

/ЧАСТНИК: "Филкаб" АД
Седалище и адрес на управление: гр. Пловдив, үл. "Коматевско шосе" № 92
Гел: 032.277.171 /Факс: <mark>032.671.133</mark> /E-mail: .office@filkab.com
ИК/ Булстат: 115328801
Адрес за кореспонденция: гр. Пловдив, ул. "Коматевско шосе" № 92
представляван от Атанас Иванов Танчев
в качеството на Изпълнителен директор

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за участие в обществена поръчка при условията на чл. 187 по реда на Глава двадесет и шеста от Закона за обществените поръчки (ЗОП)

УВАЖАЕМИ ГОСПОЖИ И ГОСПОДА,

С настоящото Ви представяме нашата оферта за участие в обявената от Вас обществена поръчка № 368-ЕР-17-МР-Д-3 с предмет: "Доставка на арматура за изолирана въздушна мрежа Ср.Н."

Декларираме, че сме запознати с обявата и условията за участие в обявената от Вас обществена поръчка. Съгласни сме с поставените от Вас условия и ги приемаме без възражения.

Декларираме, че сме запознати и приемаме условията в следните документи: Търговски условия, Технически описания ЕР Юг ЕАД: ТО 186/00 и ТО 187/00, Общи условия на закупуване на дружествата от групата EVN, Клауза за социална отговорност на дружествата от групата на EVN.

Запознати сме с проекта на договор, приемаме го и ако бъдем определени за изпълнител, ще сключим договор в законоустановения срок.

Декларираме, че ще сключим писмен договор, който включва всички предложения от офертата ни.

Декларираме, че при сключването на договор ще представим документи, издадени от компетентен орган за удостоверяване на липсата на обстоятелствата по чл. 54, ал. 1, т. 1 – 3 и декларации за липсата на обстоятелствата по чл. 54, ал. 1, т. 4, 5 и 7 от 3ОП.

Ние сме съгласни да се придържаме към това предложение за срок от 90 дни от датата, която е посочена в обявата за дата на получаване на офертата.

При изпълнението на поръчката ще използваме/няма да използваме услугите на следните подизпълнители (невярното се зачертава):

Наименование на подизпълнителя	Обхват на дейностите, които ще извършва	Размер на участието на подизпълнителя в %
н/п	-	-
н/п	2 4	-

Забележка: В случай, че се използват подизпълнители се представя:

- Заверено от участника копие от документа за регистрация или единния идентификационен код (ЕИК), съгласно чл. 23 от Закона за търговския регистър, когато участникът е юридическо лице или едноличен търговец; копие от документа за самоличност, когато участникът е физическо лице;

- Доказателство за поетите от подизпълнителите задължения

При изпълнението на поръчката ще използваме/няма да използваме капацитета на трети лица (невярното се зачертава):

¹ Офертата се подава на български език.

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Наименование на трето лице	Вид/наименование на ресурса	Местонахожвание/ Описание на дейностите, които ще се изпълняват с ресурса
н/п	-	-
н/п	π.	-

Забележка: В случай, че участника се позовава на капацитета на трети лица, той трябва да докаже, че ще разполага с тези ресурси, като представя:

- Документи за поетите от третите лица задължения

Като неразделна част от настоящата оферта, прилагаме:

- 1. Техническо предложение;
- 2. Ценово предложение (по образец);
- 3. Декларация по чл.54, ал.1, т.1, 2 и 7 от ЗОП (по образец);
- 4. Декларация по чл.54, ал.1, т.3 5 от ЗОП (по образец);
- 5. Мостра на арматура за изолирана въздушна мрежа Ср.Н.:
 - 5.1. опъвателна клема за изолиран проводник за PAS 95 мм2 1 брой;
 - 5.2. изолация за опъвателна клема за PAS 95 мм2 1 брой;

_{Дата} 25.08.2017

ДЕКЛАРАТОР: (подпис и печат) Атанас Танчев Изпълнителен директор

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ТЕХНИЧЕСКО ПРЕДЛОЖЕНИЕ

От: "Филкаб" АД (наименование на участника)

С представянето на нашата оферта заявяваме желанието си да участваме в обявената от възложителя обществена поръчка за възлагане чрез събиране на оферти с обява № 368-ЕР-17-МР-Д-3 с предмет: "Доставка на арматура за изолирана въздушна мрежа Ср.Н.", при следните условия:

Мястото за изпълнение на поръчката: Склад в гр.Стара Загора, бул. Славянски.

Срокът за изпълнение на поръчката: <u>30</u> календарни дни, след заявка (не повече от 30 дни).

Гаранционният срок е: <u>24</u> месеца, считано от датата на приемо-предавателния протокол (не помалко от 24 месеца).

Капацитет до <u>50</u> % от оферираните количества (не по-малко от 50%).

Ние сме съгласни да се придържаме към направеното техническо предложение за срок от 90 дни от датата, която е посочена в обявата за дата на получаване на офертата.

ТЕХНИЧЕСКИ ПАРАМЕТРИ:

Nº	Минимални изисквания на възложителя	Предложение на участника (Да/Не, Информация, Технически показатели)
1	Отговарят ли предлаганите от участника продукти (Опъвателни клеми и изолации за опъвателни клеми за ССХ) изцяло на заложените в цитираните по-горе в настоящото техническо предложение Технически описания, параметри, респективно спазени ли са Технически описания ЕР ЮГ ЕАД – ТО 186/00 и ЕР ЮГ ЕАД - ТО 187/00 във всичките им точки?	[X] Да [] Не
	Ако "НЕ" , моля, опишете подробно	[]
2	Притежават ли предлаганите от участника продукти сертификати/протоколи за успешно издържана "типова проверка" по EN 50397-2 и EN 60068-2, съгласно EP ЮГ ЕАД– ТО 186/00, EP ЮГ ЕАД - ТО 187/00, изготвени от акредитирана изпитателна лаборатория, или еквивалентен орган. Моля приложете ги.	[χ] Да [] Не []
	В случай, че сертификатите/протоколите са издадени от еквивалентен орган, то моля представете доказателство за еквивалентността (равностойността).	4.06 20000 005711 454 CD/046
	Ако съответните документи са на разположение в електронен формат, моля, посочете:	(уеб адрес, орган или служба издаващи документа, точн позоваване на документа [][][]
3	Към офертата за участие изработени ли са мостри съответно: 1(една) Опъвателна клема и 1(една) Изолация за опъвателна клема? Мострите отговарят ли на всички посочени в цитираните по-горе в настоящото техническо предложение Технически описания ЕР ЮГ ЕАД – ТО 186/00 и ЕР ЮГ ЕАД - ТО 187/00 конкретни характеристики и параметри ?	

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 Таблица № 2 – попълването на полетата е пожелателно и служи за по-пълно представяне на участника

 участника

 №
 Обща информация за предлаганите продукти

 Предложение на участника

 (Да/Не, Информация, Технически показатели)

 1
 Данни за поризводител и производство:

 1.1
 Данни за производственото хале на производителя
 Адрес:

 Ensio Mettisen katu 2
 06100 Porvoo

 Finland
 www.ensto.com

Име производител / търговска марка: Ensto Finland Oy

За изпълнение на изискванията на Възложителя се счита положителен отговор (ДА) на изброените в Таблица № 1 точки, прилагане на изисканите документи, доказващи изпълнение на тези изисквания, както и представяне на две мостри, изцяло отговарящи на техническите описания.

По свое усмотрение участникът е в правото си да приложи допълнителни документи, извън изрично посочените, като доказателства на зададените въпроси.

Офертата на участник, чието техническо предложение не изпълнява някое/и от минималните изисквания на Възложителя няма да бъде разгледана, респективно участникът няма да участва в класирането.

Дата. 25.08.2017

Атанас Танчев



Изпълнителен директор Филкаб АД

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Type and Sample Test Report **Tension clamp** SO256 and SO256.2



Test standard: EN 50397-2 :2009





Ensio Miettisen katu 2, P.O.Box 77 06101 Porvoo, Finland Tel. +358 204 76 21 Fax +358 204 76 2770

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Business ID: 1481990-6 Reg. Office: Porvoo

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Product: SO256 and SO256.2

<u>Contents</u>	Document no
1. Specification	SO256 SO256.2
2. Certificate	FI 29970

3. Sample test report (with BLL-T-conductor only, SMFL 28,5 kN)

3.1. Visual examination	37655
3.2. Dimensional and material verification	37655
3.3. Test for permanent marking	3766S
3.4. Tensile test at ambient temperature	3767S
3.5. Clamp bolt tightening test	3768S
3.6. Damage and failure load test	3764S

4. Sample test report (with BLL-T and PAS)

5. Type test report (with BLL-T and PAS)

PRODUCT SPECIFICATION

ENSTO

SO256

Tension clamp

Code	SO256
GTIN	6438100303822
ENumber	
Name	Tension clamp
	BLL 99-157 mm² AlMgSi
Description	Tension clamp for covered conductors BLL AlMgSi. The insulation piercing contact part has silicone seal which prevents the moisture getting into the conductor.



5/8/2017

Technical specification

Dimensions		
Weight:	2.53 kg	
Conductor diameter:	16.1 22.3 mm	
Features		
For conductor size:	BLL 99-157 mm² AlMgSi	
Mechanical		\$
SMFL:	28.5 kN	
Tightening torque:	40 Nm	
SMDL:	22 kN	
Certificates		
Standards:	EN 50397-2	
Specification		
Construction:		
		ФИЛКАБ 6 16 *
		and the
		Э́ филкаб Э́
		BAPHUC OPPI PILATA

Ensio Miettisen katu 2 06100 Porvoo Finland email: ensto@ensto.com phone: +358 204 76 21 www.ensto.com

Construction:	Component	Material		
	Body	Corrosion resistant aluminium alloy		
	Plastic parts	Frost, heat and UV- radiation resistant plastic		
	Bolts	Hot-dip galvanised steel M10		
	Bail	Stainless steel	.x	
nstallation:		pened and the conductor d between the wedges. The		
	locking connec	tor is tightened. Tightening		
		The clamp is closed and		
lorkinget	strained.			
	strained.			
	ENSTO			
	ENSTO			
	ENSTO SO256			
Aarkings: Aarkings:	ENSTO SO256 PSS1207			

week/year of manufacture

Packaging

Default package

		amaile an ata Gazata anno anno annota anno
Height:	860 mm	
Width:	800 mm	
Length:	1200 mm	
Size:	90	
Unit:	PCS	
Pallet package		
Volume:	0.0203	
-	0.0203	
Weight (brt):	7.68 kg	
Weight (net):	7.59 kg	
Height:	120 mm	
Width:	150 mm	
Length:	1130 mm	
Size:	3	
Unit:	PCS	
Derault package		

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227.7 kg
248 kg
0.8256





Ensto Finland Oy

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ENSTO

SO256.2

Tension clamp Code SO256.2 GTIN 6438100303839 ENumber

ENUMBER	
Name	Tension clamp
	BLL 99-157 mm ² AlMgSi hoist
	adapter
Description	Tension clamp for covered conductors
	BLL AlMgSi. The insulation piercing
	contact part has silicone seal which
	prevents the moisture getting into the
	conductor. Clamps are equipped with an
	adapter for hoist hook.



5/8/2017

PRODUCT SPECIFICATION

Technical specification

DimensionsWeight:2.79 kgConductor diameter:16.1 22.3 mmFeaturesFor conductor size:BLL 99-157 mm² AIMgSiMechanicalSMFL:28.5 kNTightening torque:40 NmSMDL:22 kN	
Conductor diameter:16.1 22.3 mmFeaturesSBL 99-157 mm² AlMgSiFor conductor size:BLL 99-157 mm² AlMgSiMechanical28.5 kNSMFL:28.5 kNTightening torque:40 Nm	
FeaturesFor conductor size:BLL 99-157 mm² AlMgSiMechanical28.5 kNSMFL:28.5 kNTightening torque:40 Nm	
For conductor size:BLL 99-157 mm² AlMgSiMechanical28.5 kNSMFL:28.5 kNTightening torque:40 Nm	
Mechanical SMFL: 28.5 kN Tightening torque: 40 Nm	
SMFL:28.5 kNTightening torque:40 Nm	
Tightening torque:40 Nm	
SMDL: 22 kN	
Certificates	
Standards: EN 50397-2	
Specification	
Construction:	

Construction:	Component Material	
	Body Corrosion resistant aluminium alloy	
	Bolts Hot-dip galvanised steel M10	
	Bail Stainless steel	
	Plastic parts Frost, heat and UV- radiation resistant plastic	
	Hoist Hot-dip galvanised steel adapter	
nstallation:	The clamp is opened and the conductor	
	wire is inserted between the wedges. The locking connector is tightened. Tightening torque 40 Nm. The clamp is closed and strained.	
Markings:		
Markings:	ENSTO	
	SO256.2	
	95-157 mm ²	
	40 Nm	
	week/year of manufacture	
Packaging		
Default package		
	PCS	
Size:	3	
Length:	1130 mm	
Width:	150 mm	
Height:	120 mm	
Weight (net):	8.37 kg	
Weight (brt):	8.43 kg	
	0.0203	
^{Volume:} Pallet package		
Volume: Pallet package		PHO DA
Volume:		ФИЛКАБ)

Ensto Finland Oy

Weight (net):

Width:

Height:

Ensio Miettisen katu 2 06100 Porvoo Finland

800 mm

860 mm

251.1 kg

email: ensto@ensto.com phone: +358 204 76 21

💔 www.ensto.com

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Weight (brt): Volume: 272 kg 0.8256

Ensto Finland Oy

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Ensio Miettisen katu 2 06100 Porvoo Finland email: ensto@ensto.com phone: +358 204 76 21 www.ensto.com



CERTIFICATE FI 29970

Our Ref. 289208-1

Product	Fitting for overhead line
Туре	SO256 SO256.2
Trade mark	ENSTO
Certificate Holder/ Manufacturer	Ensto Finland Oy Ensio Miettisen katu 2 FI-06150 PORVOO FINLAND
Technical information	Tension clamp for covered conductors BLL 99 - 157 mm² AlMgSi Conductor diameter 16,1 - 22,3 mm Tightening torque 40 Nm, SMDL 22 kN, SMFL 28,5 kN
Other information	See the Appendix to this Certificate
The product is certified according to the following standard(s)	EN 50397-2:2009
Validity	This certificate is valid until 01 June 2022 provided that the Conditions for FI certification are met. This certificate includes the right to use the FI mark under the condition that product changes (if any) will be approved at SGS Fimko before the product is brought onto market.
Date of issue	01 June 2017
	SGS Fimko Ltd
Signature	Sixten Lökfors
	Project Manager
This certifica	nte has 1 appendix And



This certificate is issued by the company under its General Conditions for Certification Services accessible at http://www.sgs.filen/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 proseculed to the fullest extent of the law.

SGS Fimko Ltd.

SGSS

Särkinlementie 3 P.O.Box 30 FI-00211 Helsinki, Finland t. +356 9 696 361 f. +356 9 692 5474 www.sgs.fi Business ID 0978538-5

Member of the SGS Group (SGS SA)



Appendix to Certificate: 29970

Manufacturing site

Additional information



is based on test

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

SO256.2 with adapter for hoist hook.

Additional parts for tension clamps SO256 and SO256.2: Power arc device SDI27.2 including power arc horns SDI10.2 and PEJ90 conductor with screw type cable lugs SML 1.17. End cap PK557.

This certificate is based on and replaces Certificate FI 29719 dated 11 October 2016.

Certificate FI 27049 A1 was based on manufacturer's test reports: 2166S, 2176S, 2165S, 2177S, 2106s, 1938S, 1939S, 2087S, 2089S, 2091S, 2092S, 2094S, 2095S, 2097S, 2098S, 2100S, 2101S, 2103S, 2104S, 2191 and 2170S

Manufacturer's additional test reports: 3571S, 3467S, 3074S, 3572S, 3465S, 3597S, 3595S, 3596S 3764S, 3765S, 3766S, 3767S, 3768S

Solar simulator test reports: 050810_SO256, 071210_SDI27-1 and 050111_SDI10_2

SGS Fimko test report: 251420_SML1-17

Low temperature assembly test clause 7.4.14 and Tensile test at low temperature clause 7.4.8 were performed at temperature -25 ± 3 °C.



This certificate is issued by the company under its General Conditions for Certification Services accessible at <u>http://www.sgs.fi/en/Terms-and-Conditions.espx</u> 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 fatsification of the content or appearance of the law unauthorized alteration forgery or fatsification of the content or appearance of the law





Laboratory Report No.: 3765S Revision: A Page: 1/6 Date of Test: 16.8.2016

Test object:

Tension clamp SO256 and SO256.2.

Purpose of the test and relevant standards:

Visual examination test and Dimensional and material verification test according to EN 50397-2:2009 clauses 7.1 and 7.2.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 3.5.2017

du Fuession Tested by: Ola Forsström

Approved 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: 1481990-6 Reg. Office: Porvoo

Laboratory Report

No.: 3765S Revision: A Page: 2/6

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs:

SO256 Ensto Finland Oy 99-157 mm² 40 Nm 28,5 kN 22 kN 2/2016 1 SO256.2 Ensto Finland Oy 99-157 mm²

Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs: SO256.2 Ensto Finland O 99-157 mm² 40 Nm 28,5 kN 22 kN 3/2016 1



Laboratory Report No.: 3765S Revision: A Page: 3/6

2. <u>Testing procedure</u>

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.

Requirements

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

3. Test results

Visual examination of SO256

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

All markings required by the standard were found:

Manufacturer's logo: Product code or reference: Batch number (production date): Minimum and maximum cross section: Tightening torque or die reference: Ensto SO256 (week) 07/2016 95-157 mm² 40 Nm

Visual examination of SO256.2

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

All markings required by the standard were found:

Manufacturer's logo:EProduct code or reference:SBatch number (production date):(\Minimum and maximum cross section:9Tightening torque or die reference:4

Ensto SO256.2 (week) 11/2016 95-157 mm² 40 Nm

Laboratory Report

No.: 3765S Revision: A Page: 4/6

Dimensional and material verification of SO256

The sample was within specification requirements. The clamp's dimensions were within specification tolerances, see Picture 2.

Distance	a Requirement [mm]			
Total length	(700)	705,0		
Body length	(201)	206,0		
Body height	(95)	94,8		
Body width	(46)	46,0		
Clamping piece width	(64)	64,0		
Bail diameter	(9)	9,0		
Bail eye radius	≥12	>12		



Table 1: Test results

Picture 2: Specification drawing

Component Material		Matching specification
Body	Corrosion resistant aluminium alloy	Yes
Plastic parts	Frost, heat and UV-radiation resistant plastic	Yes
Bolts	Hot dip galvanized steel	Yes
Bail	Stainless steel	Yes

Table 2: Clamp materials



Laboratory Report No.: 3765S Revision: A Page: 5/6

Dimensional and material verification of SO256.2

The sample was within specification requirements. The clamp's dimensions were within specification tolerances, see Picture 3.

Distance	Requirement [mm]	In product [mm]	
Total length	(700)	703,0	
Body length	(201)	206,0	
Body height	(95)	94,9	
Body width	(49)	48,8	
Clamping piece width	(64)	64,0	
Bail diameter	(9)	9,1	
Bail eye radius	≥12	>12	

Table 3: Test results



Picture 3: Specification drawing

Component	Material	Matching specification
Body	Corrosion resistant aluminium alloy	Yes
Plastic parts	Frost, heat and UV-radiation resistant plastic	Yes
Bolts	Hot-dip galvanised steel	Yes
Bail	Stainless steel	Yes
Hoist adapter	Hot-dip galvanised steel	Yes

Table 4: Clamp materials

Summary

The clamps passed the test.

Laboratory Report

No.: 3765S Revision: A Page: 6/6

4. Pictures



Picture 4: Measuring body height



Picture 5: Markings

5. Test equipment

	ID	Туре	Model	Purpose	Latest calibration	
	A209 L317	Caliper Measuring tape	Stainless hardened SL5M	Measuring dimensions Measuring length	15.12.2015 04.08.2016	
				8		
6.	<u>Test Id</u> 3955				очерно дание очерно дание тер ФИЛКАБ 9	
7.	<u>Revisio</u> A	<u>n history</u>		BAPHO C OI	ници (Страния)	





Laboratory Report No.: 3766S Revision: A Page: 1/3 Date of Test: 16.8.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Test for permanent marking according to EN 50397-2:2009 clause 7.3.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 3.5.2017

Ou Fuession

Tested by: Ola Forsström

Approved by: Janne Lappalainen



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



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Laboratory Report

No.: 3766S Revision: A Page: 2/3

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs:

SO256 Ensto Finland Oy 99-157 mm² 40 Nm 28,5 kN 22 kN 2/2016 3

2. Testing procedure

The markings were rubbed by hand for 15 s with a piece of cloth soaked with water and again 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

Sample	Markings clear after the test	Result
1	Yes	Passed
2	Yes	Passed
3	Yes	Passed

Table 1: Test results

Summary

The clamp fulfilled the test requirements.



Laboratory Report No.: 3766S Revision: A Page: 3/3

4. Pictures



Picture 2: Test setup



Picture 3: Markings after test

5. Test equipment

	ID	Туре	Model	Purpose	Latest calibration
	L253	Stop watch	IHM	Timekeeping	26.10.2015
6.	<u>Test Id</u>				
	3956				
	74				
7.	Revisio	n history			
	А				



Laboratory Report

No.: 3767S **Revision: A** Page: 1/5 Date of Test: 14.9.2016 & 11.4.2017

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Tensile test at ambient temperature according to EN 50397-2:2009 clause 7.4.7.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 3.5.2017

Ou Fressive

Tested by: Ola Forsström

Approved by: Janne Lappalainen



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



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Business ID: 1481990-6 Reg. Office: Porvoo

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Laboratory Report No.: 3767S **Revision:** A Page: 2/5

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs:

Conductors:

BLL-T 99 AIMgSi 24kV Type: 99 mm² Used cross section: Conductor material: AlMgSi Number of strands: 7 Conductor diameter: 12,8 mm Conductor construction: Non-compacted Shape of conductor: Round Insulation material: HDPE+PE Insulation thickness: 2,6 mm Core diameter: 17,8-18,8 mm Conductor MBL: 25,3 kN 70 °C Max operating temperature: Max short-circuit temperature: 200 °C Amokraft Manufacturer: Sweden Country: Refer to standard: EN 50397-1 437

Conductor ID: Type: Used cross section:

Conductor material:

Number of strands:

Conductor diameter:

Shape of conductor:

Insulation material:

Insulation thickness:

Core diameter:

Manufacturer:

Conductor ID:

Refer to standard:

Country:

Conductor MBL:

BLL-T 157 AIMgSi 24kV 157 mm² AlMgSi 19 16,3 mm Conductor construction: Non-compacted Round HDPE+PE 2,5 mm 21,6 mm 43,7 kN Max operating temperature: 70 °C Max short-circuit temperature: 200 °C Amokraft Sweden EN 50397-1 453

SO256

40 Nm 28.5 kN

22 kN

Δ

Ensto Finland Oy

2/2016 & 3/2017

99-157 mm²

Laboratory Report

No.: 3767S Revision: A Page: 3/5

2. Testing procedure

Two tension clamps were tested with minimum and maximum conductor size using BLL-T type conductors. The tension clamps were assembled in accordance with the manufacturer's instructions and fitted into a tensile test machine as shown in Picture 2.

The test load SMFL was SMFL=0,8×conductor MBL. The load was increased to 20 % of SMFL. Then the conductor was marked where it exits from the tension clamp. The load was then gradually increased to 60 % of SMFL and kept there for 60 s. Without any subsequent adjustment of the fitting the load was increased to SMFL and kept there for 60 s. After this the tension clamps where then checked for any movement relative to the conductor. Then the load was steadily increased until failure occurred. The failure load was recorded.



Picture 2: Tensile test arrangement

1. Min. 100 x covered conductor diameter

2. Length of tail minimum 500 mm

Requirements

The movement of the tension clamp relative to the conductor shall be less than 3 mm and no failure of the clamp or the covered conductor shall occur below SMFL, where SMFL=0,80×MBL.

Deviation

For conductor BLL-T 157 the test load SMFL (0,80 × MBL) is higher than the SMFL specified for the tension clamp. In this case the maximum test load was limited to the SMFL of the tension clamp.

	Other HO 4.0
BAPHO C OPHINIMAN	
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Laboratory Report No.: 3767S Revision: A Page: 4/5

3. Test results

Sample	Conductor	MBL [kN]	20% of SMFL [kN]	60% of SMFL [kN]	SMFL [kN]	Slippage [mm]	Breaking force [kN]	Result
1	BLL-T 99	25,3	25,3 4,0	12,1	20,2	0,0	29,5	Decord
2						0,5		Passed
3			7.0		00.5	0,0	40.0	Deser
4	BLL-T 157	43,7	7,0	21,0	28,5	0,0	40,0	Passed

Table 1: Test results

Summary

The clamp fulfilled the test requirements.

4. Pictures



Picture 3: Test setup

Laboratory Report No.: 3767S

No.: 3767S Revision: A Page: 5/5

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
T1 L109 L110 L56 L281 A209	Tensile test machine Force sensor Force sensor Torque wrench Torque wrench Caliper	Matertest 1220AF-250kN-B 1210AF-50kN-B BDS80E BDS80E Stainless hardened	Tensile test Force measurement Force measurement Torque measurement Torque measurement Measuring dimensions	No calibration 01.09.2016 01.09.2016 01.07.2015 14.10.2016 15.12.2015
A209 A223	Caliper	Sylvac	Measuring dimensions	15.03.2017

6. <u>Test Id</u>

3957, 4486

7. Revision history

Α







Laboratory Report No.: 3768S Revision: A

Page: 1/4 Date of Test: 29.8.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Clamp bolt tightening test according to EN 50397-2:2009 clause 7.4.10.1.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 3.5.2017

Ou Fuessivo

Tested by: Ola Forsström

Approved by: Janne Lappalainen



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



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Laboratory Report

No.: 3768S Revision: A Page: 2/4

1. Test objects

Tension clamp: SO256 Type: Ensto Finland Oy Manufacturer: 99-157 mm² Conductor size: **Tightening torque:** 40 Nm SMFL: 28,5 kN SMDL: 22 kN Batch number: 2/2016 2 No of pcs: Conductors: BLL-T 99 AIMgSi 24kV Type: Used cross section: 99 mm² Conductor material: AlMgSi Number of strands: 7 12,8 mm Conductor diameter: Conductor construction: Non-compacted Shape of conductor: Round HDPE+PE Insulation material: Insulation thickness: 2.6 mm 17,8-18,8 mm Core diameter: 25,3 kN Conductor MBL: 70 °C Max operating temperature: Max short-circuit temperature: 200 °C Amokraft Manufacturer: Country: Sweden Refer to standard: EN 50397-1 Conductor ID: 437 Type: BLL-T 157 AIMgSi 24kV Used cross section: 157 mm² AIMgSi Conductor material: Number of strands: 19 Conductor diameter: 16,3 mm Non-compacted Conductor construction: Shape of conductor: Round HDPE+PE Insulation material: Insulation thickness: 2.5 mm Core diameter: 21.6 mm 43.7 kN Conductor MBL: 70 °C Max operating temperature: Max short-circuit temperature: 200 °C Manufacturer: Amokraft Country: Sweden EN 50397-1 Refer to standard: Conductor ID: 453



Laboratory Report No.: 3768S Revision: A Page: 3/4

2. Testing procedure

One clamp was tested with minimum and maximum conductor size using BLL-T type conductors.

The torgue was increased to $1,1 \times$ the specified installation torgue value, $1,1 \times 40 = 44$ Nm, after which the clamp was checked for damage. The tightening was then continued until breaking occurred. The breaking torque was recorded. .

Deviation

The standard says that the clamp shall be tightened and loosened 10 times to 1,1 x the specified installation torque. The clamps in test are tightened only once to 1,1 x installation value, because the clamps are not allowed to be re-used.

Requirements

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

3. Test results

Sample	Conductor	1,1 x tightening torque [Nm]	Damage torque [Nm]	Damage	Result
1	BLL-T 99	44	95,7	Bolt broke	Passed
2	BLL-T 157	- 44	92,2	Bolt broke	Passed

Table 1: Test results

Summary

All samples fulfilled the test requirements.
Laboratory Report No.: 3768S

No.: 3768S Revision: A Page: 4/4

4. Pictures



Picture 2: Test setup

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
L56	Torque wrench	BDS80E	· • · • · · · · · · · · · · · · · · · ·	01.07.2015
L269	Torque wrench	Stahlwille 730D/10		07.11.2013

6. Test Id

3958

7. Revision history

Α







Laboratory Report No.: 3764S Revision: A Page: 1/4 Date of Test: 12.4.2017

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Damage and failure load test according to EN 50397-2:2009 clause 7.4.1.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 3.5.2017

Filessn

Tested by: Ola Forsström

Approved by: Janne Lappalainen



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



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Laboratory Report

No.: 3764S Revision: A Page: 2/4

1. Test objects

Tension clamp:

Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs: SO256 Ensto Finland Oy 99-157 mm² 40 Nm 28,5 kN 22 kN 3/2017

3

Conductors:

Type: BLL-T 157 AIMgSi 24kV Used cross section: 157 mm² Conductor material: AlMgSi Number of strands: 19 Conductor diameter: 16,4 mm Conductor construction: Non-compacted Shape of conductor: Round Insulation material: HDPE+PE Insulation thickness: 2.5 mm Core diameter: 21,5 mm Conductor MBL: 43,7 kN 70 °C Max operating temperature: Max short-circuit temperature: 200 °C Manufacturer: Amokraft Sweden Country: Refer to standard: EN 50397-1 Conductor ID: 453



Laboratory Report No.: 3764S Revision: A Page: 3/4

2. Testing procedure

Three samples were tested. The test was carried out as in Picture 2. The load was applied in the direction 1. The load was gradually increased until it reached the specified minimum damage load (SMDL). This load was kept constant for 60 s. The fitting was then removed and measurement of any permanent deformation was done. The load was gradually increased until it reached the specified minimum failure load (SMFL). This load was kept constant for 60 s.





Requirements

Regarding damage load, the test is passed if no permanent deformation, which can affect the proper function of the fitting, occurs at or below the specified mechanical minimum damage load.

3. Test results

			SMDL			
Sample	Conductor	SMDL for 60 s [kN]	Allowed permanent deformation [mm]	Measured permanent deformation at 0 kN [mm]	SMFL for 60 s [kN]	Result
1				1,6		Passed
2	BLL-T 157	22,0	2,0	1,4	28,5	Passed
3				1,9		Passed

Table 1: Test results

Summary

The clamp fulfilled the test requirements.

Laboratory Report No.: 3764S

Revision: A Page: 4/4

4. Pictures



Picture 3: Test setup

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
T1	Tensile test machine	Matertest	Tensile test	No calibration
L110	Force sensor	1210AF-50kN-B	Force measurement	01.09.2016
L281	Torque wrench	BDS80E	Torque measurement	14.10.2016
A223	Caliper	Sylvac	Measuring dimensions	15.03.2017

6. Test Id

4488

7. Revision history

А



Type and Sample Test Report **Tension clamp** SO256 and SO256.2









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Product: SO256 and SO256.2

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Contents	Document no
1. Specification	SO256
	SO256.2
	SDI27.2
	SML1.17
	SDI10.2
	РК557
2. Certificate	Fl 29719
3. Sample test reports	
3.1. Visual examination	
• SO256 and SO256.2	35715
• SDI27.2	34675
• SML1.17	3074S
• SDI10.2	3467S
3.2. Dimensional and material verification	
• SO256 and SO256.2	3571S
• SDI27.2	3467S
• SML1.17	3074S
• SDI10.2	3467S
3.3. Test for permanent marking	
• SO256	3572S
• SDI10.2	3465S
3.4. Tensile test at ambient temperature	35975
3.5. Clamp bolt tightening test	35955
3.6. Damage and failure load test	35965
	report SO256
4. Type test report Complete_type_test	_report_SO256

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БЯРНО С ОРИГИНАЛА



PRODUCT SPECIFICATION

28.9.2016

1/2

SO256	,		1/2 6 4 3 8 1 0 0 3 0 3 8 2 2
Name:	Tension clamp		
	PAS/BLL-T 95-15	57 mm² AIMgSi	h
Туре:	SO256		15.
GTIN:	6438100303822		0.
Description:	insulation piercin	r covered conductors PAS/BLL AIMgSi. The g contact part has silicone seal which prevents the into the conductor.	
Package:	3/90		
Unit:	PCS		
Technical specification Mechanical SMDL SMFL Tightening torque Dimensions Weight Conductor diameter Features For conductor size Certificates Standards Construction:	22 kN 25 kN 40 Nm 2.53 k 16.1	9 22.3 mm BLL 95-157 mm² AIMgSi	
Installation;	betwe	amp is opened and the conductor wire is inserted en the wedges. The locking connector is tightened oning torque 40 Nm. The clamp is closed and ed.	
Markings:	ENSTO		
	SO256		
	PSS1207		
	PSS1208		
<u>a. 7</u>			
Ensto Finland Oy	Ensio Miettisen katu P.O.Box 77 06101 Porvoo, Finla	Fax +358 204 76 2770	to.com



SO256

PRODUCT SPECIFICATION



95-157mm² 40 Nm week/year of manufacture

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OB

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ENSTO

PRODUCT SPECIFICATION

28.9.2016 1/2

SO256.2			
Name:	Tension clamp		
	PAS/BLL-T 95-1	157 mm² AIMgSi hoist adapter	(h)
Туре:	SO256.2		100
GTIN:	6438100303839)	0.
Description:	insulation pierci	for covered conductors (PAS/BLL AIMgSi). The ng contact part has silicone seal which prevents the into the conductor. Clamps are equipped with an t hook.	
Package:	3/90		
Unit:	PCS		
Technical specific Mechanical			
SMDL	22 kN		
SMFL	25 kN		
Tightening torque Dimensions	40 Ni	m	
Weight	2.79	ka	
Conductor diameter		22.3 mm	
Features			
For conductor size	PAS	/ BLL 95-157 mm² AlMgSi	
Certificates			
Standards	EN 5	0397-2	
Construction:	Component	Material	
	Body	Corrosion resistant aluminium alloy	
	Bolts	Hot-dip galvanised steel M10	
	Bail	Stainless steel	
	Plastic parts	Frost, heat and UV-radiation resistant plastic	
	Hoist adapter	Hot-dip galvanised steel	
Installation:	The	clamp is opened and the conductor wire is inserted	

Markings:

SO256.2 95-157 mm²

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strained.

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between the wedges. The locking connector is tightened. Tightening torque 40 Nm. The clamp is closed and

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PRODUCT SPECIFICATION

28.9.2016 2/2

SO256.2

40 Nm week/year of manufacture



ENSTO

PRODUCT SPECIFICATION

20.5.2016 1/2

Name: Power arc device For products SDI90.x composite insulators on angle poles and SO255, SO256, SO181.6 SO255, SO256, SO181.6 Type: SDI7.2 GTIN: 6438100305611 Description: Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension champ SO181.6 and on tension poles with tension champs SO255 or SO256. The package includes arching horns and 95 mm² conductor with tension champs SO255 or SO256. Package: 9/486 Unit: PCS Package includes arching horns and 95 mm² conductor with tension champs SO181.6 mm on 12 kV, 130-150 mm on 24 kV and 220-250 mm Nominal voltage (Un) 12 36 kV Dimensions Power arc device SD127.2 is used with SD190.x composite insulators on angle poles with suspension champs SO256 or SO256. Use: Spark gap 12 kV 90-100 mm Spark gap 24 kV 130-150 mm Spark gap 24 kV 130-150 mm So255 or SO256. Sorews Construction: Component Material Al-parts Corrosion resistant aluminium alloy Sorews Hot dip galvanized steel Washer Stainless steel The package includes arching 2 pos horns SDI10.2 and 36 mm² conductor VEJ80 with serve type cable lugs.<	SDI27.2		
SO255, SO256, SO181.6 Type: SD127.2 GTIN: 6438100305611 Description: Power arc device SD127.2 is used with SD180.x composite insulators on angle poles with suspension clamp SO255 or SO256. The package includes arching horns and 95 mm ² conductor with cable tugs. Spark gap is adjusted to 90.100 mm on 12 kV, 130-150 mm on 24kV and 220-250 mm on 36 kV. Package: 9/486 Unit: PCS Technical specification 0.83 kg Veight 0.83 kg Veight 0.83 kg Unit: Package: Package: 90250 mm Nominal voltage (Un) 1236 kV Dimensions 0.83 kg Veight 0.83 kg Use: Spark gap 12 kV 90-100 mm Spark gap 36 kV 220-250 mm Power arc device SD127.2 is used with SD190.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with suspension clamp SO181.6 and on tension poles with suspension clamp SO255 or SO256. Construction: Corrosion resistant aluminium alloy screws Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SD110.2 and 95 mm² conductor Will screw type cable lugs. <th>Name:</th> <th>Power arc device</th> <th></th>	Name:	Power arc device	
GTIN: 6438100305611 Description: Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with usepension clamp SO256 or SO256. The package includes arching horns and 95 mm² conductor with cable lugs. Spark gap is adjusted to 90-100 mm on 12 kV, 130-150 mm on 24kV and 220-250 mm on 36 kV. Package: 9/486 Unit: PCS Technical specification: Felectrical values Arc gap 90 250 mm Nominal voltage (Un) 12 36 kV Dimensions Weight Weight 0.83 kg Use: Spark gap 12 kV 90-100 mm Spark gap 24 kV 130-150 mm Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO256. Construction: Component Material Al-parts Corrosion resistant aluminium alloy Socrews Hot dip galvanized steel Washers Stailess steel The package includes arching 2 pcs horns SDI10.2 and g5 mm² conductor PEJ90 with screw type cable lugs.			1 11
Description: Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamp SO256 or SO256. The package includes arching horns and 95 mm² conductor with cable lugs. Spark gap is adjusted to 90-100 mm on 12 kV, 130-150 mm on 24kV and 220-250 mm on 36 kV. Package: 9/486 Unit: PCS Technical specification: PCS Technical specification: 250 mm Nominal voltage (Un) 12 36 kV Dimensions 0.83 kg Weight 0.83 kg Use: Spark gap 24 kV Spark gap 36kV 220-250 mm Spark gap 38kV 220-250 mm Nominal voltage (Un) 12 36 kV Dimensions Spark gap 24 kV 130-150 mm Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO255 or SO256. Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. Construction: Corrosion resistant aluminium alloy Screws Hot dip galvanized stee! Washers Stainless stee! The package includes arching 2 pcs horns SDI10.2 an	Туре:	SDI27.2	100 500
Insultators on angle poles with suspension clamp SO181.6 and on tension poles with rension clamps SO256 or SO256. The package includes arching horns and 95 mm² conductor with cable lugs. Spark gap is adjusted to 90-100 mm on 12 kV, 130-150 mm on 24 kV and 220-250 mm on 36 kV. Package: 9/486 Unit: PCS Electrical specification Electrical values Arc gap 90 250 mm Nominal voltage (Un) 12 36 kV Dimensions Weight 0.83 kg Use: Spark gap 12 kV 90-100 mm Spark gap 24 kV 130-150 mm Spark gap 36kV 220-250 mm Nominal voltage (Un) 12 36 kV Dimensions 0.83 kg Use: Spark gap 12 kV 90-100 mm Spark gap 36kV 220-250 mm Rower arc device SD127.2 is used with SD190.x composite insulators on angle poles with tension clamps SO255 or SO256. Construction: Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SD110.2 and 95 mm² conductor PEJ90 with screw type cable lugs.	GTIN:	6438100305611	a a
Unit: PCS Technical specification Electical values 90	Description:	insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. The package includes arching horns and 95 mm ² conductor with cable lugs. Spark gap is adjusted to 90-100 mm on 12 kV, 130-150	012±0.4
Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp Description of the conductor will be installed on the clamp	Package:	9/486	\bigcirc
Electrical values $90 \dots 250 \ \text{mm}$ Arc gap $90 \dots 250 \ \text{mm}$ Nominal voltage (Un) $12 \dots 36 \ \text{kV}$ Dimensions $12 \dots 36 \ \text{kV}$ Weight $0.83 \ \text{kg}$ Use:Spark gap $12 \ \text{kV}$ $90-100 \ \text{mm}$ Spark gap $24 \ \text{kV}$ $130-150 \ \text{mm}$ Spark gap $24 \ \text{kV}$ $130-150 \ \text{mm}$ Spark gap $24 \ \text{kV}$ $220-250 \ \text{mm}$ Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp $SO 181.6 \ \text{and on tension poles with tension clamps}$ Construction:Component MaterialAl-partsCorrosion resistant aluminium alloy ScrewsAl-partsStainless steelWashersStainless steelThe package includes arching 2 pcs horns SDI10.2 and $95 \ \text{mm}^2$ conductor will be installed on the clampInstallation:One end of the conductor will be installed on the clamp	Unit:	PCS	Ø12+04
Use: Spark gap 12 kV 90-100 mm Spark gap 24 kV 130-150 mm Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. Construction: Component Material Al-parts Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainl=ss steel The package includes arching 2 pcs horns SDI10.2 and 95 mm ² conductor PEJ90 with screw type cable lugs. Installation: One end of the conductor will be installed on the clamp	Electrical values Arc gap Nominal voltage (Un) Dimensions	90 250 mm 12 36 kV	
Spark gap 24 kV 130-150 mm Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. Construction; Component Material Al-parts Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation; One end of the conductor will be installed on the clamp	-	-	
Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. Construction: Component Material Al-parts Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation: One end of the conductor will be installed on the clamp	000.		
Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamps SO255 or SO256. Construction; Component Material AI-parts Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation;: One end of the conductor will be installed on the clamp			
AI-parts Corrosion resistant aluminium alloy Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation; One end of the conductor will be installed on the clamp		Power arc device SDI27.2 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.6 and on tension poles with tension clamp	S
Screws Hot dip galvanized steel Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation; One end of the conductor will be installed on the clamp	Construction:	Component Material	
Washers Stainless steel The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs. Installation; One end of the conductor will be installed on the clamp		Al-parts Corrosion resistant aluminium alloy	×
The package includes arching 2 pcs horns SDI10.2 and 95 mm² conductor PEJ90 with screw type cable lugs.Installation;One end of the conductor will be installed on the clamp	2	Screws Hot dip galvanized steel	
95 mm ² conductor PEJ90 with screw type cable lugs. Installation: One end of the conductor will be installed on the clamp		Washers Stainless steel	
······································			
069 #1	Installation	-	
		M	
Ensto Finland Oy Ensio Miettisen katu 2 Tel. +358 204 76 21 www.ensto.com P.O.Box 77 Fax +358 204 76 2770 06101 Porvoo, Finland	Ensto Finland Oy	P.O.Box 77 Fax +358 204 76 2770	to.com



PRODUCT SPECIFICATION

20.5.2016 2/2

SDI27.2

Tools required:

Articulated spanner ST20

Markings:

SDI10.2, 44 Nm



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PRODUCT SPECIFICATION



Saves Your Energy



SML1.17 Cable lug with shear head bolts

Code	SML1.17
GTIN	6418677457555
Name	Cable lug with shear head bolts
	Al/Cu 10-95 mm², Ø13
Description	The cable lug is used for terminating conductors of cables up to 36 kV. Because of the shear head bolt construction, no crimping tools are needed. The required torque is achieved by tightening the bolt until it breaks off. The adapter needed in tightening is included in the package. The lug is longitudinally water tight. It is suitable for aluminium and copper conductors: solid and stranded, sector shaped and circular.



Dimensions

Weight:	0.07 kg
Conductor size Al:	10 95 mm²
Conductor size Cu:	10 95 mm²
Drawing markings	
В:	28 mm
d:	14±0,5 mm
H:	10 mm
D1:	25 mm
D2:	13 mm
L1:	32 mm
L2:	59 mm
L3:	73 mm
SW:	17 mm
Ratings	
ETIM class:	EC001054

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Specification		
Construction:		
Construction:	Component	Material
	Body	Tinned aluminium alloy
	Screws	Tinned aluminium
	Tin layer thickness	Lug body, > 10 µm
		Screw, > 3 µm
	Centering ring	Polypropylene
	Grease	RFL3
	Tool	Aluminium
Installation:	Follow installation connector package	instructions in the
Tools required:	SW17 wrench	
Markings:	ENSTO SML1.17X / Class A	\l/Cu 10-95mm² WW/YYYY
Standard:	IEC61238-1	
ETIM		

ETIM

Surface protection:	Tinned
Nominal cross section copper, RM:	10 95 mm²
Nominal cross section copper, RE:	10 95 mm²
Nominal cross section copper, SM:	10 95 mm²
Nominal cross section aluminium, RM:	10 95 mm²
Nominal cross section aluminium, RE:	10 95 mm²
Nominal cross section aluminium, SM:	10 95 mm²
Nominal cross section aluminium, SE:	10 95 mm²
Material conductor:	Aluminium/copper

Packaging

Default package

Unit:	PCS
Size:	10
Length:	165 mm
Width:	165 mm
Height:	140 mm
Weight (net):	1.1005 kg
Volume:	3.8115

Pallet package

Ensto Finland Oy

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ADMINING STREAM

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ОД

		5/4
Unit:	FIN	
Size:	2520	
Length:	1200 mm	
Width:	800 mm	
Height:	1010 mm	
Weight (net):	259.56 kg	
Weight (brt):	298 kg	
Volume:	969.6	

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CD140 2

ENSTO

PRODUCT SPECIFICATION

18.5.2016

1/2

			6418677410673
Name:	Power arc device		
	For tension insulators		
Туре:	SDI10.2		-Sh /
GTIN:	6418677410673		1
Description:	conductor lines. SDI10.2 include metal parts of the tension insula	tion insulator type SDI90 on covered as two horns, which are fixed to the tor so that the peaks are towards ween the peaks is 100 - 150 mm at	
	Arc fault test: Arc test 2 x 10 kA, 1s		Ĩ+ ₽© 🖗
	Short circuit test: I1s=11,5 kA, 1s Idyn=29 kA		
Package:	15/945		
Unit:	PCS		
Arc gap	95 230 mm		
Nominal voltage (Un) Mechanical Tightening torque Dimensions	12 36 kV 44 Nm		
Nominal voltage (Un) Mechanical Tightening torque	12 36 k∨ 44 Nm 0.58 kg Arcing protection hor	ns for the suspension insulator arc device is designed particularly ents.	
Nominal voltage (Un) Mechanical Tightening torque Dimensions Weight	12 36 k∨ 44 Nm 0.58 kg Arcing protection hor SDI80.n. The power	arc device is designed particularly	
Nominal voltage (Un) Mechanical Tightening torque Dimensions Weight Use:	12 36 kV 44 Nm 0.58 kg Arcing protection hor SDI80.n. The power for the small arc curre Component Material	arc device is designed particularly	300 N/ mm²
Nominal voltage (Un) Mechanical Tightening torque Dimensions Weight Use:	12 36 kV 44 Nm 0.58 kg Arcing protection hor SDI80.n. The power for the small arc curre Component Material	arc device is designed particularly ents. nt aluminium alloy, tensile strength :	300 N/ mm²
Nominal voltage (Un) Mechanical Tightening torque Dimensions Weight Use:	12 36 kV 44 Nm 0.58 kg Arcing protection hor SDI80.n. The power for the small arc curre Component Material Al parts Corrosion resistar	arc device is designed particularly ents. nt aluminium alloy, tensile strength :	300 N/ mm²
Nominal voltage (Un) Mechanical Tightening torque Dimensions Weight Use:	12 36 kV 44 Nm 0.58 kg Arcing protection hor SDI80.n. The power for the small arc curre Component Material Al parts Corrosion resistan Screws Hot-dip galvanised Washers Stainless steel The kit SDI10.2 cons	arc device is designed particularly ents. nt aluminium alloy, tensile strength :	300 N/ mm²

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PRODUCT SPECIFICATION

18.5.2016



Tools required:

Markings:

SDI10.2

Articulated spanner ST20.

SDI 10.2 44 Nm



ENSTO	Saves Your Ene	rgy		PRODUCT SPECIFICATION 9/19/16
PK557				6438100306915
End cap				
Code	PK557			
GTIN	6438100306915			
Name	End cap			
D	50-157 mm ²			
Description	PK557 is used for into the end of the		er entry	
Taskaiselau				
Technical sp	Decincation			
Dimensions				
Weight:		0.01 kg		
Conductor size:		50-157		
Conductor diam	eter:	12.7 22.3 mm	1	
Specification				
Construction:				
Construction:		Component	Material	
		Body	UV-resistant elastomer	
Markings:		Ensto, Ø12,7-22	2,3 and PMR2720	
Standard:		EN 50397-2		
Packaging				
	age			
Default pack	age	120		
Default pack Size: Length:	age	215 mm		
Default pack Size: Length: Width:	age	215 mm 215 mm		
Default pack Size: Length: Width: Height:	age	215 mm 215 mm 120 mm		
Packaging Default pack Size: Length: Width: Height: Weight (net): Weight (brt):	age	215 mm 215 mm		

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CERTIFICATE FI 29719

Our Ref.

286326-1

Product Tension clamp for overhead line Туре SO256 SO256.2 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 Tension clamp for covered conductors PAS/BLL 95 - 157 mm² AlMgSi **Technical information** Conductor diameter 16,1 - 22,3 mm Tightening torque 40 Nm SMDL 22 kN SMFL 25 Kn Other information See the Appendix to this Certificate The product is certified EN 50397-2:2009 according to the following standard(s) This certificate is valid until 11 October 2021 provided that the Conditions for FI certification are met. Validity This certificate includes the right to use the FI mark under the condition that product changes (if any) will be approved at SGS Fimko before the product is brought onto market. Date of issue 11 October 2016 SGS Fimko Ltd Signature Sixten Lökfors **Project Manager** OB BAPHO C OPA This certificate has 1 appendix



This certificate is issued by the company under its General Conditions for Certification Services accessible at http://www.sos.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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 Business ID 0978538-5

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Appendix to Certificate: 29719

Manufacturing site

Additional information



Is based on test

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

SO256.2 with adapter for hoist hook.

Additional parts for tension clamps SO256 and SO256.2: Power arc device SDI27.2 including power arc horns SDI10.2 and PEJ90 conductor with screw type cable lugs SML 1.17. End cap PK557.

This certificate is based on and replaces certificate FI 27049 A1 dated 15 December 2014.

Certificate FI 27049 A1 was based on manufacturer's test reports: 2166S, 2176S, 2165S, 2177S, 2106s, 1938S, 1939S, 2087S, 2089S, 2091S, 2092S, 2094S, 2095S, 2097S, 2098S, 2100S, 2101S, 2103S, 2104S, 2191 and 2170S

Manufacturer's additional test reports: 3571S, 3467S, 3074S, 3572S, 3465S, 3597S, 3595S and 3596S

Solar simulator test reports: 050810_SO256, 071210_SDI27-1 and 050111_SDI10_2

SGS Fimko test report: 251420_SML1-17

Low temperature assembly test clause 7.4.14. and Tensile test at low temperature clause 7.4.8 were done in temperature -25 \pm 3 °C



Laboratory Report

No.: 3571S Revision: A Page: 1/6 Date of Test: 16.8.2016

Test object:

Tension clamp SO256 and SO256.2.

Purpose of the test and relevant standards:

Visual examination test and Dimensional and material verification test according to EN 50397-2:2009 clauses 7.1 and 7.2.

Conclusion:

Clamp passed the test.



Picture 1: SO256

Date of Report: 22.8.2016

Tested by: Mika Karjalainen

Approved by: Janne Lappalainen





вярно с оридани



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16

OB

Laboratory Report No.: 3571S Revision: A Page: 2/6

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs:

Type:

SMFL: SMDL:

Manufacturer:

Conductor size: Tightening torque:

Batch number:

No of pcs:

SO256 Ensto Finland Oy 95-157 mm² 44 Nm 25 kN 22 kN 07/2016 1 SO256.2 Ensto Finland Oy 95-157 mm² 44 Nm 25 kN 22 kN

11/2016

1

Laboratory Report

No.: 3571S Revision: A Page: 3/6

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.

Requirements

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

3. Test results

Visual examination of SO256

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 or reference:	SO256
Batch number (production date):	07/2016
Minimum and maximum cross section:	95-157 mm2
Tightening torque or die reference:	40

Visual examination of SO256.2

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 or reference:	SO256.2
Batch number (production date):	11/2016
Minimum and maximum cross section:	95-157 mm2
Tightening torque or die reference:	40

Dimensional and material verification of SO256

All samples were within specification requirements. Clamps dimensions were within specification tolerances see Picture 2.

Distance	Requirement [mm]	in product
Total length	(700)	705
Body length	(201)	206
Body height	(95)	94,8
Body width	(64)	64,0
Clamping piece width	(46)	46,0
Bail diameter	(9)	9,0
Bail eye radius	≥12	>12



Table 1: Test results

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Laboratory Report No.: 3571S Revision: A Page: 4/6



Picture 2: Specification drawing

Component	Material	Matching specification	
Body	Corrosion resistant aluminium alloy	yes	
Plastic parts	Frost, heat and UV- radiation resistant plastic	yes	
Bolts	Hot dip galvanized steel	yes	
Bail Stainless steel		yes	

Table 2: Clamp materials

Dimensional and material verification of SO256.2

All samples were within specification requirements. Clamps dimensions were within specification tolerances see Picture 3.

Distance	Requirement [mm]	In product
Total length	(700)	703
Body length	(201)	206,0
Body height	(95)	94,9
Body width	(64)	64,0
Clamping piece width	(49)	48,8
Bail diameter	(9)	9,06
Bail eye radius	≥12	>12

Table 3: Test results

Laboratory Report No.: 3571S

No.: 3571S Revision: A Page: 5/6





Component Material		Matching specification
Body Corrosion resistant aluminium alloy		yes
Plastic parts Frost, heat and UV- radiation resistant plastic		yes
Bolts	Hot-dip galvanised steel	yes
Bail	Stainless steel	yes
Hoist adapter	Hot-dip galvanised steel	yes

Table 4: Clamp materials

Summary

Clamps passed the test.



Laboratory Report No.: 3571S Revision: A Page: 6/6

4. Pictures



Picture 4: Measuring body height



Picture 5: Markings

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
A209	Caliper	Stainless hardened	Measuring dimensions	15.12.2015
L317	Measuring tape	SL5M	Measuring length	04.08.2016

6. <u>Test Id</u>

3955

7. Revision history

А



Laboratory Report

No.: 3467S Revision: A Page: 1/5 Date of Test: 19.5.2016

Test object:

Power arc device SDI27.2.

Purpose of the test and relevant standards:

Part of sample test. Visual examination test and Dimensional and material verification test according to EN 50397-2:2009 clauses 7.1 and 7.2.

Conclusion:

Power arc device passed the test.



Picture 1: SDI27.2

Date of Report: 20.5.2016

enna Aarnio Tested by

Approved by: Janne Lappalainen



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ILITY NETWORKS

LABORATORY

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Ordered by: T. Virtanen

Business ID: 1481990-6 Reg. Office: Porvoo

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Laboratory Report No.: 3467S Revision: A Page: 2/5

1. Test objects

Power arc device:SDI27.2Type:SDI27.2Manufacturer:Ensto Finland OyTightening torque:44 NmBatch number:5/2016No of pcs:1

Laboratory Report

No.: 3467S Revision: A Page: 3/5

2. <u>Testing procedure</u>

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.

Requirements

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

3. Test results

Visual examination

The power arc device was visually looking the same as in the specification drawing.

The power arc device includes the following parts:

- 2 x power arc device SDI10.2
- 1 x 95 mm² conductor PEJ90 with screw type cable lugs

Markings on power arc device SDI10.2 were found:

Marking	In specification	In product
Product code	SDI10.2	Yes
Tightening torque	44 Nm	Yes

Table 1: Test results of visual examination

Dimensional and material verification

All samples were within specification requirements. Power arc dimension was within specification tolerances, see Picture 2.

Distance	Requirement [mm]	in product	Remark
Arching horn diameter	12 ± 0,4	12,14	passed

Table 2: Test results of dimensional verification

Component	Material	Matching specification	
Al-parts	Corrosion resistant aluminium alloy	Yes	
Screws	Hot dip galvanized steel	Yes	
Washers	Stainless steel		

Table 3: Test results of material verification





Summary

The power arc device fulfilled all test requirements.

4. Pictures



Picture 3: Measuring the diameter of arching horn

Laboratory Report No.: 3467S

No.: 3467S Revision: A Page: 5/5



Picture 4: Markings of arching horn

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
A224	Slide gauge	Stainless	Measuring dimensions	16.03.2016

6. Test Id

3871

7. Revision history

Α







Laboratory Report

No.: 3074S Revision: A Page: 1/6 Date of Test: Enter a date

Test object:

SML1.17 cable lug with shear head bolt.

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 cable lug passed the test.



Picture 1: Tested cable lug SML1.17

Date of Report: 29.4.2015

Tested by: Joonas Kortelainen

Approved by: Janne Lappalainen



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UTILITY NETWORKS

LABORATORY

Ordered by: Jukka Mäkeläinen **Distribution:** UG PDM-Team

Business ID: 1481990-6 Reg. Office: Porvoo

Laboratory Report No.: 3074S

No.: 3074S Revision: A Page: 2/6

1. Test objects

Cable lug:

Type: Connector class: Manufacturer: Conductor range: Batch number: No of pcs: SML1.17 cable lug with shear head bolt A Ensto Finland Oy Al/Cu 10 - 95 mm² 04 /2014 1



Laboratory Report No.: 3074S Revision: A Page: 3/6

52

2. <u>Testing procedure</u>

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

Requirements

The cable lug shall fulfill the manufacturer specification data and standard requirement.

3. Test results

Visual examination:

The cable lug was visually looking the same as in the manufacturing drawing. The identification markings were according to specification.

Marking	ENSTO SML1.17X	
-	Al/Cu 10-95mm ²	
	04/2014 Class A	

Dimensional and material verification:

Dimension	Specification [mm]	Measured [mm]
Palm width	28	27,3
Conductor hole diameter	14	14,1
Barrel width	25	24,7
Palm hole diameter	13	13
Palm height	11	10,6
Barrel lenght	32	33,5
Lug lenght to a center of the palm	59	59
Total lenght of the lug	73	73,1
Tool width	17	16,8

Table 1: Dimensions of the cable lug
Laboratory Report No.: 3074S

No.: 3074S Revision: A Page: 4/6



Picture 2: Specification drawing

Component	Material	Matching specification
Body Tinned aluminium alloy		Yes
Screws	Tinned aluminium	Yes
Centering ring	Polypropylene	Yes
Grease	RFL3	Yes
Tool	Aluminium	Yes

Table 2: Materials of the cable lug

Summary

The cable lug fulfilled the test requirements.



Laboratory Report No.: 3074S Revision: A Page: 5/6

4. Pictures



Picture 3: Measuring palm width

Laboratory Report No.: 3074S

No.: 3074S Revision: A Page: 6/6

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
A238	Slide gauge	CD-15APX	Measuring dimensions	28.04.2015

6. Test Id

2969

7. Revision history

Α







Laboratory Report No.: 3467S

Revision: A Page: 1/5 Date of Test: 19.5.2016

Test object:

Power arc device SDI27.2.

Purpose of the test and relevant standards:

Part of sample test. Visual examination test and Dimensional and material verification test according to EN 50397-2:2009 clauses 7.1 and 7.2.

Conclusion:

Power arc device passed the test.



Picture 1: SDI27.2

Date of Report: 20.5.2016

Tested by Jenna Aarnio

Approved by: Janne Lappalainen



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Ordered by: T. Virtanen Distribution: OHL PD-Team

ABORATORY

Business ID: 1481990-6 Reg. Office: Porvoo

Laboratory Report No.: 3467S

No.: 3467S Revision: A Page: 2/5

1. Test objects

Power arc device: Type: Manufacturer: Tightening torque: Batch number: No of pcs:

SDI27.2 Ensto Finland Oy 44 Nm 5/2016 1



Laboratory Report No.: 3467S Revision: A Page: 3/5

2. <u>Testing procedure</u>

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.

Requirements

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

3. Test results

Visual examination

The power arc device was visually looking the same as in the specification drawing.

The power arc device includes the following parts:

- 2 x power arc device SDI10.2
- 1 x 95 mm² conductor PEJ90 with screw type cable lugs

Markings on power arc device SDI10.2 were found:

Marking	In specification	In product
Product code	SDI10.2	Yes
Tightening torque	44 Nm	Yes

Table 1: Test results of visual examination

Dimensional and material verification

All samples were within specification requirements. Power arc dimension was within specification tolerances, see Picture 2.

Distance	Requirement [mm]	In product	Remark
Arching horn diameter	12 ± 0,4	12,14	passed

Table 2: Test results of dimensional verification

Component	Material	Matching specification
Al-parts	Corrosion resistant aluminium alloy	Yes
Screws	Hot dip galvanized steel	Yes
Washers	Stainless steel	

Table 3: Test results of material verification

No.: 3467S Revision: A Page: 4/5



Picture 2: Specification drawing

Summary

The power arc device fulfilled all test requirements.

4. Pictures



Picture 3: Measuring the diameter of arching horn



Laboratory Report No.: 3467S Revision: A Page: 5/5



Picture 4: Markings of arching horn

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
A224	Slide gauge	Stainless	Measuring dimensions	16.03.2016

6. Test Id

3871

7. Revision history

Α



No.: 3572S Revision: A Page: 1/3 Date of Test: 16.8.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Part of type test. Test for permanent marking according to EN 50397-2:2009 clause 7.3.

Conclusion:

Clamp passed the test.



Picture 1: SO256

Date of Report: 22.8.2016

Tested by: Mika Karjalainen

Approved by: Janne Lappalainen



Ordered by: T. Virtanen Distribution: OHL PD-team





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Tel. +358 204 76 21 Fax +358 204 76 2770 Business ID: 1481990-6 Reg. Office: Porvoo

Laboratory Report No.: 3572S Revision: A Page: 2/3

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs: 1020

SO256 Ensto Finland Oy 95-157 mm² 44 Nm 25 kN 22 kN 07/2016 3

2. Testing procedure

The markings were rubbed by hand for 15 s with a piece of cloth soaked with water and again 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

Sample	Markings clear after the test	Result
1	yes	passed
2	yes	passed
3	yes	passed

Table 1: Test results

Summary

Clamp fulfilled the test requirements.

Laboratory Report No.: 3572S

Revision: A Page: 3/3

4. Pictures



Picture 2: Test setup



Picture 3: Markings after test

5. Test equipment

5.	lesteq	ulpment				PHO RA
	ID	Туре	Model	Purpose	Latest calibration	E PHOKAS
	L253	Stop watch	IHM	timekeeping	26.10.2015	16 16 16 16
6.	<u>Test Id</u> 3956					BRANDIC OPATIMALITA
7.	<u>Revisio</u> A	n history				



No.: 3465S Revision: A Page: 1/6 Date of Test: 19.5.2016

Test object:

Power arc device SDI10.2.

Purpose of the test and relevant standards:

Part of sample test. Test for permanent marking according to EN 50397-2:2009 clause 7.3.

Conclusion:

Tested samples passed the test.



Picture 1: SDI10.2

Date of Report: 20.5.2016

Tested by Aarnio

Approved by: Janne Lappalainen



Ordered by: T. Virtanen **Distribution:** OHL PD-Team



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No.: 3465S Revision: A Page: 2/6

1. Test objects

Power arc device: Type: Manufacturer: Tightening torque: Batch number: No of pcs:

SDI10.2 Ensto Finland Oy 44 Nm 06042016/21451 3



Laboratory Report No.: 3465S Revision: A Page: 3/6

2. Testing procedure

The markings were rubbed by hand for 15 s with a piece of cloth soaked with water and again 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

Sample	Markings clear after the test	Result		
1.1	yes	passed		
1.2	yes	passed		
2.1	yes	passed		
2.2	yes	passed		
3.1 yes		passed		
3.2	yes	passed		

Table 1: Test results

Summary

All samples fulfilled the test requirements.

Laboratory Report No.: 3465S

No.: 3465S Revision: A Page: 4/6

4. Pictures



Picture 2: 1.1 and 1.2 samples before and after the test



Laboratory Report No.: 3465S Revision: A Page: 5/6



Picture 4: 3.1 and 3.2 samples before and after the test



Picture 5: Test setup

Laboratory Report No.: 3465S Revision: A

Page: 6/6

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
L253	Timer	IHM	Timing of test	26.10.2015

6. <u>Test Id</u>

3870

7. Revision history

А







Laboratory Report No.: 3597S Revision: A Page: 1/6 Date of Test: 14.9.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Tensile test at ambient temperature according to EN50397-2:2009 clause 7.4.7.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 15.9.2016

Tested by: Mika Karjalainen

Approved by: Janne Lappalainen



Ordered by: T. Virtanen **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: 1481990-6 Reg. Office: Porvoo

No.: 3597S Revision: A Page: 2/6

1, Test objects Tension clamp: Type: SO256 Manufacturer: Ensto Finland Ov 95-157 mm² Conductor size: Tightening torque: 44 Nm 25 kN SMFL: SMDL: 22 kN Batch number: 07/2016 No of pcs: 8 Conductors: **SAX-W 95** Type: Used cross section: 95 mm² Conductor material: AIMgSi Number of strands: 7 Conductor diameter: 11,3 mm Conductor construction: Compacted Shape of conductor: Round Insulation material: XLPE Insulation thickness: 2,4 mm Core diameter: 16,1 mm Conductor MBL: 30.4 kN Max operating temperature: 80 °C Max short-circuit temperature: 200 °C Manufacturer: Prysmian Country: Finland Refer to standard: EN50397-1 Conductor ID: 210 SAX-W 150 AlMgSi 12/20 kV, K2000 Type: Used cross section: 150 mm² Conductor material: AIMgSi Number of strands: 19 Conductor diameter: 14,2 mm Conductor construction: Compacted Shape of conductor: Round Insulation material: XLPE Insulation thickness: 2.2 mm Core diameter: 18,9 mm Conductor MBL: 47,3 kN Max operating temperature: 80 °C Max short-circuit temperature: 200 °C Manufacturer: Prysmian Country: Finland Refer to standard: SFS 5791, EN 50397-1 Conductor ID: 463 BAPHO C

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Laboratory Report No.: 3597S Revision: A Page: 3/6

Type: Used cross section: Conductor material: Number of strands:

Conductor diameter: 12,8 mm Conductor construction: Non-compacted Shape of conductor: Round HDPE+PE Insulation material: Insulation thickness: Core diameter: Conductor MBL: Max operating temperature: Max short-circuit temperature: 200 °C Manufacturer: Country: Refer to standard: Conductor ID:

Type: Used cross section: Conductor material: Number of strands: Conductor diameter: Conductor construction: Shape of conductor: Insulation material: Insulation thickness: Core diameter: Conductor MBL: Max operating temperature: Max short-circuit temperature: 200 °C Manufacturer: Country: Refer to standard: Conductor ID:

2,6 mm 17,8-18,8 25,3 kN 70 °C Amokraft Sweden EN 50397-1 437 BLL-T 157 AIMgSi 24kV 157 mm² AlMgSi 19 16,3 mm Non-compacted Round HDPE+PE 2.5 mm 21,6 mm 43,7 kN 70 °C Amokraft Sweden EN 50397-1

453

BLL-T99 AIMgSi 24kV

99 mm²

AIMgSi

7

No.: 3597S Revision: A Page: 4/6

2. <u>Testing procedure</u>

Two tension clamps were tested with minimum and maximum conductor size using BLL-T and SAX-W type conductors. The tension clamps were assembled in accordance with manufacturers' instructions and fitted into a tensile test machine as shown in Picture 2.

The test load SMFL was SMFL=0,8×conductor MBL. The load was increased to 20 % of SMFL. Then the conductor was marked where it exits from the tension clamp. The load was then gradually increased to 60 % of SMFL and kept there for 60 s. Without any subsequent adjustment of the fitting the load was increased to SMFL and kept there for 60 s. After this the tension clamps where then checked for any movement relative to the conductor. Then the load was steadily increased until failure occurred. The failure load was recorded.



Picture 2: Tensile test arrangement

1. Min. 100 x covered conductor diameter

2. Length of tail minimum 500 mm

Requirements

The movement of the tension clamp relative to the conductor shall be less than 3 mm and no failure of the clamp or the covered conductor shall occur below SMFL, where SMFL=0,80×MBL.

Deviation

For some conductors the test load SMFL ($0,80 \times MBL$) is higher than the SMFL specified for the tension clamp. In these cases the maximum test load was limited to the SMFL of the tension clamp.



Laboratory Report No.: 3597S Revision: A Page: 5/6

3. Test results

Sample	Conductor	MBL [kN]	20% of SMFL [kN]	60% of SMFL [kN]	SMFL [kN]	Breaking force [kN]	Result
1	SAX MUDE	30,4	4,9	14,6	24,3	34,1	Passed
2	2 SAX-W 95	30,4	4,9	14,0	24,3	54,1	rasseu
3	0 A X 1A/ 450	47.0	7,6	22,7	25,0	34,3	Passed
4	4 SAX-W 150	47,3	7,0	22,1	25,0	54,5	rasseu
5	BLL-T 99	05.0	4.0	10.1	20.2	20.5	Dessed
6		25,3	4,0	12,1	20,2	29,5	Passed
7	40.7	7.0	21.0	25.0	24.0	Deesed	
8	BLL-T 157	43,7	7,0	21,0	25,0	34,9	Passed

Table 1: Test results

Summary

The clamp fulfilled the test requirements.

4. Pictures



Picture 3: Test setup

Laboratory Report No.: 3597S Revision: A

Page: 6/6

5. Test equipment

I	D	Туре	Model	Purpose	Latest calibration
	T1	Tensile test machine	Matertest	Tensile test	No calibration
ļ	L109	Force sensor	1220AF-250kN-B	Force measurement	01.09.2016
	L110	Force sensor	1210AF-50kN-B	Force measurement	01.09.2016
	L56	Torque wrench	BDS80E	Torque measurement	01.07.2015
	A209	Caliper	Stainless hardened	Measuring dimensions	15.12.2015

6. Test Id

3957

7. Revision history

А







Laboratory Report No.: 3595S Revision: A Page: 1/5

Date of Test: 29.8.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Clamp bolt tightening test according to EN 50397-2:2009 clause 7.4.10.1.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 30.8.2016

Tested by: Mika Karjalainen

Approved by: Janne Lappalainen



Ordered by: T. Virtanen 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: 1481990-6 Reg. Office: Porvoo

No.: 3595S Revision: A Page: 2/5

1. Test objects Tension clamp: Type: SO256 Manufacturer: Ensto Finland Oy 95-157 mm2 Conductor size: Tightening torque: 44 Nm SMFL: 25 kN SMDL: 22 kN Batch number: 07/2016 No of pcs: 4 Conductors: Type: **SAX-W 95** Used cross section: 95 mm² AlMgSi Conductor material: Number of strands: 7 Conductor diameter: 11,3 mm Conductor construction: Compacted Shape of conductor: Round Insulation material: **XLPE** Insulation thickness: 2.4 mm Core diameter: 16.1 mm Conductor MBL: 30.4 kN Max operating temperature: 80 °C Max short-circuit temperature: 200 °C Manufacturer: Prysmian Country: Finland EN50397-1 Refer to standard: Conductor ID: 210 SAX-W 150 AIMgSi 12/20 kV, K2000 Type: Used cross section: 150 mm² AIMgSi Conductor material: Number of strands: 19 Conductor diameter: 14.2 mm Compacted Conductor construction: Round Shape of conductor: Insulation material: XLPE Insulation thickness: 2,2 mm Core diameter: 18,9 mm Conductor MBL: 47.3 kN Max operating temperature: 80 °C Max short-circuit temperature: 200 °C Manufacturer: Prysmian Country: Finland Refer to standard: SFS 5791, EN 50397-1 Conductor ID: 463

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Laboratory Report No.: 3595S Revision: A Page: 3/5

Type: BLL-T99 AIMgSi 24kV Used cross section: 99 mm² Conductor material: AIMgSi Number of strands: 7 Conductor diameter: 12.8 mm Conductor construction: Non-compacted Shape of conductor: Round HDPE+PE Insulation material: 2,6 mm Insulation thickness: 17,8-18,8 Core diameter: Conductor MBL: 25,3 kN Max operating temperature: 70 °C Max short-circuit temperature: 200 °C Amokraft Manufacturer: Country: Sweden Refer to standard: EN 50397-1 Conductor ID: 437 Type: BLL-T 157 AlMgSi 24kV 157 mm² Used cross section: AlMgSi Conductor material: Number of strands: 19 Conductor diameter: 16,3 mm Conductor construction: Non-compacted Shape of conductor: Round Insulation material: HDPE+PE Insulation thickness: 2,5 mm Core diameter: 21,6 mm Conductor MBL: 43,7 kN 70 °C Max operating temperature: Max short-circuit temperature: 200 °C Manufacturer: Amokraft Sweden Country: Refer to standard: EN 50397-1 Conductor ID: 453

No.: 3595S Revision: A Page: 4/5

2. Testing procedure

One clamp was tested with minimum and maximum conductor size using BLL-T and SAX-W type conductors.

The torque was increased to $1,1 \times$ the specified installation torque value, $1,1 \times 40 = 44$ Nm, after which the clamp was checked for damage. The tightening was then continued until breaking occurred. The breaking torque was recorded.

Deviation

Standard says that clamp shall be tightened and loosened 10 times to $1,1 \times 1$ the specified installation torque. The clamps in test are tightened only once to $1,1 \times 1$ installation value, because the clamps are not allowed to be re-used.

Requirements

No damage shall occur, during the tightening which could affect the correct function of the clamp or its nuts.

3. Test results

Sample	Conductor [mm ⁴]	1,1 x tightening torque [Nm]	Damage torque [Nm]	Damage	Result
1	PAS-W 95		>100	no break	passed
2	PAS-W 150	44	98	bolt threads broke	passed
3	BLL-T 99		95,7	bolt broke	passed
4	BLL-T 157	- 44	92,2	bolt broke	passed

Table 1: Test results

Summary

All samples fulfilled the test requirements.

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Laboratory Report No.: 3595S Revision: A Page: 5/5

4. Pictures



Picture 2: Test setup

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
L56	Torque wrench	BDS80E	Torque measurement	01.07.2015
L269	Torque wrench	Stahlwille 730D/10	Torque measurement	07.11.2013

6. <u>Test Id</u>

3958

- 7. Revision history
 - А



No.: 3596S Revision: A Page: 1/4 Date of Test: 15.9.2016

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Damage and failure load test according to EN 50397-2:2009 clause 7.4.1.

Conclusion:

The clamp passed the test.



Picture 1: SO256

Date of Report: 15.9.2016

Tested by: Mika Karjalainen

Approved by: Janne Lappalainen



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LABORATORY

Ordered by: T. Virtanen **Distribution:** OHL PD-team

Business ID: 1481990-6 Reg. Office: Porvoo

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Laboratory Report No.: 3596S Revision: A Page: 2/4

1. Test objects

Tension clamp: Type: Manufacturer: Conductor size: Tightening torque: SMFL: SMDL: Batch number: No of pcs:

SO256 Ensto Finland Oy 95-157 mm² 44 Nm 25 kN 22 kN 07/2016 3

Conductors:

Type: BLL-T 157 AIMgSi 24kV Used cross section: 157 mm² Conductor material: AlMgSi Number of strands: 19 Conductor diameter: 16,3 mm Conductor construction: Non-compacted Shape of conductor: Round Insulation material: HDPE+PE Insulation thickness: 2,5 mm Core diameter: 21.6 mm Conductor MBL: 43,7 kN Max operating temperature: 70 °C Max short-circuit temperature: 200 °C Manufacturer: Amokraft Country: Sweden Refer to standard: EN 50397-1 Conductor ID: 453

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No.: 3596S Revision: A Page: 3/4

2. Testing procedure

Three samples were tested. The test was carried out as in Picture 2. The load was applied in the direction 1. The load was gradually increased until it reached the specified minimum damage load (SMDL). This load was kept constant for 60s. The fitting was then removed and measurement of any permanent deformation was done. The load was gradually increased until it reached the specified minimum failure load (SMFL). This load was kept constant for 60s.





Requirements

Regarding damage load, the test is passed if no permanent deformation, which can affect the proper function of the fitting, occurs at or below the specified mechanical minimum damage load.

3. Test results

Sample		SMDL				Sec. Sec. of
	Conductor	SMDL for 60 s [kN]	Allowed permanent deformation [mm]	Measured permanent deformation at 0 kN [mm]	SMFL for 60 s [kN]	Result
1				1,4		Passed
2	BLL-T 157	22,0	2,0	1,1	25,0	Passed
3				1,6		Passed

Table 1: Test results

Summary

The clamp fulfilled the test requirements.

Δ	от филкаб
ВЯРНО С ОРИГИЦИЛА	13 *
	U

Laboratory Report No.: 3596S Revision: A Page: 4/4

£

4. Pictures



Picture 3: Test setup

5. Test equipment

ID	Туре	Model	Purpose	Latest calibration
T1	Tensile test machine	Matertest	Tensile test	No calibration
L109	Force sensor	1220AF-250kN-B	Force measurement	01.09.2016
L110	Force sensor	1210AF-50kN-B	Force measurement	01.09.2016
L56	Torque wrench	BDS80E	Torque measurement	01.07.2015
A209	Caliper	Stainless hardened	Measuring dimensions	15.12.2015

6. Test Id

3959

7. Revision history

А



Saves Your Energy

ENSTO

Product: SO256

<u>Contents</u>		Document no
1. Specification		SO256
		SO256.2
		SDI27.2
		SML1.17
		SDI10.2
		PK557
2. Certificate		FI 27049
3. Test reports:		
3.1. Visual exa	amination	
3.1.1.	SO256	2166S
3.1.2.	SO256.2	2166S
3.1.3.	SDI27.2	2176S
3.2. Dimensior	nal and material verification	
3.2.1.	SO256	2166S
3.2.2.	SO256.2	2166S
3.2.3.	SDI27.2	2176S
3.3. Test for pe	ermanent marking	
3.3.1.	SO256	2165S
3.3.2.	SDI10.2	2177S
3.4. Damage a	and failure load test	2106S
3.5. Tensile tes	st at ambient temperature	
3.5.1.	BLL-T AIMgSi	1938S
3.5.2.	SAX-W AIMgSi	1939S
3.6. Tensile te	st at low temperature	
3.6.1.	BLL-T AlMgSi	2087S
3.6.2.	SAX-W AIMgSi	2089S
3.7. Tensile te	st at high temperature	
3.7.1.	BLL-T AIMgSi	2091S
3.7.2.	SAX-W AIMgSi	2092S

Saves Your Energy

ENSTO

Product: SO256

3.8. Clamp bolt	tightening test	
3.8.1.	BLL-T AIMgSi	2094S
3.8.2.	SAX-W AlMgSi	2095S
3.9. Low tempe	rature assembly test	
3.9.1.	BLL-T AIMgSi	2097S
3.9.2.	SAX-W AIMgSi	2098S
3.10. Watertight	tness test	
3.10.1.	BLL-T AIMgSi	2100S
3.10.2.	SAX-W AIMgSi	2101S
3.11. Short circ	uit test	
3.11.1.	BLL-T AlMgSi	2103S
3.11.2.	SAX-W AIMgSi	2104S
3.12. Corrosion	test	
3.12.1.	SO256	050810_SO256
3.12.2.	Conductor with cable lugs	071210_SDI27-1
3.12.3.	SDI10.2	050111_SDI10_2
3.13. Climatic a	geing test (Method 2)	
3.13.1.	SO256	2191S
3.13.2.	End cap	2170S
3.14. Ageing te	st (IEC61238-1)	
3.14.1.	SML1.17	251420-1_SML1-17



Saves Your Energy

PRODUCT SPECIFICATION

20.6.2011

SO256

ENSTO

Ensto Finland Oy		Ensio Miettisen katu P.O.Box 77 06101 Porvoo, Finla	Fax +	358 204 76 21 358 204 76 2770	www.ens	to.com	
Standard:		EN 50397-2					
		40 Nm week/year of ma	nufacture				
		PSS1207 PSS1208 95-157mm2					
Markings:		ENSTO SO256					
Installation:		the wedges. The	ened and the cond locking connector np is closed and st	r is tightened. T			
		Bail	Stainless steel				
		Plastic parts Bolts	Frost, heat and Hot-dip galvanis	UV-radiation r			
Construction:		Component Body	Material Corrosion resist	tant aluminium	allov		
Use:		-	or covered conduc		-	sulated messenge	IS OI
Tightening torqu	le Nm:	40 Tancian alama fr	ar covered conduc				ra of
For conductor m SMFL kN:	וm²:	PAS/BLL 95-157 30	′ AlMgSi				
Weight (kg): Conductor diam		2.53 16.1-22.3					
Technical spec	ification	0.50				+CE BO	
Package: Unit:	3/90 PCS					\$ (700)	
Description	messeng insulation	clamp for covered c ers of aerial MV ca piercing contact p to the conductor.	bles like AHXAMK	-WM3 (Multi-w	iski). The	V	٩
EAN:	64381003					No.	
Туре:	PAS/BLL SO256	-T 95-157 mm² AlN	lgSi				n
Name:	Tension	•	1-0:				

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PRODUCT SPECIFICATION

20.6.2011

SO256.2

ENSTO

Name:	Tension PAS/BLL	clamp -T 95-157 AlMgSi h	noist adap
Туре:	SO256.2		
EAN:	64381003	303839	State
Description;	messeng cables lik has silico prevents	ers of aerial MV□ e AHXAMK-WM3 (ne seal which□	ed conductors PAS/BLL AIMgSi and for insulated Multi-wiski). The insulation piercing contact part g into the conductor. Clamps are equipped with an
Package: Unit:	3/90 PCS		
Technical spec	ification		
Weight (kg): Conductor diam For conductor n SMFL kN: Tightening torqu	nm²:	2.79 16.1-22.3 PAS/BLL 95-157 30 40	AIMgSi
Use:		aerial MV	or covered conductors PAS/BLL AIMgSi and for insulated messengers of AMK-WM3 (Multi-wiski). Clamps are equipped with an adapter for hoist hook.
Construction:		Component	Material
		Body Bolts Bail Plastic parts Hoist adapter	Corrosion resistant aluminium alloy Hot-dip galvanised steel M10 Stainless steel Frost, heat and UV-radiation resistant plastic Hot-dip galvanised steel
Installation:		the wedges. The	ened and the conductor wire is inserted between locking connector is tightened. Tightening torque np is closed and strained.
Markings:		ENSTO SO 256. 95-157mm2 40 Nm week/year of ma	
Standard;		EN 50397-2	
			SHPHO C OPMINING PHO SAN BUNG SHPHO
Ensto Finland Oy		Ensio Miettisen katu P.O.Box 77 06101 Porvoo, Finla	Fax +358 204 76 2770

LINE AND

ENSTO

PRODUCT SPECIFICATION

9.6.2011

SDI27.2

Name:	Power arc	device	
	For product	s SDI90.x composite insulators on angle poles and SO255, SO256,	4
	SO181.6		1 11
Туре:	SDI27.2		Se la
EAN:	643810030	5611	
Description:	poles with s clamps SO The packag Spark gap	device SDI27.2 is used with SDI90.x composite insulators on angle suspension clamp SO181.6 and on tension poles with tension 255 or SO256. □ ge includes arching horns and 95 mm² conductor with cable lugs. s adjusted to 90-100 mm on 12 kV, 130-150 mm on 24kV and m on 36 kV.□	Cart
Package:	9/405		
Unit:	PCS		
orine.			
Technical spec	ification		
-		90-250	
Arc gap mm: Nominal voltage	ه (ا ام) k\/·	12-36	
Weight (kg):		0.83	
Use:		Spark gap 12 kV 90-100 mm	
		Spark gap 24 kV 130-150 mm	
		Spark gap 36kV 220-250 mm Power arc device SDI27.2 is used with SDI90.x composite insulator	s on angle poles with
		suspension	s on angle poles with
		clamp SO181.6 and on tension poles with tension clamps SO255 or	SO256.
O tru ti il			
Construction:		Component Material	
		Al-parts Corrosion resistant aluminium alloy	
		Screws Hot dip galvanized steel Washers Stainless steel	
		The package includes arching 2 pcs horns SDI 10.2 and 95 mm ² co	nductor PE I 90 with
		screw type cable lugs.	
Installation:		One end of the conductor will be installed on the clamp and other end	nd on the SDI 10.2
Tools required:		Articulated spanner ST 20	

www.ensto.com



PRODUCT CARD 20.9.2011

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SML1.17

Name:	Cable lug with shear head bolts		
	Al/Cu 10-95 mm², Ø13		
Туре:	SML1.17		
EAN:	6418677457555		S
Description:	The cable lug is used for terminating conductors of cables up to 36 kV. Because of the shear head bolt construction, no crimping tools are needed. The required torque is achieved by tightening the bolt until it breaks off. The adapter needed in tightening is included in the package.	6	
	The lug is water tight. It is suitable for aluminium and copper conductors: solid and stranded, sector shaped and circular.□ □ □	Ö	<u>ب</u> (
Package: Unit:	20/2100 PCS		*@ :-

Technical specification

Conductor size mm ² :	Al/Cu 10-95
Weight (kg):	0.095
A mm:	74
B mm:	26
C mm:	17
D mm:	14
E mm:	13
F mm:	13
Hole diameter mm:	13

PRODUCT SPECIFICATION

9.6.2011

SDI10.2

ENSTO

Name:	Power arc	device	
	For tension	n insulators	
Туре:	SDI10.2		7
EAN:	64186774	10673	
Description:	lines. SDI tension ins	10.2 includes to sulator so that the	h tension insulator type SDI90 on covered conductor o horns, which are fixed to the metal parts of the e peaks are towards each other and the distance - 150 mm at 24 kV. □
	Arc fault te		
	Arc test 2:	x 10 kA, 1s⊡	A 012±0,4
	Short circu	iit test:□	
	l1s=11,5 k Idyn=29 k/	A, 1s⊡	Smith Hittense (Sk
Package:	15/945		
Unit:	PCS		
Technical spec	ification		
Arc gap mm:		95-230	
Nominal voltage	e (Un) kV:	12-36	
Weight (kg):		0.58	
Tightening torqu	ue Nm:	44	
Use:		Arcing prot	ction horns for the suspension insulator SDI80.n. The
		power arc o	evice is designed particularly for the small arc
		currents.	
Construction:		Componer	t Material
		Al parts	Corrosion resistant aluminium alloy, tensile strength 300 N/ mm ²
		Screws	Hot-dip galvanised
		Washers	Stainless steel
			0.2 consists of following parts:
		·	f Arc horns PSS891 and fixing elements
Installation:			re mounted on the insulator end fittings. The screws of have to be tightened to torque of 44 Nm.
Tools required		Articulated	spanner ST20.
Markings:		SDI 10.2	ur .
		44 Nm	
			82

P.O.Box 77 06101 Porvoo, Finland

Construction of the local division of the lo

ENSTO

PK557

Ν	ame:	

Type:

EAN:

End cap 50-157 mm² PK557

6438100306915

Description: Package: Unit:

PK557 is used for preventing water entry into the end of the branch cable. 120

PCS

Technical specification

Conductor size mm²: 50-157 Weight (kg): Conductor diameter mm:

Construction:	Component	t Material
	Body	UV-resistant elastom
Markings:	Ensto, Ø12,	7-22,3 and PMR2720

Standard:

0.007 12.7-22.3

mer EN 50397-2:2009 clause 7.6



BAPHO C OPV Tel. +358 204 76 21 Ensio Miettisen katu 2 www.ensto.com

Ensto Finland Oy

P.O.Box 77 06101 Porvoo, Finland Fax +358 204 76 2770



PRODUCT SPECIFICATION

20.9.2011



CERTIFICATE FI 27049



Our Ref. 258614-8

Connector for overhead lines
SO256 SO256.2
ENSTO
Ensto Finland Oy Ensio Miettisen katu 2 FI-06150 PORVOO, FINLAND
Ensto Finland Oy Ensto Utility Networks Ensio Miettisen katu 2 FI-06150 PORVOO, FINLAND
Tension clamp for covered conductors PAS/BLL 95 – 157 mm ² AlMgSi Conductor diameter 16,1 – 22,3 mm Tightening torque 40 Nm SMFL 30 kN
EN 50397-2:2009
This certificate is valid until 13 October 2016 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.
13 October 2011
SGS Fimko Ltd Sixten Lökfors Project Manager

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Appendix to Certificate:

27049

P150

Manufacturing site

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

Additional Information

SO256.2 with adapter for hoist hook.

Additional parts for tension clamps SO256 and SO256.2: Power arc device SDI27.2 including power arc horns SDI10.2 and PEJ90 conductor with screw type cable lugs SML 1.17. End cap PK557.

is based on test

Tests made in manufacturer's premises, witnessed by SGS Fimko Ltd.

Manufacturer's test reports: 2166S, 2176S, 2165S, 2177S, 2106s, 1938S, 1939S, 2087S, 2089S, 2091S, 2092S, 2094S, 2095S, 2097S, 2098S, 2100S, 2101S, 2103S, 2104S, 2191 and 2170S

Solar simulator test reports: 050810_SO256, 071210_SDI27-1 and 050111_SDI10_2

SGS Fimko test report: 251420_SML1-17







LABORATORY REPORT No.: 2166S Revision: A Page: 1/5 Date of Test: 19.4. and 16.6.2011

Test object:

Tension clamp SO256 and SO256.2.

Purpose of the test and relevant standards:

Part of type test.

Visual examination test and Dimensional and material verification test, according to EN 50397-2:2009 clause 7.1 and 7.2.

Conclusion:

The clamp passed the test.

Picture 1: Tested clamp SO256

Date of Report: 20.6.2011

Tested by: Patrick Ekholm

Reviewed by: Janne Lappalainen

Witnessed by: Sami Hakonen / SGS Fimko

UTILITY NETWORKS

LABORATORY

Ordered by: V.Vilenius 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

ENSTO

LABORATORY REPORT

No.: 2166S Revision: A Page: 2/5

1. Test objects

Clamp:

Type: Batch number: Conductor range: Conductor diameter: Tightening torque: No of pcs:

Type: Batch number: Conductor range: Conductor diameter: Tightening torque: No of pcs: Tension clamp SO256 0-series 95 – 157 mm² 16,1 – 22,3 mm 40Nm 1

Tension clamp SO256.2 0-series 95 – 157 mm² 16,1 – 22,3 mm 40Nm 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.





LABORATORY REPORT

No.: 2166S Revision: A Page: 3/5

3. Test results

ENSTO

<u>SO256</u>

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:	SO256
Batch number (production date):	09/2011
Minimum and maximum cross section:	95-157mm ²
Tightening torque:	40Nm

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	46	46,2
Body length	201	201,9
Body width	95	94,4
Clamping piece width	64	64,3
Bail diameter	8,93±0,15	8,83
Bail radius	≥ 12	> 12





LABORATORY REPORT

No.: 2166S Revision: A Page: 4/5

SO256.2

ENSTO

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:	SO256.2
Batch number (production date):	24/2011
Minimum and maximum cross section:	95-157mm ²
Tightening torque:	40Nm

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	49	48,0
Body length	201	200,0
Body width	95	94,7
Clamping piece width	64	63,9
Bail diameter	8,93±0,15	8,9
Bail radius	≥ 12	> 12



Picture 3: Specification drawing

Summary:

The clamps fulfilled all test requirements.



LABORATORY REPORT

No.: 2166S Revision: A Page: 5/5

4. Pictures

ENSTO



Pictures 4 to 5: Clamp markings

5. Test equipment

ID	TYPE	MODEL	PURPOSE
A227	Calliper	Limit	Dimension measurements
	Steel sleeve	Ø 24,1 mm	Radius check

6. Test Id

1213

7. Revision history

А



LABORATORY REPORT No.: 2176S Revision: A Page: 1/5 Date of Test: 26.5.2011

Test object:

Power arc device SDI27.2.

Purpose of the test and relevant standards:

Part of type test. Visual examination test and Dimensional and material verification test, according to EN 50397-2:2009 clause 7.1 and 7.2.

Conclusion:

The power arc device passed the test.



Picture 1: Tested power arc device SDI27.2



Date of Report: 30.5.2011

Tested by: Patrick Ekholm

C Reviewed by: Janne Lappalainen

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Witnessed by: Sami Hakonen / SGS Fimko

Ordered by: V.Vilenius 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 78 21 Fax +358 204 76 2770 Business ID: 0130215-6 Reg. Office: Porvoo

Saves Your Energy LABORATORY REPORT No.: 2176S ENSTO Revision: A Page: 2/5 1. Test objects Power arc device: Type: Batch number: SDI27.2 0-series 44Nm Tightening torque: No of pcs: 1

LABORATORY REPORT

No.: 2176S Revision: A Page: 3/5

2. Testing procedure

ENSTO

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 power arc device shall fulfil the manufacturer specification data and standard requirement.

3. Test results

Visual examination:

The power arc device was visually looking the same as in the specification drawing,

The power arc device includes following parts:

- 2 x power arc device SDI10.2
- 1 x PEJ90 (95mm² conductor with screw type cable lugs SML1.17)
- 1 x M10 nut + Stainless steel washer

Markings on power arc device SDI10.2 were found:

Product code: Tightening torque: SDI10.2 44Nm



ENSTO

LABORATORY REPORT

No.: 2176S Revision: A Page: 4/5

Dimensional and material verification:

All samples were within specification requirements. Power arc device dimensions were within specification tolerances, see picture 2.

Distance	Requirement [mm]	Measured [mm]	
Arching horn diameter	12 ± 0,4	11,9	



Ø12±0,4

Picture 2: Specification drawing

Summary:

The power arc device fulfilled all test requirements.

LABORATORY REPORT

No.: 2176S Revision: A Page: 5/5

4. Pictures

ENSTO



Picture 3: Power arc device SDI10.2 markings

5. Test equipment

	ID	TYPE		MODEL	PURPOSE		
	A227	Calliper		Limit	Dimension measurements		
6.	<u>Test Id</u>						
	791						
7.	<u>Revisior</u>	n history					

А





LABORATORY REPORT No.: 2165S Revision: A Page: 1/3 Date of Test: 24.3.2011

Test object:

Tension clamp SO256.

Purpose of the test and relevant standards:

Part of type test. Test for permanent marking according to EN 50397-2:2009 clause 7.3.

Conclusion:

The clamp passed the test.

Picture 1: Tested clamp SO256

5

Date of Report: 23.5.2011

Tested by: Patrick Ekholm

Reviewed by: Janne Lappalainen

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Witnessed by: Sami Hakonen / SGS Fimko

Ordered by: V.Vilenius Distribution: OHL PD-team

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LABORATORY REPORT

No.: 2165S Revision: A Page: 2/3

1. Test objects

ENSTO

Clamp:

Type: Batch number: Conductor range: Conductor diameter: Tightening torque: No of pcs: Tension clamp SO256 0-series $95 - 157 \text{ mm}^2$ 16,1 - 22,3 mm40Nm3

2. Testing procedure

The test procedure was acc. to standard. The marking of the clamp 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

Requirement:

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

3. Test results

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



LABORATORY REPORT No.: 2165S Revision: A

Page: 3/3

4. Pictures

ENSTO



Picture 2: Markings after test



Picture 3: Markings after test

5. Test equipment

No special test equipment needed

6. Test Id

1213

- 7. Revision history
 - A



LABORATORY REPORT No.: 2177S Revision: A Page: 1/3 Date of Test: 26.5.2011

Test object:

Power arc device SDI10.2.

Purpose of the test and relevant standards:

Part of type test. Test for permanent marking according to EN 50397-2:2009 clause 7.3.

Conclusion:

The power arc device passed the test.



Picture 1: Tested power arc device SDI10.2



Date of Report: 30.5.2011

Tested by: Patrick Ekholm

Reviewed by: Janne Lappalainen

Witnessed by: Sami Hakonen / SGS Fimko

Ordered by: V.Vilenius Distribution: OHL PD-team

