK. No cracks or other visible damages. Card and print are seemingly unchanged. The text is fully readable.

UV resistance

Requirement	Test result
Function OK. Colour and print: No important changes.	Function OK. Colour and print are seemingly unchanged. The text is fully readable.

Abrasion resistance, marking

Requirement	Test result
Requirement: Print (abrasion 200+200 cycles)	The text is fully readable after 200+200 cycles.

Chemical resistance

Requirement: The sleeve should be without remark regarding function. There must be no cracks or other types of damage. Print (abrasion 200+200 cycles).

Chemical	Test result
Diesel	Function OK. The text is fully readable after 200+200 cycles.
Acid	The card goes black due to corrosion. However the text is readable after 200+200 cycles.
Alkali	Function OK. The text is fully readable after 200+200 cycles.
Distilled water	Function OK. The text is fully readable after 200+200 cycles.
Salt water	Function OK. The text is fully readable after 200+200 cycles.
Transformer oil	Function OK. The text is fully readable after 200+200 cycles.
Ethanol	Function OK. The text is fully readable after 200+200 cycles.

Appendix 5

Testing of marking system - GEKAB -

Test results: Cable identification card type SS Marking text: SS - FIBX

Ageing 2000 h +90 °C

Requirement	Test result
Adhesion and dismounting shall be without remarks No cracks or other damages are allowed.	Function OK. No cracks or other visible damages. Card and print are seemingly unchanged. The text is fully readable.

UV resistance

Requirement	Test result
Function OK. Colour and print: No important changes.	Function OK. Card and print are seemingly unchanged. The text is fully readable.

Abrasion resistance, marking

Requirement	Test result
Requirement: Print (abrasion 200+200 cycles)	The text is fully readable after 200+200 cycles.

Chemical resistance

Requirement: The sleeve should be without remark regarding function. There must be no cracks or other types of damage. Print (abrasion 200+200 cycles).

Chemical	Test result
Diesel	Function OK. The text is fully readable after 200+200 cycles.
Acid	The card goes black due to corrosion. However the text is readable after 200+200 cycles.
Alkali	Function OK. The text is fully readable after 200+200 cycles.
Distilled water	Function OK. The text is fully readable after 200+200 cycles.
Salt water	Function OK. The text is fully readable after 200+200 cycles.
Transformer oil	Function OK. The text is fully readable after 200+200 cycles.
Ethanol	Function OK. The text is fully readable after 200+200 cycles.