



*Saves Your Energy*

# **TENSION CLAMP SO3.35**

## **Type Test Report**



**Test standard: EN50483-3, 2009**



**Contents**

**Document no**

1. Specification	SO3.35
2. Certificate	FI 27957
3. Test reports:	
3.1. Visual examination	2563S
3.2. Dimensional and material verification	2563S
3.3. Test for permanent marking	2568S
3.4. Tensile test at ambient temperature	2575S
3.5. Corrosion ageing test	2620S
3.5.1. Gas atmosphere test (Method 2)	
3.5.2. Tensile test	
3.6. Climatic ageing test	
3.6.1. Climatic ageing test (Method 2)	2550S



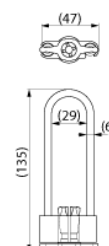
# SO3.35

Name: **Tension clamp**  
For uninsulated AAAC messenger 35 mm<sup>2</sup>  
Type: SO3.35  
EAN: 6418677404603  
Description: Used for tensioning of an uninsulated messenger (AMKA).  
Package:  
Unit: PCS



## Technical specification

Colour code: Red  
Messenger mm: 6.8  
Messenger mm<sup>2</sup>: 35  
Weight (kg): 0.103  
SMFL kN: 9.3



Use: Used for the dead-ending of AAAC conductors (e.g. AMKA cable messenger) by means of hooks to either a pole or a wall.

Construction:	Component	Material
	Body and cone	Corrosion resistant aluminium alloy
	U-bar	Hot-dip galvanised steel
	Nut	Aluminium alloy

Installation: The messenger wire of the AMKA cable is passed through the cone. The butterfly nut is tightened manually. To ensure the grip the messenger wire of the AMKA cable is bent downwards behind the cone. The cone is colour coded to simplify identification of the correct clamp.

Tools required: None

Markings: SO 3

Standard: EN 50483-3





# CERTIFICATE FI 27957

Our Ref. 270807-1

Product	Fitting for overhead lines
Type	SO4.70, SO3.25, SO3.35, SO3.50, SO4.95
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	Tension clamp for uninsulated messenger

Type	Messenger cross-section area	Messenger diameter	SMFL
SO3.25	25 mm <sup>2</sup>	5,8 mm	6,6 kN
SO3.35	35 mm <sup>2</sup>	6,8 mm	9,3 kN
SO3.50	50 mm <sup>2</sup>	8,0 mm	13,2 kN
SO4.70	70 mm <sup>2</sup>	9,6 mm	18,6 kN
SO4.95	95 mm <sup>2</sup>	11,3 mm	18,6 kN

The product is certified according to the following standard(s)

<b>Validity</b>	This certificate is valid until 21 March 2018 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 21 March 2013

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 <http://www.sgs.fi/en/Terms-and-Conditions.aspx>. 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.sqs.fi](http://www.sqs.fi)

Business ID 0978538-5

Member of the SGS Group (SGS SA)



Appendix to Certificate: 27957

**Manufacturing site** Ensto Ensek AS  
Paldiski mnt. 35 / 4A  
EE-76606 KEILA, ESTONIA

**Additional information** Ensto Finland's test reports:

SO3.25: 2562S, 2567S, 2509S, 2619S and 2550S  
SO3.35: 2563S, 2568S, 2575S, 2620S and 2550S  
SO3.50: 2564S, 2569S, 2577S, 2621S and 2550S  
SO4.70: 2565S, 2570S, 2578S, 2622S and 2551S  
SO4.95: 2566S, 2571S, 2580S, 2623S and 2551S



Saves Your Energy

## LABORATORY REPORT

No.: 2563S

Revision: A

Page: 1/4

Date of Test: 10.10.2012

---

### Test object:

Tension clamp SO3.35 for uninsulated AAAC messenger.

---

### Purpose of the test and relevant standards:

Part of type test.

Visual examination test and Dimensional and material verification test, according to EN 50483-1:2009 Annex A, table A.1 and clause 6 Marking.

---

### Conclusion:

The clamp passed the test.



Picture 1: Tested clamp SO3.35



---

**Date of Report:** 11.10.2012

**Tested by:** Ola Forsström

**Witnessed by:** Sami Hakonen / SGS Fimko

**Reviewed by:** Janne Lappalainen

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



## 1. Test objects

Tension clamp:

Type:

Tension clamp SO3.35 for uninsulated AAAC messenger

Batch number:

120410 / 2568

Messenger size:

35 mm<sup>2</sup>

Tightening torque:

By hand

SMFL:

9,3 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:

SO3 (red paint)

Batch number (production date):

The batch number can be found on the cardboard box of the delivered clamp

Minimum and maximum cross section:

35 mm<sup>2</sup>

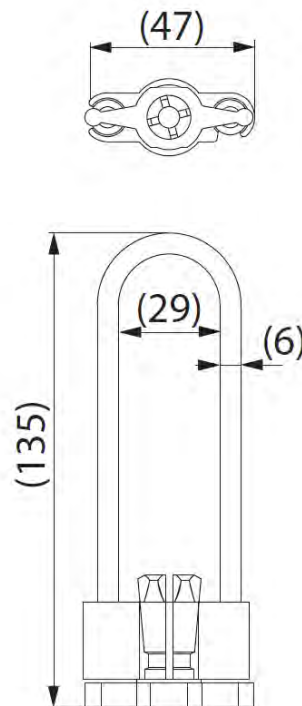
The cross section is marked on the cone of the clamp and is also indicated by a colour code (red)

**Dimensional and material verification:**

Clamp dimensions were within specification tolerances, see picture 2.

Distance	Requirement [mm]	Measured [mm]
Clamp length	(135)	133,8
Clamp width	(47)	47,2
U-bar diameter	(6)	6,0
U-bar eye diameter	(29)	29,0

Table 1: Dimensions of the SO3.35



Picture 2: Specification drawing

Component	Material	Matching specification
Body and cone	Corrosion resistant aluminium alloy	Yes
U-bar	Hot-dip galvanized steel	Yes
Nut	Aluminium alloy	Yes

Table 2: Material verification of the SO3.35

**Summary:**

The clamp fulfilled all test requirements.





**4. Pictures**



Picture 3: Markings on the clamp's body

**5. Test equipment**

ID	Type	Model	Purpose	Latest calibration
A223	Slide gauge	Sylvac	Measuring dimensions	23.03.2012

**6. Test Id**

1942

**7. Revision history**

A



Saves Your Energy

## LABORATORY REPORT

No.: 2568S

Revision: A

Page: 1/3

Date of Test: 10.10.2012

---

### Test object:

Tension clamp SO3.35 for uninsulated AAAC messenger.

---

### Purpose of the test and relevant standards:

Part of type test.

Test for permanent marking according to EN50483-1:2009 clause 9.2.

---

### Conclusion:

The tension clamp passed the test.



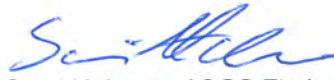
Picture 1: Tested tension clamp SO3.35



---

**Date of Report:** 12.10.2012

  
**Tested by:** Kenneth Väkeväinen

  
**Witnessed by:** Sami Hakonen / SGS Fimko

  
**Reviewed by:** Janne Lappalainen

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



### 1. Test objects

Tension clamp:

Type:

Manufacturer:

Batch number:

Color code:

Messenger size:

No of pcs:

Tension clamp SO3.35 for un-insulated AAAC messenger

Ensto Finland Oy

120410 / 2568

Red

35 mm<sup>2</sup>

2

### 2. Testing procedure

The test procedure was according to standard. The marking of the connector was rubbed by hand for 15 s with a piece of cloth soaked with water and another 15 s with a piece of cloth soaked with petroleum spirit. The petroleum spirit used was Mineral turpentine from KIILTO / Finland.

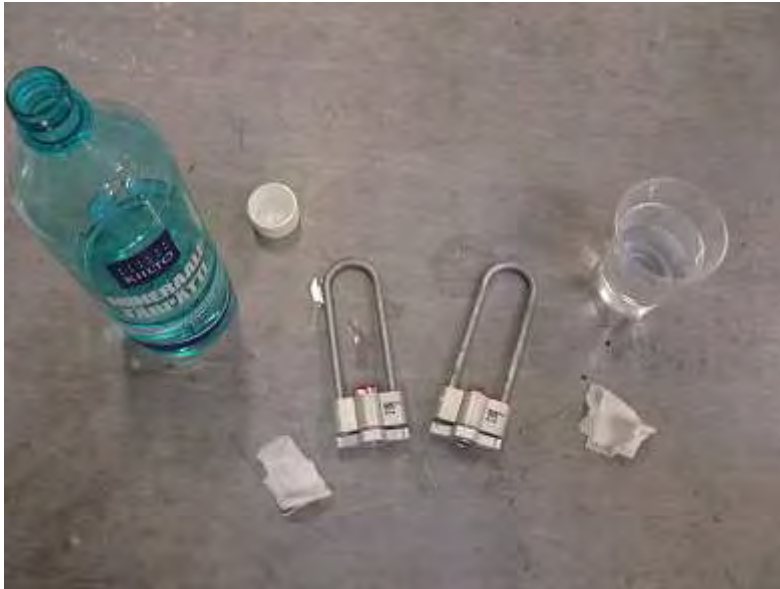
#### **Requirements**

The marking shall remain clear and allow the accessory to be easily identified.

### 3. Test results

The marking remained clear and was not affected at all by the rubbing.

#### 4. Pictures



Picture 2: Samples after the test

#### 5. Test equipment

No special test equipment needed.

#### 6. Test Id

1947

#### 7. Revision history

A





Saves Your Energy

## LABORATORY REPORT

No.:2575S

Revision: A

Page: 1/4

Date of Test: 10.10.2012

---

### Test object:

Tension clamp SO3.35 for uninsulated AAAC messenger 35 mm<sup>2</sup>.

---

### Purpose of the test and relevant standards:

Part of type test.

Tensile test at ambient temperature according to EN 50483-3:2009, clause 8.1.1.

---

### Conclusion:

The clamp passed the test.



Picture 1: Tested clamp SO3.35.



---

**Date of Report:** 17.10.2012

**Tested by:** Patrick Ekholm

**Witnessed by:** Sami Hakonen / SGS Fimko

**Reviewed by:** Janne Lappalainen

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



**1. Test objects**

Tension clamp:

Type:	SO3.35
Batch number:	120410/2568
Messenger size:	35 mm <sup>2</sup>
Tightening torque:	Manually
SMFL:	9,3 kN
No of pcs:	2

Conductors:

Type:	AMKA 3x25+35 mm <sup>2</sup>
Used cross section:	35 mm <sup>2</sup>
Manufacturer/country:	Prysmian / Finland
Breaking load for messenger:	10,3 kN
Conductor material:	Aluminium
Standard:	HD 626-5D
Conductor ID:	114



## 2. Testing procedure

The clamps were installed to the messengers according to manufacturer instructions. The butterfly nut was tightened manually. The clamps were tested with messenger size 35 mm<sup>2</sup>. The test assembly was installed into a horizontal test machine. First the load was increased to 80% of MBL of the messenger, next it was decreased to 20% of MBL of the messenger and the messenger was marked where it exits the clamp. Then the load was increased to 90% of MBL of the messenger and kept at this value for 60 seconds and the load was removed.

### Requirement:

The clamp shall not slip by more than 10 mm respect to the mark on the neutral messenger. No damage shall occur, which would affect the correct function of the tension clamp.

## 3. Test results

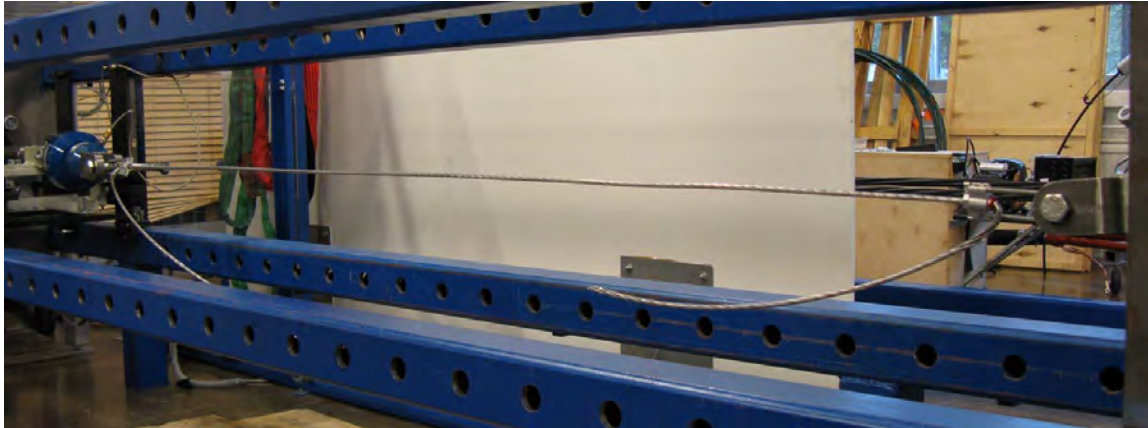
Messenger [mm <sup>2</sup> ]	MBL of Messenger [kN]	80% of MBL [kN]	20% of MBL [kN]	90% of MBL for 60 s [kN]	Slippage [mm] Sample 1/Sample 2	Result
35	10,3	8,2	2,1	9,3	1 / 1	o.k.

Table 1: Test data and results.

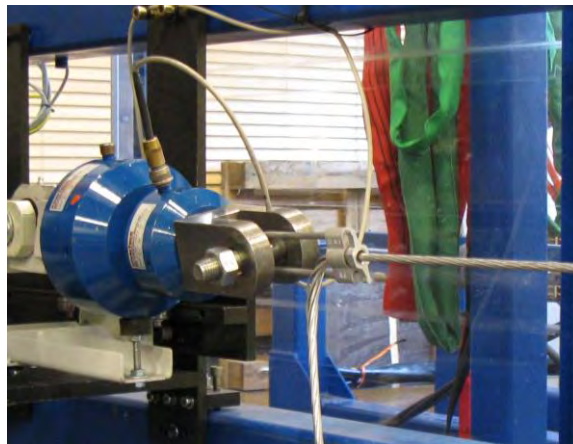
### Summary:

All samples fulfilled the test requirements.

#### 4. Pictures



Picture 2: Test assembly



Picture 3: Clamp under test

#### 5. Test equipment

ID	Type	Model	Purpose	Latest calibration
T1	Tensile test machine	Matertest	Tensile test	No calibration
A113	Slide gauge	Mitutoyo	Measuring dimensions	23.03.2012
L110	Loadcell	1210AF-50kN-B	Force measurement	23.08.2012

#### 6. Test Id

1937

#### 7. Revision history

A





Saves Your Energy

## LABORATORY REPORT

No.: 2620S

Revision: A

Page: 1/7

Date of Tests: 2.7. – 11.12.2012

---

### Test object:

Tension clamp SO3.35 for uninsulated AAAC messenger.

---

### Purpose of the test and relevant standards:

Part of type test.

Corrosion ageing test according to EN 50483-3 clause 8.1.4.3.2 and EN 50483-6 clause 8.4.2.2 Gas atmosphere (Method 2).

---

### Conclusion:

The tension clamp passed the test.



Picture 1: Tested tension clamp SO3.35



---

**Date of Report:** 11.12.2012

  
**Tested by:** Ola Forsström

  
**Supervised by:** Sami Hakonen / SGS Fimko

  
**Reviewed by:** Janne Lappalainen

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



**1. Test objects**

Tension clamp:

Type:	Tension clamp SO3.35 for uninsulated AAAC messenger
Batch number:	120410 / 2568
Color code:	Red
Messenger size:	35 mm <sup>2</sup>
No of pcs:	2

Conductor:

Type:	AMKA 3x25+35 mm <sup>2</sup>
Used cross-section:	35 mm <sup>2</sup>
Manufacturer/Country:	Prysmian / Finland
Messenger diameter:	6,8 mm
Number of strands:	7
Conductor material:	Aluminium
Refer to standard:	SFS 2200, HD 626-5D



## **2. Testing procedure**

### Corrosion ageing test

The clamps were installed at both ends of a neutral messenger section according to installation instructions. The free length between the clamps was approximately 0,5 m. A load of 25 % of the MBL of the messenger was applied to the clamps and maintained for 10 minutes in a tensile test machine before placing the assembly in a horizontal position in a corrosion chamber.

The samples were photographed before the test, after every test week and after finishing the test. On completion of the test the samples were washed in running tap water for five minutes and after that five minutes in demineralized water. After washing, the samples were dried by shaking by hand.

The salt solution used consisted of demineralized water mixed with 0,05 % sodium chloride (NaCl) and 0,35 % ammonium sulphate  $(\text{NH}_4)_2(\text{SO}_4)$  by mass. The amount of total impurities in the used salts was  $\leq 0,01$  % (standard says  $\leq 0,3\%$ ). The pH of each batch of solution added to the test chamber's saline water tank was measured with a pH meter, and all readings were within the limits specified by the standard (pH 5,0 to 5,4). The test cycle consisted of a 1 hour drying period at 35 °C and a 1 hour fog period at ambient temperature 25 °C. This cycle was repeated 500 times for a total of 1000 hours.

Test settings:

pH of salt solution:	5,1
Compressed air supply pressure:	1,0 bar
Saline water through-flow:	200 cm <sup>3</sup> /h
Temperature of water used for washing:	23 °C

A calculation shows that a saline water through-flow of 200 cm<sup>3</sup>/h equals approximately 1,8 ml collected solution per hour for each 80 cm<sup>2</sup> of horizontal collecting area in the test chamber measuring 570 x 1560 mm. This was also confirmed in a separately performed test. The standard requirement is 1,0 to 2,0 ml collected solution.

### Tensile test at ambient temperature (EN 50483-3, 8.1.1)

After the corrosion test the assembly was installed into a tensile test machine. A load was applied and increased until it reached 80 % of the MBL of the messenger after which it was reduced to 20 % of the MBL of the messenger. The messenger was then marked where it exits the clamp before the load was increased to 90 % of the MBL of the messenger and maintained for 60 seconds.

### **Requirements:**

#### Corrosion ageing test

A visual inspection shall be carried out and there shall be no significant trace of red rust (more than 10% of the exposed surface area of the metallic parts). The sample's identification marking shall be legible when examined with normal or corrected vision, without magnification. No damage shall occur which would affect the correct function of the tension clamp. The tension clamps shall meet the requirements of the mechanical test EN 50483-3 clause 8.1.1.

#### Tensile test at ambient temperature

The clamp shall not slip by more than 10 mm with respect to the mark on the messenger and no damage shall occur which could affect the correct function of the tension clamp.



### 3. Test results

In the visual inspection some oxidation of the aluminium parts was visible on both samples but no trace of red rust. The identification marking was legible. No damage occurred which could affect the correct function of the tension clamp in the corrosion ageing test or in the following tensile test.

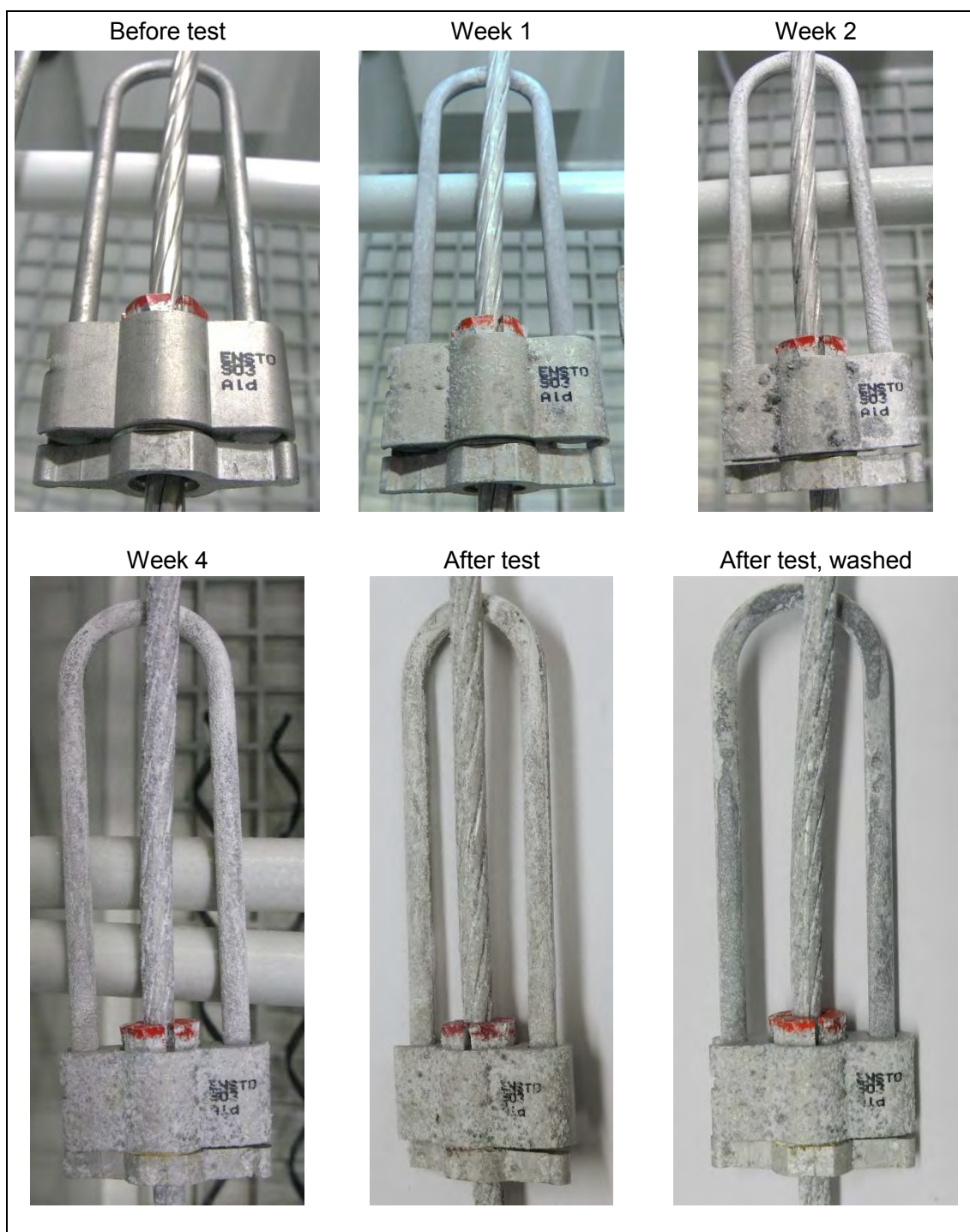
Messenger [mm <sup>2</sup> ]	MBL of Messenger [kN]	80% of MBL [kN]	20% of MBL [kN]	90% of MBL for 60 s [kN]	Result
35	10,3	8,2	2,1	9,3	ok, no slippage

**Summary:**

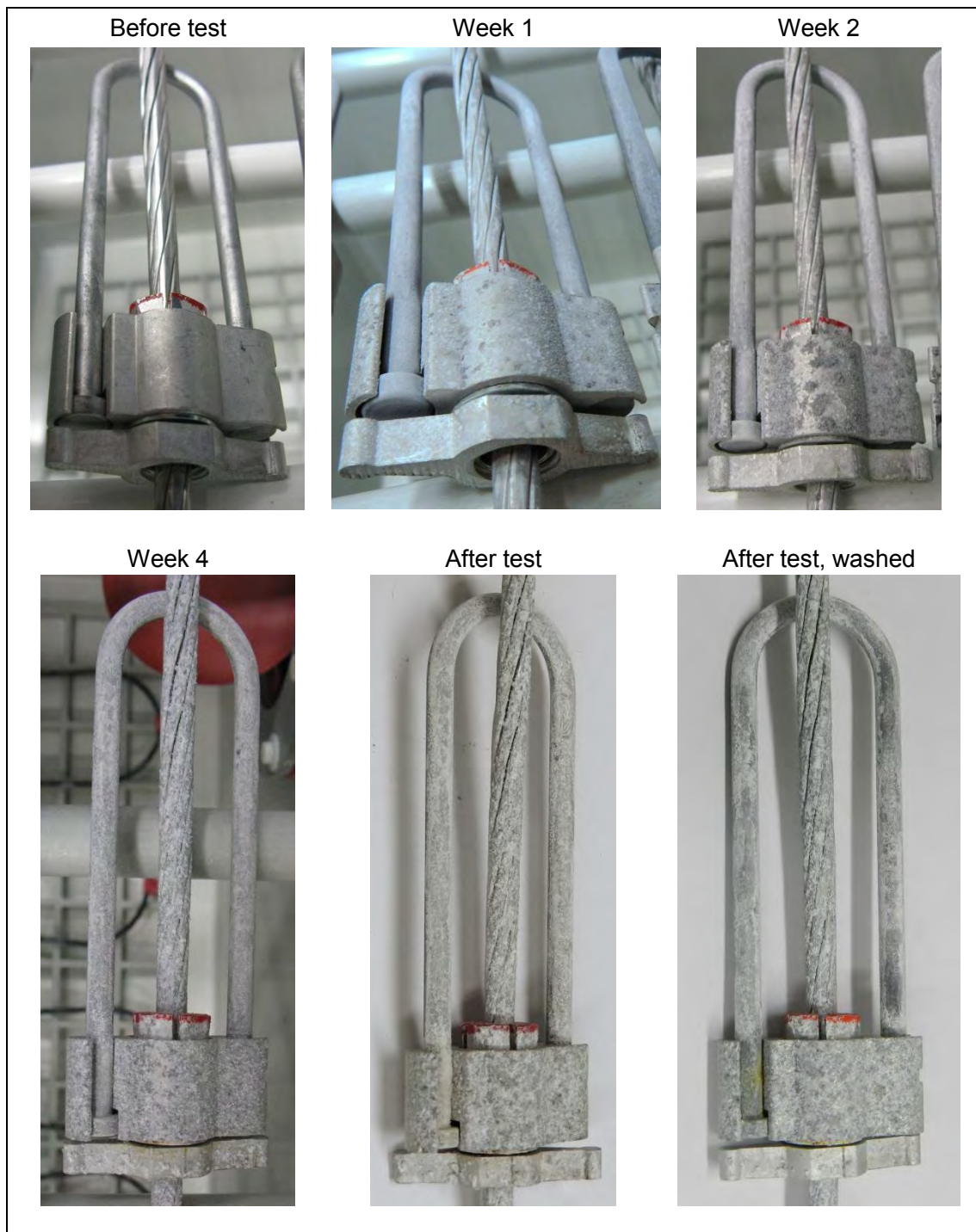
All samples fulfilled the test requirements.



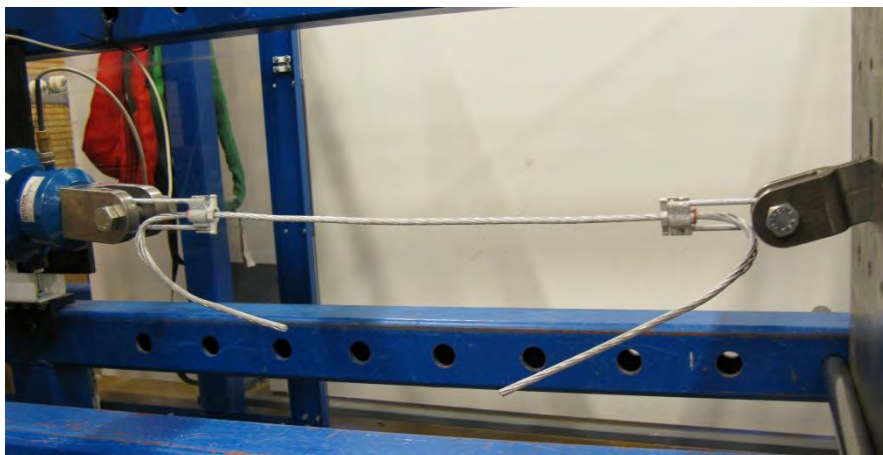
#### 4. Pictures



Picture 2: SO3.35, sample 1



Picture 3: SO3.35, sample 2



Picture 4: Tensile test setup

## 5. Test equipment

ID	Type	Model	Purpose	Latest calibration
L245	Corrosion Chamber	SC / KWT 1000	Corrosion testing	15.05.2012
L257	pH/Temperature Tester	H198127	Measuring pH and temperature	Calibrated when used
L87	Multimeter	Fluke 87V	Temperature measurement	17.10.2012
T1	Tensile test machine	Matertest	Tensile test	No calibration
L110	Loadcell	1210AF-50kN-B	Force measurement	23.08.2012
A224	Slide gauge	Stainless	Measuring dimensions	23.03.2012

## 6. Test Id

1796

## 7. Revision history

A





Saves Your Energy

## LABORATORY REPORT

No.: 2550S

Revision: A

Page: 1/5

Date of Test: 31.7.- 25.9.2012

---

### Test object:

Tension clamp SO3.35 for un-insulated AAAC messenger. Tension clamps SO3.25 and SO3.50 have the same clamp body and markings as SO3.35.

---

### Purpose of the test and relevant standards:

Part of type test.

Climatic ageing test, method 2 (UV-test), according to EN50483-4:2009 clause 8.1.5.2.3.2.

---

### Conclusion:

The tension clamp passed the test.




Picture 1: Tested tension clamp SO3.35



---

**Date of Report:** 26.9.2012

  
**Tested by:** Kenneth Väkeväinen

  
**Witnessed by:** Sami Hakonen / SGS Fimko

  
**Reviewed by:** Janne Lappalainen

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





*Saves Your Energy*

## LABORATORY REPORT

No.: 2550S

Revision: A

Page: 2/5

### 1. Test objects

Tension clamp:

Type:

Manufacturer:

Batch number:

Colour code:

Messenger size:

No of pcs:

Tension clamp SO3.35 for un-insulated AAAC messenger

Ensto Finland Oy

120410 / 2568

Red

35 mm<sup>2</sup>

2

## 2. Testing procedure

The test was carried out in a chamber, where an irradiance of  $0,83 \text{ kW/m}^2$  with the spectral distribution given in Table 1 was provided over an irradiation measurement plane of  $900 \text{ mm} \times 900 \text{ mm}$ . This value includes any radiation reflected from the test enclosure. 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, fig 1. The temperature was maintained at  $55 \pm 2 \text{ }^\circ\text{C}$  during the irradiation period and at  $25 \pm 2 \text{ }^\circ\text{C}$  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.

### Deviation

The irradiance of the visible light inside the test chamber does not fulfil the requirement of the standard. Visible light affects the visual colour and heating of the surface of the test item. This is non-critical for the test result, since the visual colour is not an issue if the markings can be seen. The temperature in the test chamber is continuous controlled by a cooling fan so the surface temperature of the test item is kept stable regarding of the generated heat.

### Requirements

The specimen may not have any degradation, which could affect the normal function.  
The sample's identification marking shall be legible.

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

Table 1: Spectral energy distribution and permitted tolerances

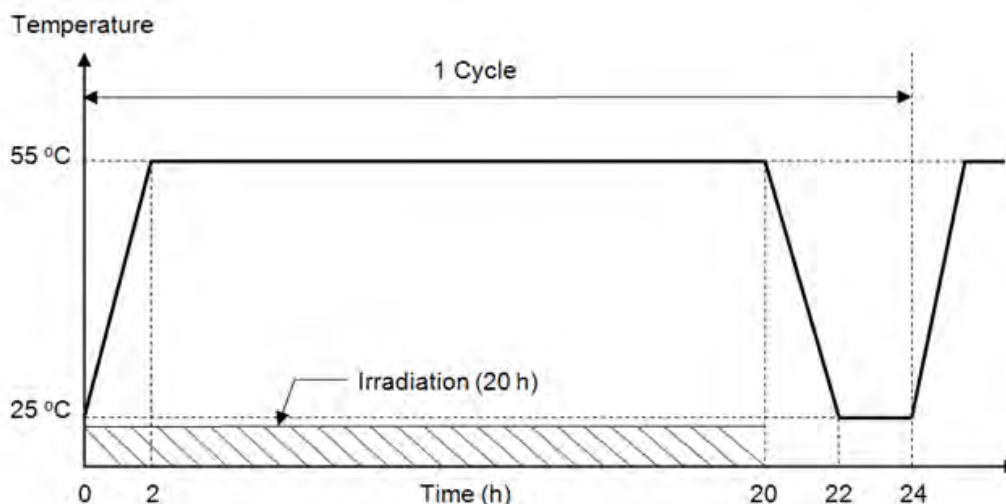


Figure 1: Temperature-radiation-time relationships

### 3. Test results

No visual degradation could be noticed after the test and the markings on tension clamp were clearly legible.

### 4. Pictures



Picture 2: Samples before UV-test



Picture 3: Samples after UV-test



**5. Test equipment**

ID	Type	Model	Purpose	Latest calibration
UV1	UV-radiation chamber	Ensto	Climate testing	No calibration
L112	Thermometer	CENTER 309	Temperature measurements	10.02.2012

**6. Test Id**

1840

**7. Revision history**

A