



Saves Your Energy

TENSION CLAMP SO28

Type Test Report



Test standard: EN50483-3, 2009



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PRODUCT SPECIFICATION

28.2.2013

SO28

Name: **Tension clamp**
For uninsulated AAAC messenger 25-50 mm²

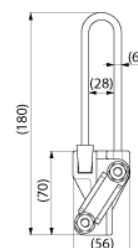
Type: SO28

EAN: 6418677404580

Description: The messenger is fitted, the clamp opened, directly into the groove without cutting. □
SMFL various messenger cross-sections: □
□
25 mm² - 6.6 kN □
35 mm² - 9.3 kN □
50 mm² - 13.2 kN

Package: PCS

Unit: PCS



Technical specification

Messenger mm: 5.8-8
Messenger mm²: 25-50
Weight (kg): 0.247
SMFL kN: 13.2
Tightening torque Nm: 20

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 Corrosion resistant aluminium alloy
U-Bolts Hot-dip galvanised steel

Installation: The messenger is fitted directly in to groove without cutting.
Tightening torque of bolts 20 Nm

Tools required: Articulated spanner ST 20

Markings: SO 28

Standard: EN 50483-3



CERTIFICATE FI 28202

Our Ref. 273333-1

Product	Fitting for overhead lines
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Type SO28

Trade mark ENSTO

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

Technical information	Tension clamp for 25 – 50 mm ² uninsulated messenger
	Messenger diameter 5,8 – 8,0 mm
	Tightening torque 20 Nm
	SMFL 25 mm ² 6,6 kN
	SMFL 35 mm ² 9,3 kN
	SMFL 50 mm ² 13,2 kN

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

Validity	This certificate is valid until 04 September 2018 unless the standard in question has been amended or superseded with significant changes in requirements, in which case, SGS Fimko has the right to shorten the validity of the certificate based on the legislation of the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.
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Date of issue 04 September 2013

SGS Fimko Ltd

Signature

Sixten Lökfors
Project Manager



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.

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Member of the SGS Group (SGS SA)

Appendix to Certificate: 28202

Manufacturing site

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

Additional information

Tests made at manufacturer's premises.
Manufacturer's test reports: 2663S, 2637S, 2638S, 2639S and 2552S



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LABORATORY REPORT

No.: 2663S

Revision: A

Page: 1/5

Date of Test: 11.3.2013

Test object:

Tension clamp SO28.

Purpose of the test and relevant standards:

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 SO28.

ENSTO
UTILITY NETWORKS
LABORATORY

Date of Report: 12.3.2013


Tested by: Jenna Nieminen


Reviewed by: Janne Lappalainen


Supervised by: Sami Hakonen/ SGS Fimko

Ordered by: Petteri Pulkkinen
Distribution: PPu, TVi



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LABORATORY REPORT

No.: 2663S

Revision: A

Page: 2/5

1. Test objects

Tension clamp:

Type:

SO28

Batch number:

240512/2744

Messenger range:

Uninsulated AAAC messenger 25-50 mm²

Messenger diameter:

5,8-8 mm

Tightening torque:

20 Nm

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.

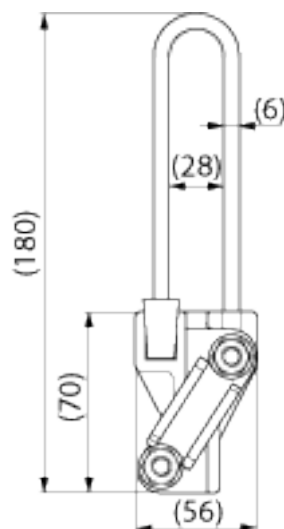
All markings required by the standard were found:

Manufacturer's logo:	ENSTO
Product code:	SO28
Conductor range:	25-50 mm ²
Tightening torque:	20 Nm
Batch number (in the cardboard box):	240512/2744

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 height with bail	180	182,0
Body height	70	69,7
Body width	56	55,6
Bail diameter	6	6,0
Bail width	28	28,6



Picture 2: Specification drawing

Summary:

The clamp fulfilled all test requirements.

4. Pictures



Picture 3: Clamp under the dimensional test

5. Test equipment

ID	Type	Model	Purpose	Latest calibration
A224	Slide gauge	Stainless	Measuring dimensions	23.03.2012

6. Test Id

2117, 2118

7. Revision history

A



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LABORATORY REPORT

No.:2637S

Revision: B

Page: 1/4

Date of Test: 7.8.2013

Test object:

Tension clamp SO28.

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 SO28.



Date of Report: 7.8.2013


Tested by: Jenna Nieminen


Reviewed by: Janne Lappalainen


Supervised by: Sami Hakonen/ SGS Fimko

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



1. Test objects

Tension clamp:

Type:	SO28
Batch number:	240512/2744
Messenger size:	25-50 mm ²
Tightening torque:	20 Nm
SMFL:	25 mm ² - 6.6 kN
	35 mm ² - 9.3 kN
	50 mm ² - 13.2 kN
No of pcs:	4

Conductors:

Type:	AMKA 3x16+25 mm ²
Used cross section:	25 mm ²
Manufacturer/country:	Prysmian / Finland
Breaking load for messenger:	7,4 kN
Conductor material:	Aluminium
Standard:	HD 626-5D
Conductor ID:	115

Type:	AMKA 3x35+50 mm ²
Used cross section:	50 mm ²
Manufacturer/country:	Prysmian / Finland
Breaking load for messenger:	14,2 kN
Conductor material:	Aluminium
Standard:	HD 626-5D
Conductor ID:	113



2. Testing procedure

The clamps were installed to the messengers according to manufacturer instructions. The clamps were tested with messenger size 25 mm^2 and 50 mm^2 . 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

Sample	MBL of conductor	80 % of MBL	20 % of MBL	90 % of MBL / 60 s	Slippage 1. 2. [mm]
50 mm ²	14,2	11,4	2,8	12,8	2 1
25mm ²	7,4	5,9	1,5	6,7	0 0

Table 1: Test data and results.

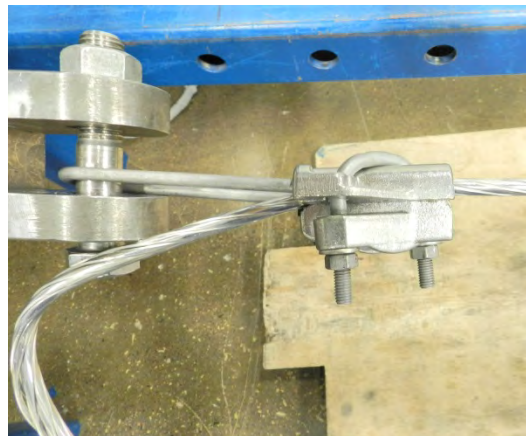
Summary:

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
L110	Loadcell	1210AF-50kN-B	Force measurement	23.08.2012
L56	Torque wrench	BDS80E	Torque measurement	11.07.2012
L46	Torque wrench	ADS40	Torque measurement	10.09.2012
A224	Slide gauge	Stainless	Measuring dimensions	23.03.2012

6. Test Id

2358

7. Revision history

B: Test with 25 mm² conductor was repeated, because 90 % of MBL tensile load was calculated wrong at the first time.



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LABORATORY REPORT

No.:2638S

Revision: A

Page: 1/3

Date of Test: 22.3.2012

Test object:

Tension clamp SO28.

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 SO28.



Date of Report: 4.1.2013


Tested by: Jenna Nieminen


Reviewed by: Janne Lappalainen


Supervised by: Sami Hakonen/ SGS Fimko

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



1. Test objects

Tension clamp:

Type:	SO28
Batch number:	240512/2744
Messenger size:	25-50 mm ²
Tightening torque:	20 Nm
SMFL:	25 mm ² - 6.6 kN
	35 mm ² - 9.3 kN
	50 mm ² - 13.2 kN
No of pcs:	2

2. Testing procedure

Two clamps were tested. The clamp was installed on to the messenger. The tightening torque was increased to 1,1 x the specified installation torque, 20 Nm x 1,1 = 22 Nm. The clamp was tightened and loosened ten times. After ten installations the clamp was tightened to the maximum torque value recommended by the bolt supplier, 24 Nm, which was lower than twice the specified installation torque value, 2 x 20 Nm = 40 Nm.

The clamp was checked for any damages.

Requirement

No damage shall occur during tightening which could affect the correct function of the clamp or it's nuts.

3. Test results

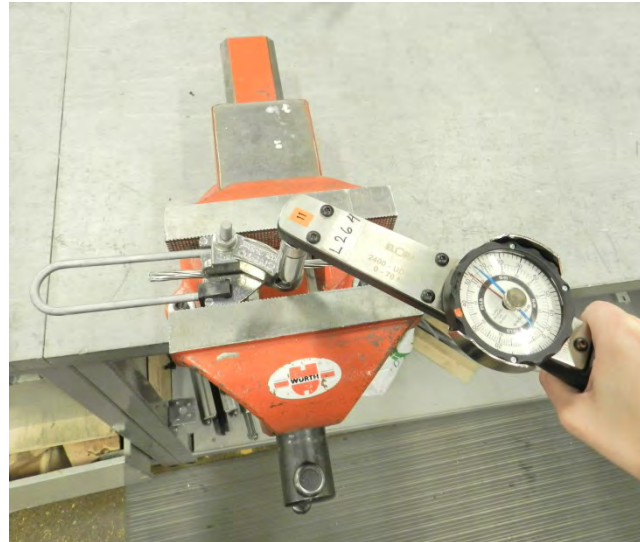
Sample	10 x 20 Nm	24 Nm
25 mm ²	ok	ok
50 mm ²	ok	ok

Table 1: Test data

Summary:

All samples fulfilled standard requirements.

4. Pictures



Picture 2: Test set up.

5. Test equipment

ID	Type	Model	Purpose	Latest calibration
L264	Torque wrenh	Elora 2400 - UDS 70	Torque measurement	19.11.2012

6. Test Id

2066

7. Revision history

A



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LABORATORY REPORT

No.: 2639S

Revision: A

Page: 1/7

Date of Tests: 14.11.2012. – 4.1.2013

Test object:

Tension clamp SO28 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). Tensile test at ambient temperature after corrosion test according to EN 50483-3 clause 8.1.1.

Conclusion:

The tension clamp passed the test.



Picture 1: Tested tension clamp SO28

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Date of Report: 4.1.2013

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 SO28 for uninsulated AAAC messenger
Batch number	2744 / 240512
Messenger range:	25 – 50 mm ²
Messenger diameter:	5,8 – 8,0 mm
SMFL:	13,2 kN
Tightening torque:	20 Nm
No of pcs:	2

Conductors:

Type:	AMKA 3x35+50 mm ²
Used cross-section:	50 mm ²
Manufacturer/Country:	Prysmian / Finland
Messenger diameter:	8,0 mm
Number of strands:	7
Conductor material:	Aluminium
Refer to standard:	SFS 2200, HD 626-5D
Conductor ID:	113



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 (NH₄)₂(SO₄) by mass. The amount of total impurities in the used salts was ≤ 0,01 % (standard says ≤ 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:	5,0 – 5,2
Compressed air supply pressure:	1,0 bar
Saline water through-flow:	200 cm ³ /h
Temperature of water used for washing:	34 °C

A calculation shows that a saline water through-flow of 200 cm³/h equals approximately 1,8 ml collected solution per hour for each 80 cm² 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

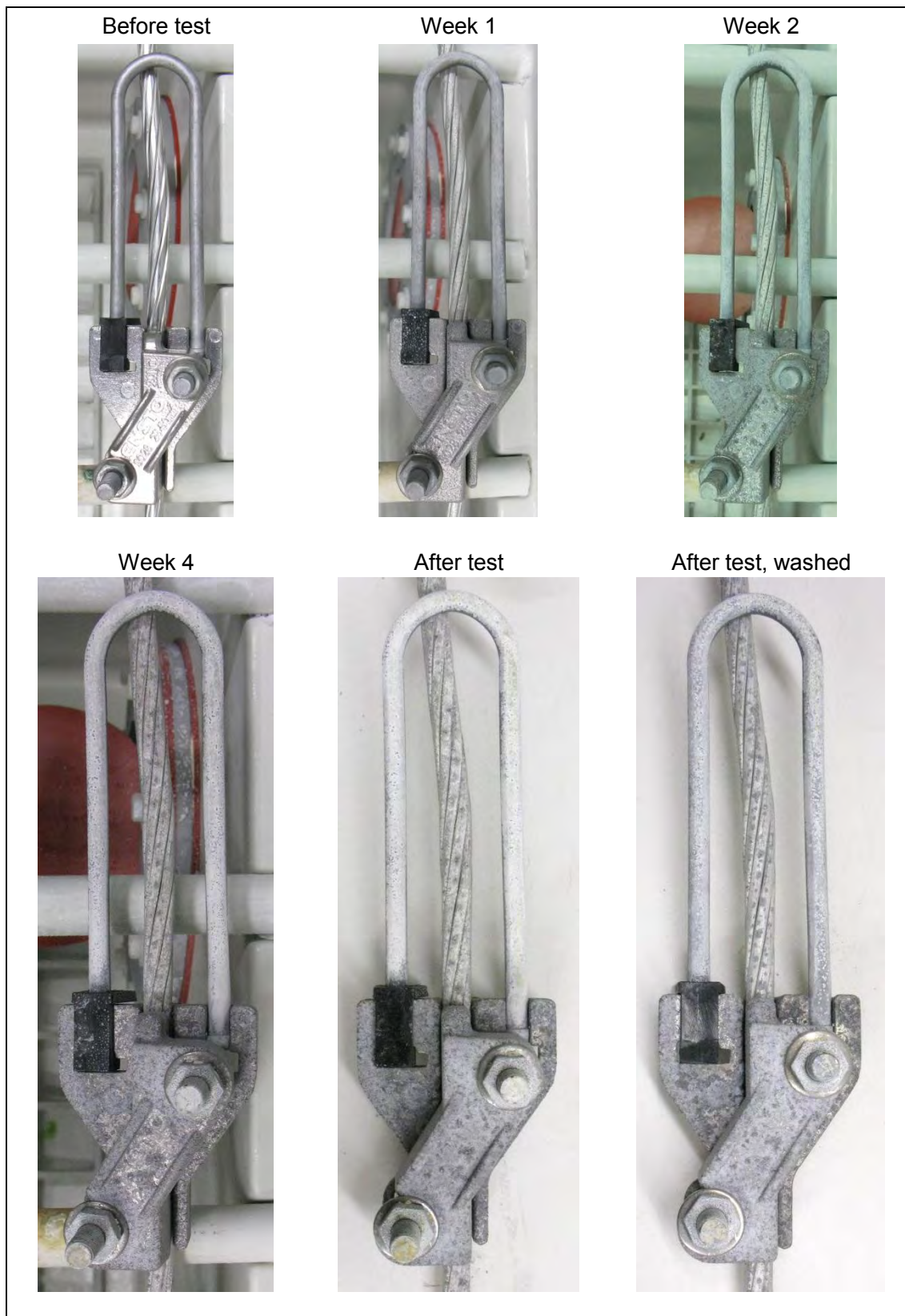
In the visual inspection substantial oxidation of the aluminium parts was visible on both samples but no trace of red rust. The identification marking was legible after additional cleaning of the tension clamp's surface. No damage occurred which could affect the correct function of the tension clamp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

Sample	Messenger [mm ²]	MBL of Messenger [kN]	80% of MBL [kN]	20% of MBL [kN]	90% of MBL for 60 s [kN]	Slippage [mm]	Result
1	50	14,2	11,4	2,8	12,8	1,0	OK
2						3,0	

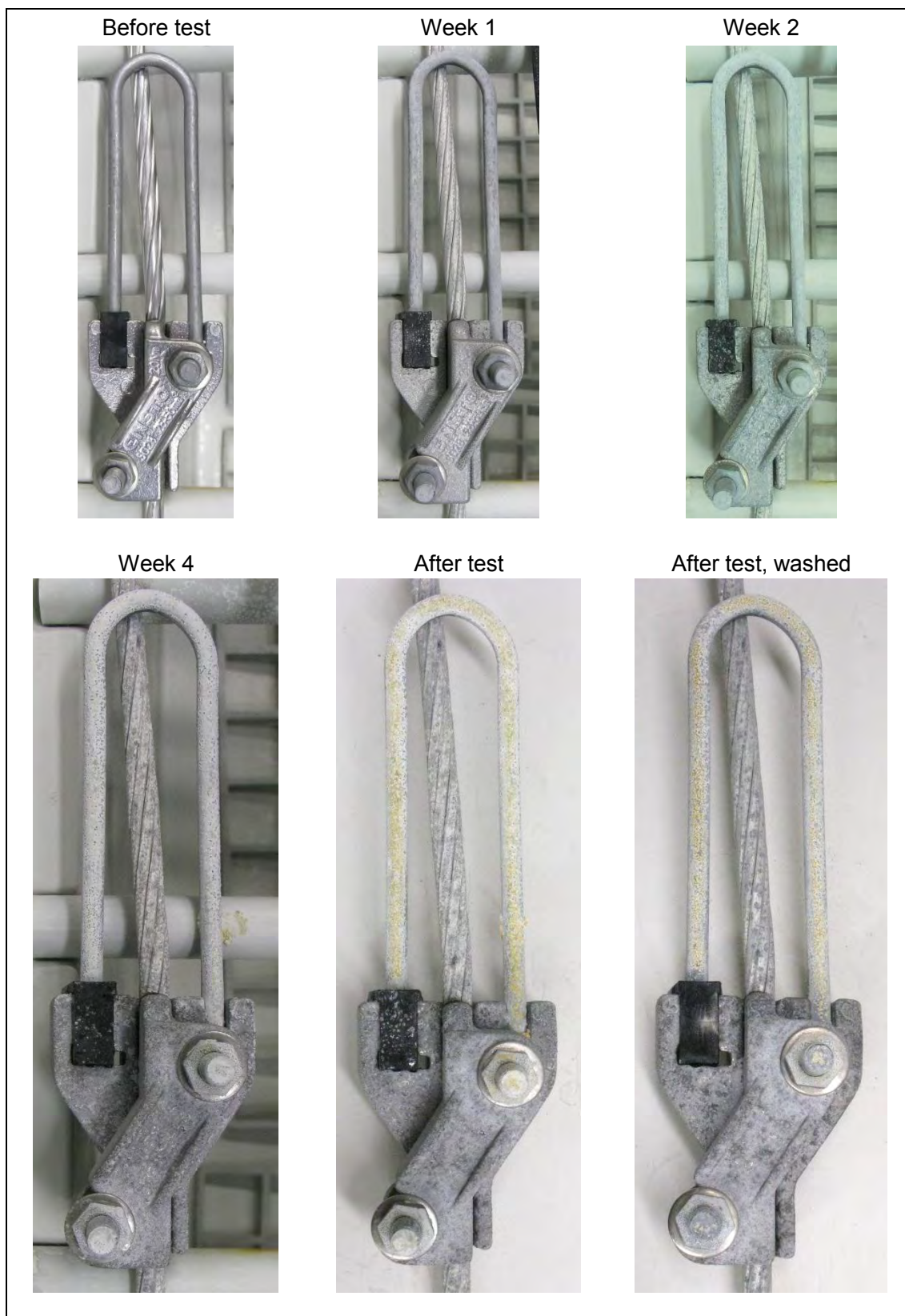
Summary:

All samples fulfilled the test requirements.

4. Pictures



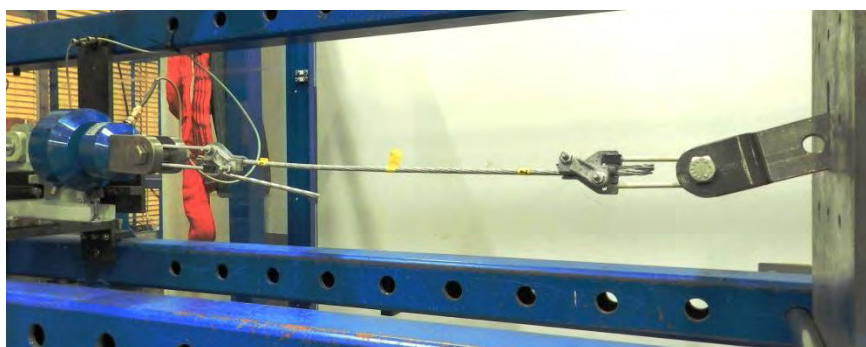
Picture 2: SO28, sample 1



Picture 3: SO28, sample 2



Picture 4: Identification marking after test



Picture 5: 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	Calibration when used
L262	pH7.01	HI7007L/C	Reference material	26.01.2012
L261	pH4.01	HI7004L/C	Reference material	30.08.2012
L87	Multimeter	Fluke 87V	Temperature measurement	17.10.2012
L212	Torque wrench	ADS25	Torque measurement	14.05.2012
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

1980

7. Revision history

A



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LABORATORY REPORT

No.: 2552S

Revision: A

Page: 1/5

Date of Test: 31.7.- 25.9.2012

Test object:

Tension clamp SO28 for un-insulated AAAC messenger.

Purpose of the test and relevant standards:

Part of type test.

Climatic ageing test, method 2 (UV-test), according to EN50483-3:2009 clause 8.1.4.4.

Conclusion:

The tension clamp passed the test.



Picture 1: Tested tension clamp SO28

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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



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LABORATORY REPORT

No.: 2552S

Revision: A

Page: 2/5

1. Test objects

Tension clamp:

Type:

Manufacturer:

Batch number:

Messenger size:

No of pcs:

Tension clamp SO28 for un-insulated AAAC messenger

Ensto Finland Oy

240512 / 2744

25 - 50 mm²

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

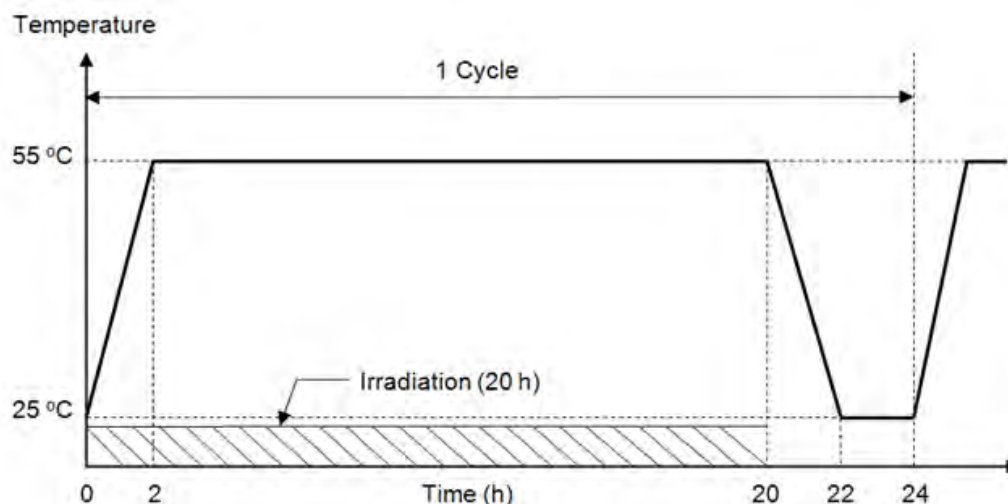


Figure 1: Temperature-radiation-time relationships

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

1842

7. Revision history

A