



Saves Your Energy

SUSPENSION CLAMP SO214

Type Test Report



Test standard: EN50483-3, 2009



Contents

Document no

1. Specification	SO214
2. Certificate	FI27389
3. Test reports:	
3.1. Visual examination	2344S
3.2. Dimensional and material verification	2344S
3.3. Tensile test at ambient temperature	2353S
3.4. Slip test at ambient temperature	2350S
3.5. Clamp bolt tightening test	2349S
3.6. Corrosion ageing test	
3.6.1. Gas atmosphere test (Method 2)	210211_SO214_prohesion_test
3.6.2. Tensile test at ambient temperature	2355S
3.7. Climatic ageing test	
3.7.1. Climatic ageing test (Method 2)	2356S



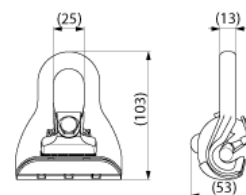
SO214

Name: **Suspension clamp**
For AAAC messenger 16-95 mm² (ø 4.8-13 mm)
Type: SO214
EAN: 6418677410666
Description: Used for suspension of overhead cables with uninsulated messenger (AMKA) in straight lines and angles up to 90°.
Package: 50/1800
Unit: PCS



Technical specification

For angles up to: 90°
Messenger mm: 4.8-13
Messenger mm²: 16-95
Weight (kg): 0.248
SMFL kN: 25
Tightening torque Nm: 48



Use: Use for the suspension of cable (e.g. AMKA) with bare messenger in straight lines and at angles of up to 90°.

Construction:	Component	Material
	Body	Weather resistant aluminium alloy
	Plastic protection	Weather and UV-radiation resistant plastic
	Bolt	Hot-dip galvanised steel

SO214 is provided with weather-resistant friction protection to ensure reliability of operation.

Installation: Suspension clamp is hung on the suspension hook. The messenger wire of the cable resting on the pulley is separated from the cable by separating wedges and inserted in the conductor groove of the suspension clamp. The bolt is tightened to the torque of 48 Nm. The pulley and the wedges are removed. It is recommended to tie the cable with a nylon tie on both sides of the suspension clamp.

Tools required: Separation wedges ST31, Articulated spanner ST20.

Markings: SO214, Ensto, 16-95 mm²

Standard: EN 50483-3:2009

CERTIFICATE FI 27389

Our Ref. 258614-21



Product Fitting for overhead lines

Type SO214

Trade mark ENSTO

Certificate Holder Ensto Finland Oy
Ensio Miettisen katu 2
FI-06150 PORVOO
FINLAND

Manufacturer Ensto Finland Oy
Ensto Utility Networks
Ensio Miettisen katu 2
FI-06150 PORVOO
FINLAND

Technical information Suspension clamp for messenger AAAC 16 – 95 mm²
Conductor diameter 4,8 - 13 mm
Tightening torque 48 Nm
SMFL 25 kN

The product is certified according to the following standard(s) EN 50483-3:2009

Validity This certificate is valid until 20 March 2017 unless the standard in question has been amended or superseded with significant changes in requirements, in which case, SGS Fimko has the right to shorten the validity of the certificate based on the legislation of the European Union. This certificate includes the right to use the FI mark under the condition that changes (if any) will be checked at SGS Fimko before the product is brought onto market and that the conditions for FI certification are met.

Date of issue 20 March 2012

SGS Fimko Ltd

Signature

Sixten Lökfors
Project Manager



This certificate has 1 appendix



This certificate is issued by the company under its General Conditions for Certification Services accessible at www.sgs.com/terms_and_conditions.htm. Attention is drawn to the limitations of liability defined therein and in the Test Report here above mentioned which findings are reflected in this certificate. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS Fimko Ltd.

Särkiniementie 3 P.O.Box 30 FI-00211 Helsinki, Finland
t. +358 9 696 361 f. +358 9 692 5474 www.fi.sgs.com

Business ID 0978538-5

Member of the SGS Group (SGS SA)

Appendix to Certificate: 27389

Manufacturing site

Ensto Ensek AS
Paldiski mnt. 35 / 4A
EE-76606 KEILA
ESTONIA

Additional information

Tests made in manufacturer's premises, witnessed by SGS Fimko Oy.
Manufacturer's test reports:
2344S, 2353S, 2350S, 2349S, 2355S and 2356S

Solar simulator test report:
210211_SO214_prohesion_test



Saves Your Energy

LABORATORY REPORT

No.: 2344S

Revision: A

Page: 1/4

Date of Test: 13.10.2011

Test object:

Suspension clamp SO214.

Purpose of the test and relevant standards:

Part of type test.

Visual examination test and dimensional and material verification test according to EN50483-1:2009, Annex A, Table A1.

Conclusion:

The clamp passed the test.



Picture 1: Tested clamp SO214.



Date of Report: 30.12.2011

Tested by: Kari Malinen

Reviewed by: Janne Lappalainen

Witnessed by: Sami Hakonen / SGS Fimko

Ordered by: P. Pulkkinen
Distribution: OHL PD-team



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16-95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	1

2. Testing procedure

The test was performed against the manufacturer specification sheet and standard requirement. The test included a visual examination part and a dimensional and material verification part.

Requirement:

The clamp shall fulfil the manufacturer specification data and standard requirement.

3. Test results

Visual examination:

The clamp was visually looking the same as in the specification drawing.

All markings required by the standard were found:

Manufacturer's logo:

ENSTO

Product code:

SO214

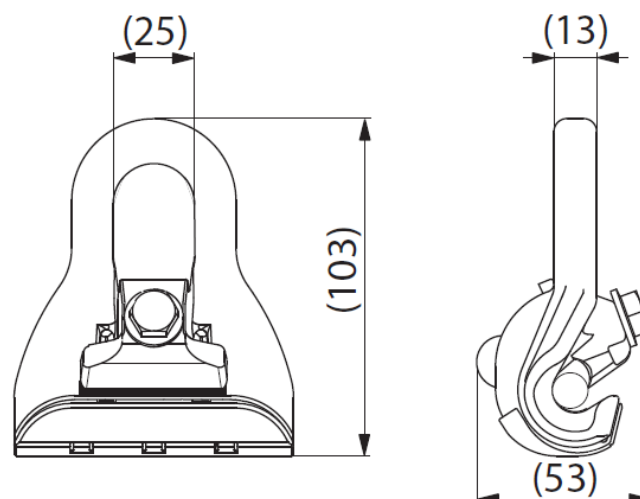
Minimum and maximum cross section:

16-95 mm²

Dimensional and material verification:

All samples were within specification requirements. Clamp dimensions were within specification tolerances, see picture 2.

Distance	Requirement [mm]	Measured [mm]
Body thickness	13	12,9
Eye width	25	24,6
Total length	103	102,6
Body width	53	53,4



Picture 2: Specification drawing

Summary:

The clamps fulfilled all test requirements.

4. Pictures



Picture 2: Dimensional verification.



Picture 3: Markings on the clamp.

5. Test equipment

ID	TYPE	MODEL	PURPOSE
A222	Calliper	Sylvac	Dimension measurements

6. Test Id

1432

7. Revision history

A



Saves Your Energy

LABORATORY REPORT

No.: 2353S

Revision: A

Page: 1/4

Date of Tests: 29.9.2011

Test object:

Suspension clamp SO214.

Purpose of the test and relevant standards:

Part of type test.

Tensile test at ambient temperature according to EN50483-3:2009 clause 8.2.2.1.

Conclusion:

The suspension clamp passed the test.



Picture 1: Tested suspension clamp SO214.



Date of Report: 4.1.2012

Tested by: Kari Malinen

Witnessed by: Sami Hakonen / SGS Fimko

Reviewed by: Janne Lappalainen

Ordered by: P.Pulkkinen
Distribution: OHL-PD team



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16 - 95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	2

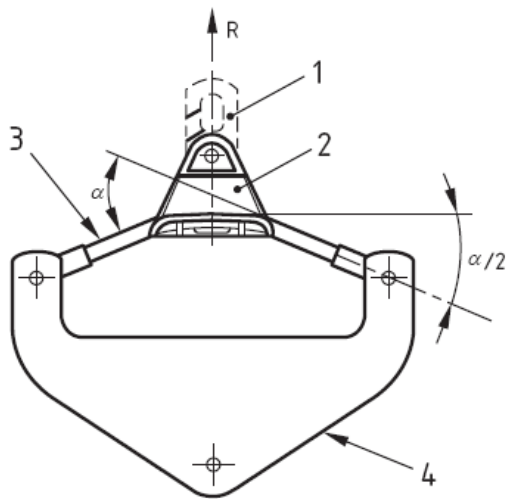
Conductors:

Type:	AMKA 3x16+25 mm ²
Used cross section:	16 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

Type:	AMKA 3x70+95 mm ²
Used cross section:	70 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

2. Testing procedure

The test procedure was acc. to standard. The tensile test assembly was installed into a horizontal tensile test machine as shown in picture 3.



1. Mobile link
2. Suspension clamp
3. Neutral messenger
4. Rigid bar

Picture 2: Tensile test arrangement.

Requirements

No damage shall occur which could affect the correct function of the clamp.

3. Test results

Sample [mm ²]	MBL of neutral messenger [kN]	60% of MBL for 60s [kN]	90% of MBL [kN]
25	7,4	4,4	6,7
95	27,9	16,7	25,1

Table 1: Tensile test parameters.

Summary:

The tested clamps fulfilled the requirements of the tensile test in ambient temperature.

4. Pictures



Picture 3: Test set up.

5. Test equipment

ID	TYPE	MODEL	PURPOSE
L56	Torque wrench	BDS – 80 E	Torque adjustment
L110	Tensile test machine	50 kN	Tensile tests

6. Test Id

1414

7. Revision history

A



Saves Your Energy

LABORATORY REPORT

No.: 2350S

Revision: A

Page: 1/4

Date of Tests: 29.9.2011

Test object:

Suspension clamp SO214.

Purpose of the test and relevant standards:

Part of type test.

Slip test at ambient temperature according to EN50483-3:2009 clause 8.2.2.

Conclusion:

The suspension clamp passed the test.



Picture 1: Tested suspension clamp SO214.



Date of Report: 4.1.2012

Tested by: Kari Malinen

Witnessed by: Sami Hakonen / SGS Fimko

Reviewed by: Janne Lappalainen

Ordered by: P.Pulkkinen
Distribution: OHL-PD team



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16 - 95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	2

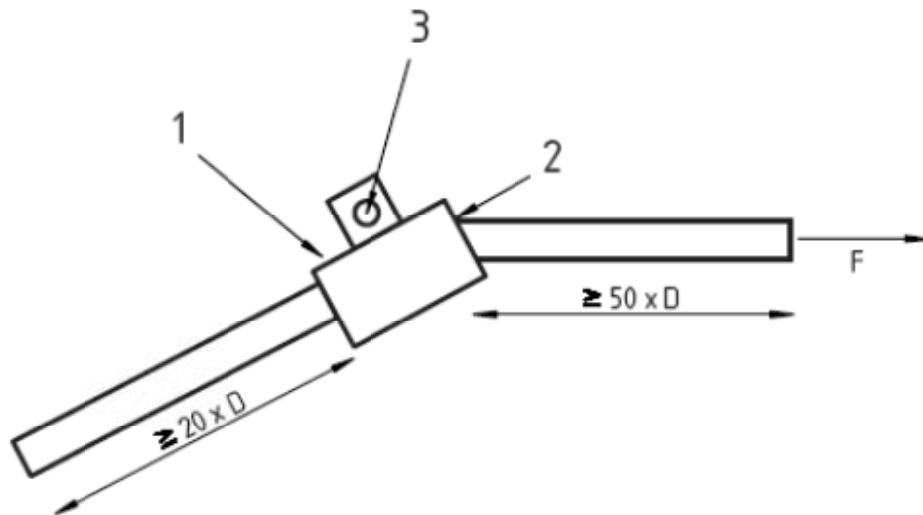
Conductors:

Type:	AMKA 3x16+25 mm ²
Used cross section:	16 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

Type:	AMKA 3x70+95 mm ²
Used cross section:	70 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

2. Testing procedure

The test procedure was acc. to standard. The slip test assembly was installed into a horizontal tensile test machine as shown in picture 3.



Picture 2: Slip test at ambient temperature.

Requirements

No slippage shall occur at 45 N/mm² for bare neutral messenger.

No damage shall occur, which could affect the correct function of the suspension clamp and cable.

3. Test results

Messenger [mm ²]	Min. Slipping force (45 N/mm ²) [N]	Slipping force [N]
25	1125	5700
95	4275	7600

Table 1: Slip test results.

Summary:

The tested clamps fulfilled the requirements of the slip test in ambient temperature.

4. Pictures



Picture 3: Test set up.

5. Test equipment

ID	TYPE	MODEL	PURPOSE
L56	Torque wrench	BDS – 80 E	Torque adjustment
L110	Tensile test machine	50 kN	Tensile tests

6. Test Id

1414

7. Revision history

A



Saves Your Energy

LABORATORY REPORT

No.:2349 S

Revision: A

Page: 1/3

Date of Test: 29.9.2011

Test object:

Suspension clamp SO214.

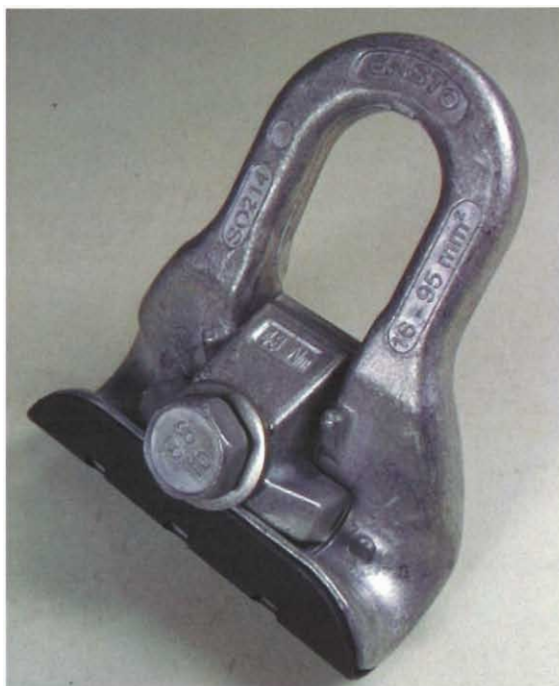
Purpose of the test and relevant standards:

Part of type test.

Clamp bolt tightening test according to EN 50483-3:2009, clause 8.2.1.

Conclusion:

The clamp passed the test.



Picture 1: Tested clamp SO214.



Date of Report: 3.1.2012

Tested by: Kari Malinen

Reviewed by: Janne Lappalainen

Witnessed by: Sami Hakonen / SGS Fimko

Ordered by: P. Pulkkinen
Distribution: OHL PD-team

Ensto Utility Networks Laboratory
Ensto Finland Oy

Ensio Miettisen katu 2,
P.O.Box 77
06101 Porvoo, Finland

Tel. +358 204 76 21
Fax +358 204 76 2770

Business ID: 0130215-8
Reg. Office: Porvoo



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16 - 95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	2

2. Testing procedure

Two clamps were tested. The clamp was installed on to the covered conductor. The tightening torque was increased to 1,1 x the specified installation torque, 48 Nm x 1,1 = 52,8 Nm. The bolt was then loosed. The tightening and loosening process were then completed 10 times. After that the torque was increased to 53,0 Nm, which is the maximum torque value recommended by the bolt supplier. This torque was used, because it is lower than two times specified installation torque. The clamp and bolts were checked for any damages.

Requirement

There shall be no breakage either to the threaded parts or to the components connected to them which could affect the correct function of the clamp.

3. Test results

Messenger size [mm ²]	Spec. installation torque [Nm]	Spec. torque x1,1 [Nm]	Spec. torque of bolt x2 [Nm]	Max. tightening torque of bolt [Nm]
25	48	52,8	96	53
95	48	52,8	96	53

Table 1: Test data

Summary:

Both samples fulfilled standard requirements.

4. Pictures



Picture 2: Bolt tightening test set up.

5. Test equipment

<u>ID</u>	<u>TYPE</u>	<u>MODEL</u>	<u>PURPOSE</u>
L56	Torque wrench	BDS – 80 E	Torque adjustment

6. Test Id

1413

7. Revision history

A

● Venus Greenhouse Test

Customer:



Ensto Finland Oy
Janne Lappalainen
P.O. Box 51
FI-06101 Porvoo

Research Contract:

EnstoFinlandLappalainen__ta141210HS.pdf
2828_001 / 14.12.2010
Ensto Test Id: 1115, 18.2.2011

Target:

Test item	Code	Q'ty	Manufacturer
Suspension clamp	SO214	2	Ensto

Picture of one of the tested samples has been taken before the test.



Testing time:

The start of the test: 22nd of February, 2011
The end of the test: 5th of April, 2011
Total test duration 1000 hours

Purpose of the test:

To test the withstand of the samples to prohesion mist spray.

Test method:

The strain of the test is made according to the standard EN 50483-6, 8.4.2.2 Gas atmosphere (Method 2). The test is a prohesion test. The test cycle consists of 0.05 % NaCl and 0.35 % (NH₄)₂SO₄ salt mist at the ambient temperature of 24 ± 3 °C for one hour and one hour long drying time at the ambient temperature of 35 °C. This test cycle is repeated for 500 times.

Validation of test method:

The test method was defined according to the requirements of the customer.

The test is used for comparative test of materials. The test conditions have some correlation with the real life conditions because the salt concentration is not very high. However, at the end of the drying period the concentration of the salt solution is very high.

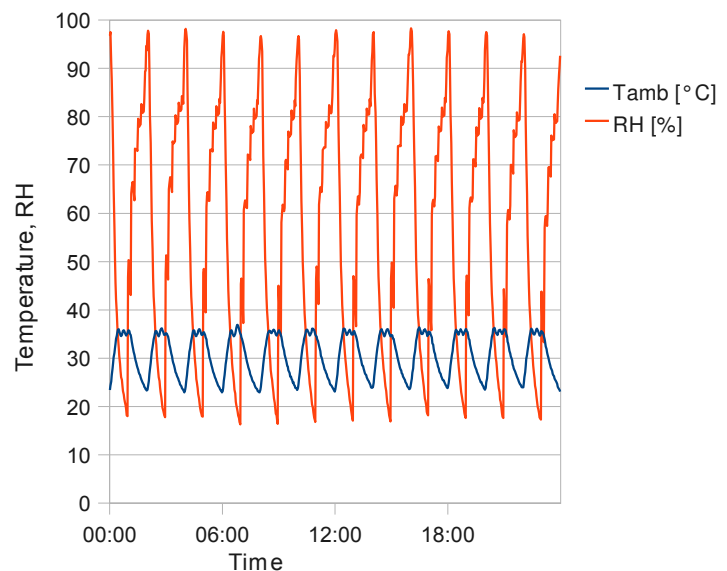
Actions done:

The samples were attached to a test casing after which the samples were placed into a prohesion mist chamber. The prohesion liquid solution was made to a purified water by using pro analysi sodium chloride and pro analysi ammonium sulphate. The amount of total impurities in the used salts was max. 0.5 % (in the standard 0.3 %). The pH of the solution was measured with a pH-meter to be 5.5. On a separate test a collecting receptacle with a collecting surface of 80 cm² collected 2 ml of prohesion solution per hour averaged over a period of 16 hours.

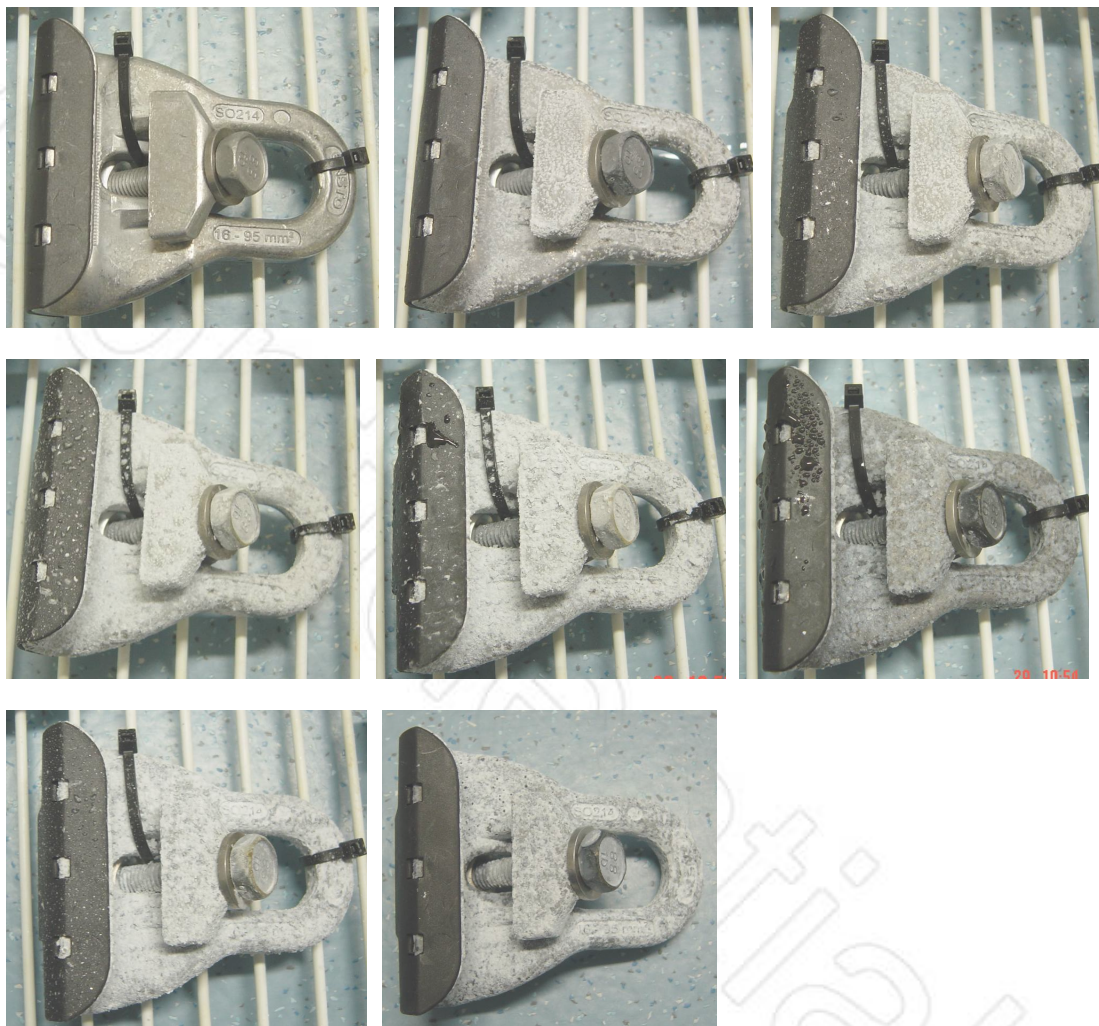
The samples were attached with plastic cable ties to the sample stand. The angle of the sample stand was 60° from horizontal. The sample stand was situated into a test chamber and the test lasted for 1000 hours.

The samples were photographed at an interval of one test week (168 h). After the test the samples were washed in running tap water for five minutes. The temperature of the tap water was 30°C. After that the samples were rinsed in purified water and then dried with an air blast.

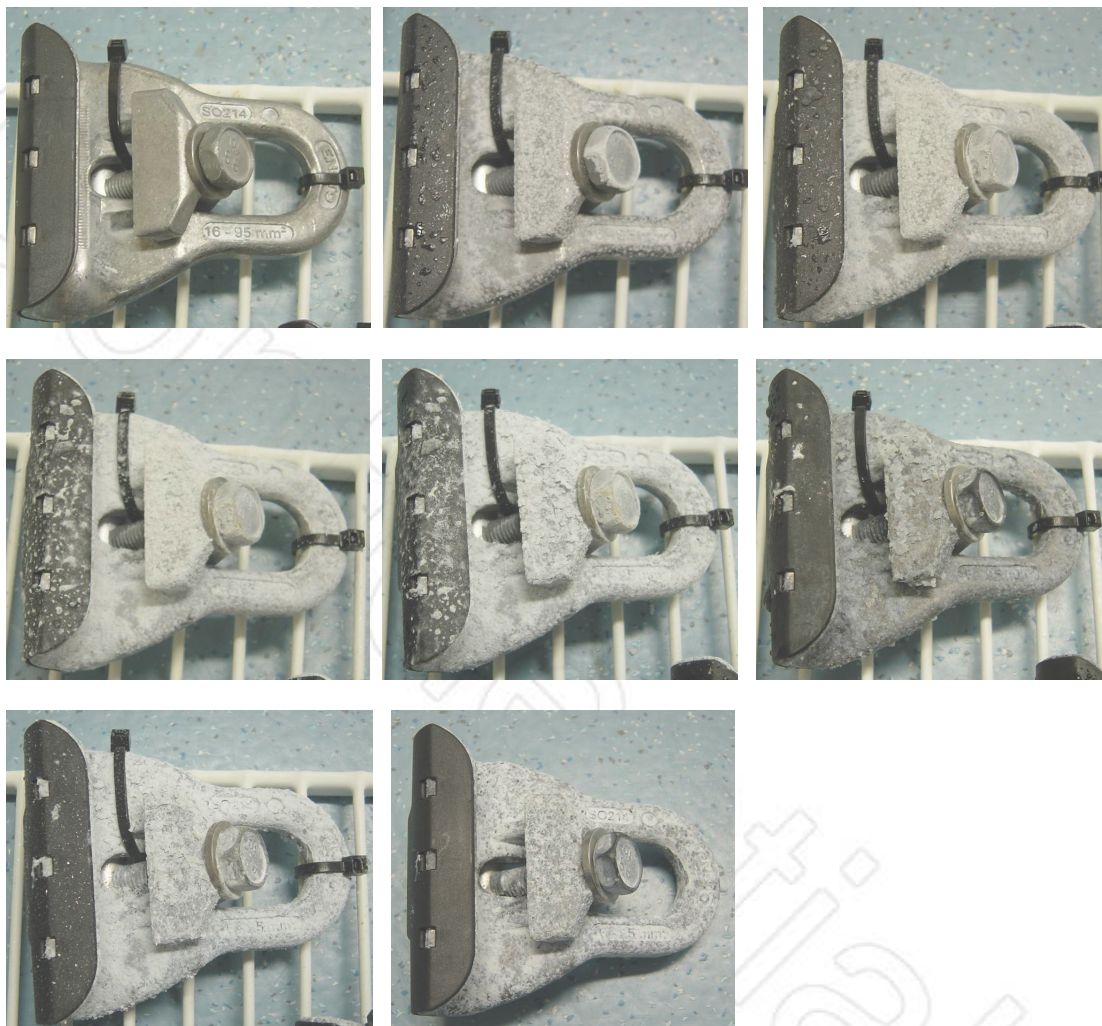
The ambient temperature and relative humidity in the test chamber during a cycle of 24 hours is presented in the figure.



Suspension clamp, SO214, Sample A (Pictures of the sample were taken: **Top row:** before the test, after one week and after two weeks, **Middle row:** after three weeks, after four weeks and after five weeks, **Bottom row:** after the test and after washing the sample.)



Suspension clamp, SO214, Sample B (Pictures of the sample were taken: **Top row:** before the test, after one week and after two weeks, **Middle row:** after three weeks, after four weeks and after five weeks, **Bottom row:** after the test and after washing the sample.)



Conclusions:

The strain for the samples was 1000 h of prohesion mist.

There was some degradation on the surfaces of the samples. The Suspension clamp **SO214** passed the visual test.

Analysis:

-

Remarks:

Samples were photographed at an interval of one test week. The photographs were sent by email to the customer.

Used measuring equipment:

Prohesion chamber, No. 22

Temperature: No. 42 / Ch4_T1, calibrated 21st January, 2011, calibration is valid

Humidity: No. 42 / RH_AUX, calibrated 21st January, 2011, calibration is valid

pH: No. 41, Fastech FT11, calibrated 21st January, 2011, calibration is valid

Actions, operations and reporting are in accordance with IEC/ISO 17025 'General requirements for the competence of testing laboratories'.

This test report is for R&D purposes and internal use only. Test reports and other documents for marketing use are also available.

Signatures:



Timo Oksa
Littoinen, 5th of April, 2011





Saves Your Energy

LABORATORY REPORT

No.: 2355S

Revision: A

Page: 1/4

Date of Tests: 29.9.2011

Test object:

Suspension clamp SO214.

Purpose of the test and relevant standards:

Part of type test.

Tensile test at ambient temperature according to EN50483-3:2009 clause 8.2.2.1., after gas atmosphere test (Method 2) done at Solar Simulator Finland according to EN 50483-1:2009 clause 8.4.2.2., test report: TestId1115_EnstoFinlandLappalainen__tr210211.pdf .

Conclusion:

The suspension clamp passed the test.



Picture 1: Tested clamp SO214.



Date of Report: 5.1.2012

Tested by: Kari Malinen

Witnessed by: Sami Hakonen / SGS Fimko

Reviewed by: Janne Lappalainen

Ordered by: P.Pulkkinen

Distribution: OHL-PD team

Ensto Utility Networks Laboratory
Ensto Finland Oy

Ensio Miettisen katu 2,
P.O.Box 77
06101 Porvoo, Finland

Tel. +358 204 76 21
Fax +358 204 76 2770

Business ID: 0130215-8
Reg. Office: Porvoo



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16 - 95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	2

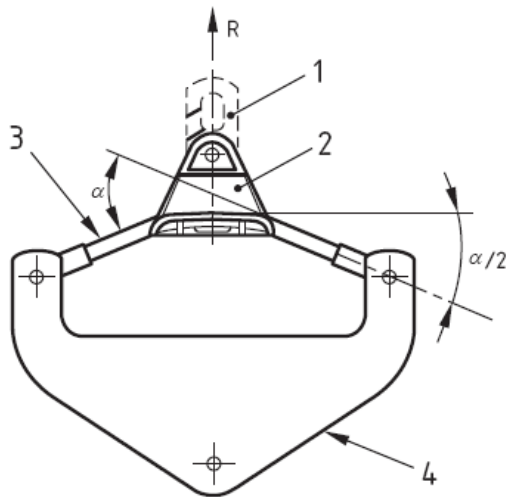
Conductors:

Type:	AMKA 3x16+25 mm ²
Used cross section:	16 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

Type:	AMKA 3x70+95 mm ²
Used cross section:	70 mm ²
Manufacturer/country:	REKA / Finland
Insulation material:	LDPE
Conductor material:	Aluminium

2. Testing procedure

The test procedure was acc. to standard. The tensile test assembly was installed into a horizontal tensile test machine as shown in picture 3.



1. Mobile link
2. Suspension clamp
3. Neutral messenger
4. Rigid bar

Picture 2: Tensile test arrangement.

Requirements

No damage shall occur which could affect the correct function of the clamp.

These samples has been passed gas atmosphere test, clause 8.5.1.2.2, therefore here used test loads are reduced.

3. Test results

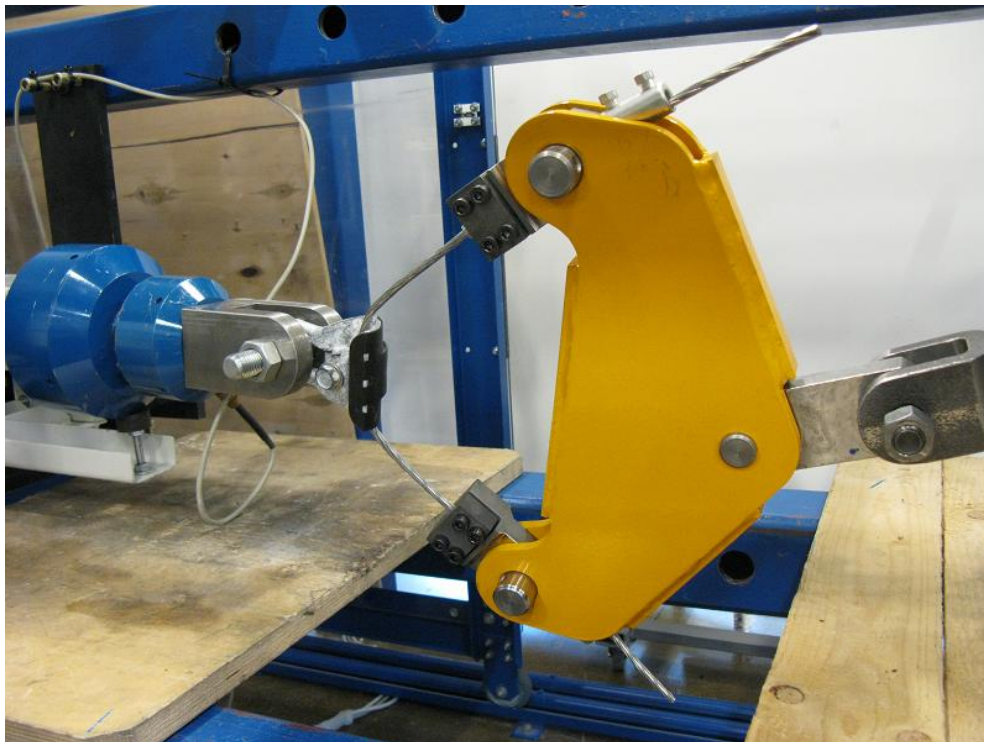
Sample [mm ²]	MBL of neutral messenger [kN]	55% of MBL for 60s [kN]
25	7,4	4,1
95	27,9	15,3

Table 1: Tensile test parameters.

Summary:

The tested clamps fulfilled the requirements of the tensile test in ambient temperature.

4. Pictures



Picture 3: Test set up.

5. Test equipment

ID	TYPE	MODEL	PURPOSE
L14	Torque wrench	BDS 80 E	Torque adjustment
L110	Tensile test machine	50 kN	Tensile tests

6. Test Id

1115

7. Revision history

A



Saves Your Energy

LABORATORY REPORT

No.: 2356S

Revision: A

Page: 1/4

Date of Test: 18.2.2011 –
15.4.2011

Test object:

Suspension clamp SO214.

Purpose of the test and relevant standards:

Part of type test.

Climatic ageing test, method 2 (UV-test), according to EN50483-3:2009, clause 8.2.3.4.2.

Conclusion:

The clamp passed the test.



Picture 1: Tested clamp SO214



Date of Report: 9.1.2012

Tested by: Kari Malinen

Witnessed by: Sami Hakonen / SGS Fimko

Reviewed by: Janne Lappalainen

Ordered by: P. Pulkkinen
Distribution: OHL PD-team



1. Test objects

Suspension clamp:

Type:	SO214
Messenger size mm ² :	16 - 95 mm ²
Tightening torque:	48 Nm
SMFL:	25 kN
No of pcs:	2

2. Testing procedure

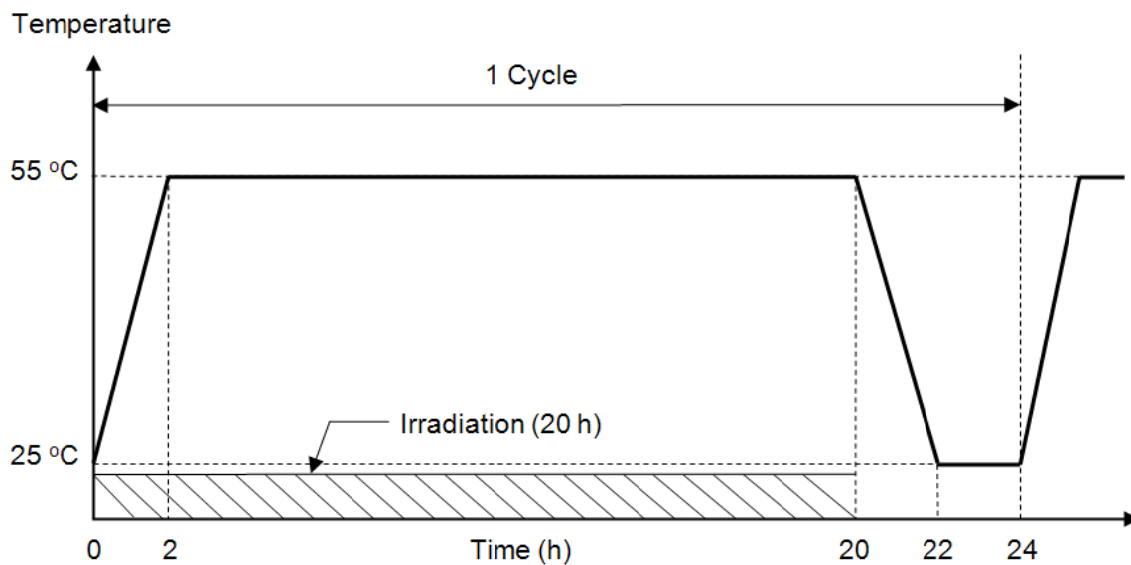
Simulated solar radiation test (UV-test)

The test was carried out in a chamber, where an irradiance of 0,83 kW/m² with the spectral distribution given in Table 1 was provided over an irradiation measurement plane of 900 mm x 900 mm. This value includes any radiation reflected from the test chamber. The radiation was produced with 20 pcs of 300 W Ultra-Vitalux lamps of Osram with burning age (50%) 1000 h. The distance to the measurement plane was 700 mm.

The test consists of 56 daily cycles (8 weeks). Each cycle consist of 20 h irradiation and 4 h darkness, Picture 2. The temperature was maintained at 55 ±2 °C during the irradiation period and at 25 ±2 °C during the darkness period. The temperature was measured with a thermocouple in a point 40 mm below the measurement plane at half the distance between the specimen and the wall.

Spectral region	Ultra-violet B	Ultra-violet A	Visible			Infra-red
Bandwidth	0,28 µm - 0,32 µm	0,32 µm - 0,40 µm	0,40 µm - 0,52 µm	0,52 µm - 0,64 µm	0,64 µm - 0,78 µm	0,78 µm - 3,00 µm
Irradiance measured	9,1 W/m ²	47,3 W/m ²	53,0 W/m ²	105,1 W/m ²	33,3 W/m ²	578,6 W/m ²
Std. requirements Irradiance Tolerance	5 W/m ² ±35 %	63 W/m ² ±25 %	200 W/m ² ±10 %	186 W/m ² ±10 %	174 W/m ² ±10 %	492 W/m ² ±20 %

Table 1: Spectral energy distribution and permitted tolerances



Picture 2: Temperature-radiation-time relationships

Requirement:

The sample's identification markings shall be legible when examined with normal or corrected vision without magnification.

No deterioration of the clamps shall occur which would impair the normal function of the clamp.

3. Test results

Summary:

No visual degradation could be noticed and the markings were clearly legible.

4. Pictures



Picture 3: Clamps before the UV test



Picture 4: Clamps after the UV test.

5. Test equipment

ID	TYPE	MODEL	PURPOSE
UV1	UV-radiation chamber	Ensto	Climate testing
L112	Thermometer	Center 309	Temperature measurements

6. Test Id

1114

7. Revision history

A