



2H1383
ДСТУ ISO/IEC 17025

Атестат акредитації
№ 2H1383
Дійсний до
16 червня 2021 року

79035, Україна, м. Львів
вул. М.Пимоненко, 3
тел.:(032) 294-82-87,
e-mail: lablizo@ukr.net

Accreditation certificate
№ 2H1383
Expiry date:
16 June, 2021

79035, Ukraine, Lviv
st. Pymonenko, 3
Tel. : (032) 294-82-87,
e-mail: lablizo@ukr.net



Approved by
The head of the
testing laboratory
of "LIZO Ltd."

[Signature]
D.R. Dovgun
26 11 2020

TYPE TEST REPORT № 42/20

of the anchoring clamp PA 25 testing

Requirements: EN 50483:2009, the manufacturer's specifications.

The test methods: EN 50483:2009.

Product name: Anchoring clamp

Model and type: PA 25

Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Reason: Contract № 12-06-20 of 25.06.2020

Tests result: ***Anchoring clamp PA 25 passed the tests by the indicated parameters, satisfy the manufacturer's declared characteristics and requirements of EN 50483:2009.***

(the testing results are given in the additional testing reports №№ 42/20-1 ... 42/20-8 which are the integral part of this testing report)

List and numbers of the testing reports where the testing results are given

Test	Testing report
1. Visual examination test and dimensional and material verification test (EN 50483 1:2009 Annex A, Table A.1 and clause 6)	42/20-1
2. Test for permanent marking (EN 50483 - 1:2009 clause 9.2)	42/20-2
3. Tensile test at ambient temperature (EN 50483 - 2:2009 clause 8.1.1, clause 8.3.1 and clause 8.3.2)	42/20-3
4. Tensile test at high temperature (EN 50483 - 2:2009 clause 8.1.3, clause 8.3.1 and clause 8.3.2)	42/20-4
5. Tensile test at low temperature (EN 50483 - 2:2009 clause 8.1.4)	42/20-5
6. Corrosion aging test (EN 50483 - 2:2009 clause 8.5.1 method 1, EN 50483-6:2009 clauses 8.4.1 and clause 8.4.2 method 1)	42/20-6
7. Climatic aging test (EN 50483 - 2:2009 clause 8.5.2 method 2, clause 8.1.1 and clause 8.3.1, EN 50483-6:2009 clause 8.5.2)	42/20-7

CLAMP CHARACTERISTICS

**Name:**

Anchoring clamp.

Model and type:

PA 25.

Purpose:

For anchoring clamping of 2- and 4-cores tap-off aerial bundled cables (ABC).

Technical characteristics

Conductors cross-sections:

2 - 4x(16 – 25) mm².

Bolt tightening torque:

-.

Minimum breaking load of the clamp declared by the manufacturer (SMFL):

2 kN.

Batch number:

07/19.

Installation temperature:

from -10 °C to +50 °C.

Weight:

120 g (± 3%).

Overall dimension (L / W / H):

(179 ± 3) mm / (26,5 ± 2) mm / (49 ± 2) mm.

Engineering data

Body and wedges:

Polyamide resistant to UV, wet and temperature difference.

Wedges holder:

Rubber.

Bracket:

Hot deep galvanized steel.

The tests were performed by:

Deputy head of the testing laboratory:

 S. S. Lakhovskyi


Engineer:

 O. O. Nepyivoda

Engineer:

 D. S. Denys

Engineer:

 A. S. Shevtsiv



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2020

TESTING REPORT № 42/20-1

***Visual examination test and dimensional and material verification test of
anchoring clamps PA 25***

Requirements: EN 50483-1:2009 Annex A, Table A.1 and clause 6.

The test methods: EN 50483:2009.

Product name: Anchoring clamp

Model and type: PA 25

Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Reason: Contract № 12-06-20 of 25.06.2020

Testing results: ***Anchoring clamps PA 25 satisfy the manufacturer's
declared characteristics and requirements of
EN 50483-1:2009 Annex A, Table A.1 and clause 6.***

This testing report is valid only for the tested samples.

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Lviv - 2020

Samples' receiving date: 15.07.2020
 Quantity of the tested samples: 1.
 Identification numbers of the samples: №1.
 The testing dates: 17.07.2020.
 The environmental conditions
 temperature: 23,6 °C;
 air pressure: 97,2 kPa;
 humidity: 70 %.

1. Tested samples:

Technical characteristics

Model and type: PA 25
 Conductors cross-sections: 2 - 4x(16 – 25) mm².
 Bolt tightening torque: -.
 Minimum breaking load of the clamp declared by the manufacturer (SMFL): 2 kN.
 Batch number: 07/19.
 Installation temperature: from -10 °C to +50 °C.

2. Testing procedure:

Verification was performed visually, by the method of measuring and material's determining.

3. Requirements:

Samples shall be made of the materials declared by the manufacturer and to correspond with the dimensions from the drawings. Marking shall be marked in accordance with EN 50483-1:2009 clause 6.

4. Testing results:

Table 1 – The materials, used in production of anchoring clamp PA 25

№	Component	Material	Correspondence with requirements
1	Body and wedges	Polyamide resistant to UV	Satisfy
2	Wedges holder	Rubber	Satisfy
3	Bracket	Hot deep galvanized steel	Satisfy

Table 2 – Dimensions of the tension clamp PA 25

№	Dimension	Declared, mm	In fact, mm	Correspondence with requirements
1	Length	179,0 ± 3	179,0	Satisfy
2	Width	26,5 ± 2	27,5	Satisfy
3	Height	83,0 ± 2	83,0	Satisfy

Table 3 – Visual examination of the tension clamp PA 25

№	Controlled marking items	Factual marking	Correspondence with requirements
1	Manufacturer's trade mark or logo	FEMAN	Satisfy
2	Product code or reference	PA 25	Satisfy
3	Traceability code / batch number	CKS170841	Satisfy
4	The minimum and maximum conductor cross sections for which the unit is suitable, mm ²	2x16 4x25	Satisfy
5	Tightening torque or die reference, if applicable	-	-
6	Recycling code, if any	-	-

There are no defects found during the visual examination of anchoring clamp PA 25. Submitted testing sample were not used earlier and wasn't processed additionally before the testing. The clamp corresponds with the dimensions from the drawings and is made from the materials declared by the manufacturer. The information about manufacturer, product type and reference, usage parameters are clear indicated at sample (Fig.1).

5. Conclusion:

Anchoring clamp PA 25 satisfy the manufacturer's declared characteristics and requirements of EN 50483-1:2009 Table A.1 and clause 6.

6. Pictures:



Fig.1 – Sample marking

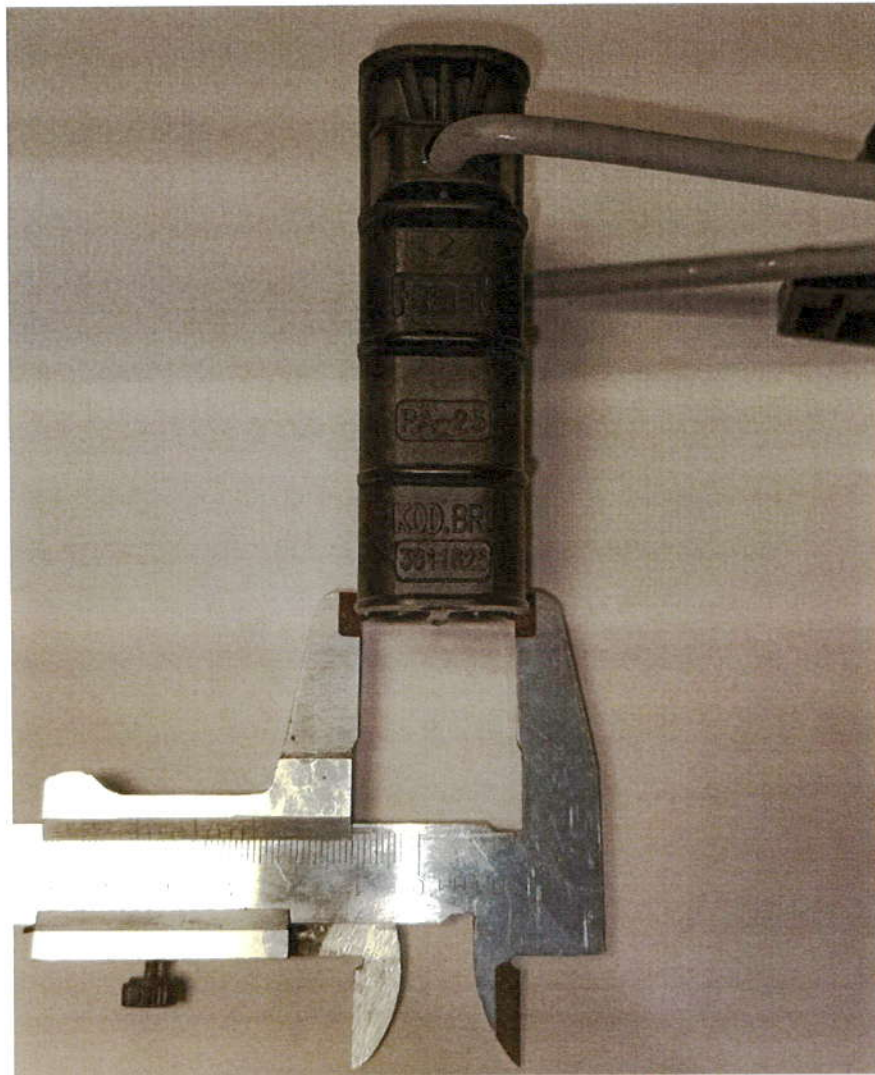


Fig.2 – Sample during the dimension's measurement



7. Test equipment:

№	Type	Model	Latest calibration
1	Slide gauge	ШЦ-1 №0701295	05.04.2020
2	Ruler 1m	VaGo-Tools №003	05.04.2020

The tests were performed by:

Deputy head of the testing laboratory:

Engineer:

 S. S. Lakhovskyi
 A. S. Shevtsiv



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D.R. Dovgun

26 » 2020

TESTING REPORT № 42/20-2

Test for permanent marking of tension clamp PA 25

Requirements: EN 50483-1:2009 clause 9.2.4.

The test methods: EN 50483-1:2009 clause 9.2.

Product name: Anchoring clamp

Model and type: PA 25

**Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia**

**Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia**

Reason: Contract № 12-06-20 of 25.06.2020

Testing results: *The anchoring clamps PA200 have passed the test for marking resistance, satisfy manufacturer's declared characteristics and requirements of EN 50483-1:2009 clause 9.2.*

This testing report is valid only for the tested samples.

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Lviv - 2020

Samples' receiving date:	15.07.2020
Quantity of the tested samples:	2.
Identification numbers of the samples:	№1, №2.
The testing dates:	17.07.2020.
The environmental conditions	
temperature:	23,6 °C;
air pressure:	97,2 kPa;
humidity:	70 %.

1. Tested samples:

Technical characteristics

Model and type:	PA 25
Conductors cross-sections:	2 - 4x(16 – 25) mm ² .
Bolt tightening torque:	-.
Minimum breaking load of the clamp declared by the manufacturer (SMFL):	2 kN.
Batch number:	07/19.
Installation temperature:	from -10 °C to +50 °C.

2. Testing procedure:

The tests are performed in accordance with EN 50483-1:2009 clause 9.2.

The tests perform at two samples of the suspension assemblies. The marking of the suspension assemblies are rubbed by hand for 15 s with a piece of cloth soaked by water and another 15 s with a piece of cloth soaked by petroleum spirit.

3. Requirements:

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

4. Testing results:

The test for permanent marking was not carried out because marking of the anchoring clamps is relief, plotted by casting. The marking remains clear and allows the assembly to be easily identified (Fig.1).

5. Conclusion:

Marking of the anchoring clamps PA 25 remains clear, allows the assembly to be easily identified and satisfy requirements of EN 50483-1:2009 clause 9.2.

6. Pictures:



Fig.1 – Marking of the samples

The tests were performed by:

Deputy head of the testing laboratory:

S. S. Lakhovskyi

Engineer:

A. S. Shevtsiv



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[Signature] D.R. Dovgun
26/06/2020

TESTING REPORT № 42/20-3

Tensile test of anchoring clamps PA 25 at ambient temperature

Requirements: EN 50483 - 2:2009 clause 8.1.1.4.

The test methods: EN 50483 - 2:2009 clause 8.1.1.

Product name: Anchoring clamp

Model and type: PA 25

Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Reason: Contract № 12-06-20 of 25.06.2020

Testing results: ***Anchoring clamps PA 25 passed tensile test at ambient temperature, satisfies manufacturer's declared characteristics and requirements of EN 50483-2:2009 clause 8.1.1.***

This testing report is valid only for the tested samples.

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Lviv - 2020

Samples' receiving date: 15.07.2020
 Quantity of the tested samples: 4.
 Identification numbers of the samples: №3, №4, №5, №6.
 The testing dates: 17.07.2020.
 The environmental conditions
 temperature: 24,2 °C;
 air pressure: 96,8 kPa;
 humidity: 72 %.

1. Tested samples:

Technical characteristics

Model and type: PA 25
 Conductors cross-sections: 2 - 4x(16 – 25) mm².
 Bolt tightening torque: -.
 Minimum breaking load of the clamp declared by the manufacturer (SMFL): 2 kN.
 Batch number: 07/19.
 Installation temperature: from -10 °C to +50 °C.

Conductors:

Type:	AsXSn 4x25	AsXSn 2x16
Conductor cross-section:	25 mm ²	16 mm ²
Cable diameter:	20,9 mm	15,0 mm
Conductor material:	Aluminum	Aluminum
Insulation thickness:	1,3 mm	1,2 mm
Insulation material:	XLPE	XLPE
Manufacturer / country:	PJSC «Yuzhcable works» / Ukraine	PJSC «Yuzhcable works» / Ukraine
Standard:	HD626:S1	HD626:S1

2. Testing procedure:

2.1 Tensile test.

The tests were performed in accordance with EN 50483-2:2009 clause 8.1.1.

Two samples were tested with maximum and minimum cables' cross-sections, which are indicated at the clamp. Dimension stabilization of cables insulation is performed during 1 hour in heat chamber with temperature which exceed rated temperature of the ABC to 30 °C.

The clamps were mounted at the conductors in accordance with manufacturer installation instruction and were installed into testing machine for tensile test as is shown at Fig. 1.

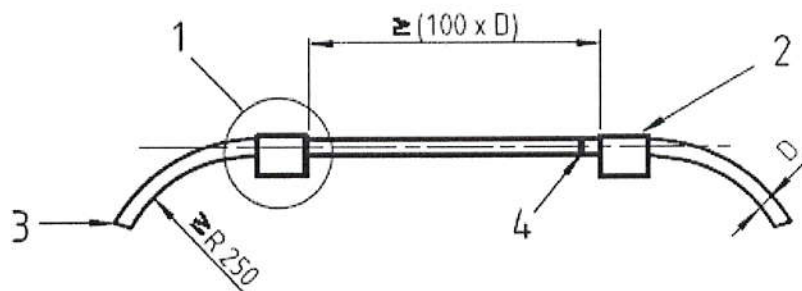
The length of free ends of the cable on the unloaded side of the clamps shall be a minimum of 350 mm with a minimum radius of 250 mm.

The span between two clamps shall be a minimum of $100\sqrt{D}$, where D is the circumscriber diameter of the areal bundled cable (ABC).

The tensile load was applied within 15 minutes of the clamp being assembled on to the ABC.

The load was increased to 20 % of MBL of the cable, and the cores were marked where they exit the clamps. The load was maintained at that value ± 10 % for 6 hours.

The load then was increased to a limit of 80 % of the MBL and was held for 60 s before the load were removed.



- | | |
|--|--------------------------------------|
| 1. Anchoring clamp; | 3. Length of free end ≥ 350 mm; |
| 2. Second anchoring clamp undergoing test; | 4. Marking. |

Fig.1 – Tensile test of the anchoring clamps

Dielectrical voltage test of the clamps and ABC were performed after the tensile test.

2.2 Dielectrical voltage test of the clamps.

The test was performed with EN 50483 - 2:2009 clause 8.3.1.

The conductors were replaced by conductive rods with the same diameter for conductors' insulation damaging simulation. The length of the rods were such that they protrude by 2 cm from both ends of the clamp.

A voltage of 4 kV a.c. was applied between the conductive rods and the clamp's metallic components.

2.3 Dielectrical voltage test of the ABC.

The test was performed in accordance with EN 50483 - 2:2009 clause 8.3.2.

The clamp was removed from the ABC. The ABC was immersed in water with ensuring that the section on which the clamp was mounted is completely immersed. The separate conductors of the ABC were electrically interconnected.

After the ABC was immersed in water during 1 hour a test voltage 4 kV during 1 minute was applied between the interconnected conductors and an electrode in contact with water in which the ABC is immersed.

3. Requirements:

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

Slippage of the cores of the cable relative to the clamp parts which are in contact shall not exceed 10 mm.

No failure or flashover of the clamps or ABC shall occurs during or after the dielectrical voltage test with voltage 4 kV during 1 min. The maximum leakage current shall not exceed $(10 \pm 0,5)$ mA in accordance with EN 50483-1:2009 clause 9.1.5.

4. Testing results:

Table 1 – Tensile test at ambient temperature results

№ n/n	Identification number of the clamp	Quantity and cross-section of the conductors, pcs. x mm ²	Minimum braking load of the clamp (SMFL), kN	Applied load 20% of SMFL during 6 hours, kN	Applied load 80% SMFL during 60 s, kN	Slippage, mm	Damages
1	3	2 x 16	2,0	0,4	1,6	0	Absent
2	4					0	Absent
3	5	4 x 25	2,0	0,4	1,6	0	Absent
4	6					0	Absent

Table 2 – Dielectrical voltage tests of clamps and ABC results after the tensile test at ambient temperature

№ n/n	Identification number of the clamp	Leakage current at dielectrical voltage test of the clamps with voltage 4 kV, mA	Failures, flashovers during dielectrical voltage test of the clamps with voltage 4 kV	Quantity and cross-section of the conductors, pcs. x mm ²	Leakage current at dielectrical voltage test of the ABC with voltage 4 kV, mA	Failures, flashovers during dielectrical voltage test of the ABC with voltage 4 kV
1	3	0	Absent	2 x 16	3,0	Absent
2	4	0	Absent		2,0	Absent
3	5	0	Absent	4 x 25	2,0	Absent
4	6	0	Absent		2,0	Absent

5. Conclusion:

No damage occurs which would affect the correct function of the anchoring clamps PA 25 after the tensile test at ambient temperature.

The slippage of ABC concerning the clamp not exceeds 10 mm.

The clamps and ABCs have passed the dielectrical voltage test.

Anchoring clamps PA 25 passed the tensile test at ambient temperature, satisfy manufacturer declared characteristics and requirement of EN 50483 - 2:2009 clause 8.1.1.

6. Pictures:

Fig. 2 – The clamp during the tensile test

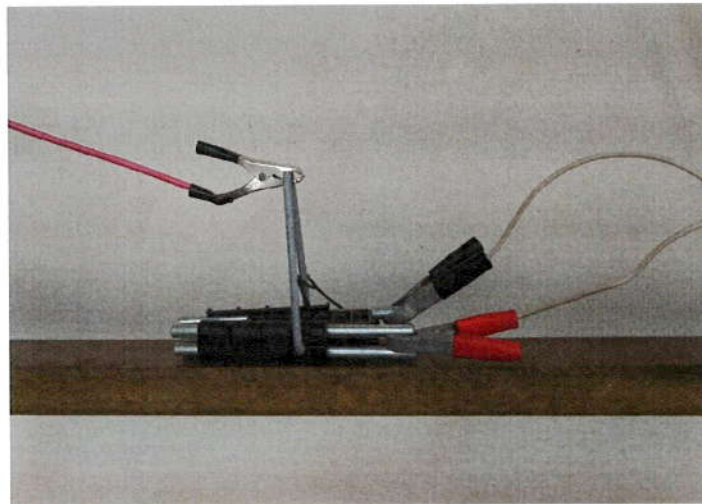


Fig. 3 – Clamps and ABC during the dielectrical voltage test

7. Test equipment:

№	Type	Model	Latest calibration date
1	Stopwatch	COСnp-26-2-010 №2284	24.04.2020
2	Ruler 1m	VaGo-Tools зав.№003	05.04.2020
3	Tensile test machine	ЛІЗО №001	Don't need calibration
4	Load sell	FB 50K №0032	06.04.2020
5	High voltage set	ЛІЗО №001	Don't need calibration
6	Voltmeter	E365-1 №913751	08.04.2020
7	Milliamperemeter	E377 №777768	08.04.2020
8	Heat chamber	ILKA №20200113	Don't need calibration
9	Measurement and control device with resistive temperature transducer	PT-0102 №14-070 ТСП-1388 №14-352	08.04.2020

The tests were performed by:

Deputy head of the testing laboratory:

Engineer:

 S. S. Lakhovskyi

 O. O. Nepyivoda





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D.R. Dovgun

26 » 2020

TESTING REPORT № 42/20-4

Tensile test of anchoring clamps PA 25 at high temperature

Requirements: EN 50483-2:2009 clause 8.1.3.4.

The test methods: EN 50483-2:2009 clause 8.1.3.

Product name: Anchoring clamp
Model and type: PA 25
Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia
Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia
Reason: Contract № 12-06-20 of 25.06.2020
Testing results: ***Anchoring clamps PA 25 passed tensile test at high temperature, satisfies manufacturer's declared characteristics and requirements of EN 50483-2:2009 clause 8.1.3.***

Samples' receiving date: 15.07.2020
 Quantity of the tested samples: 4.
 Identification numbers of the samples: №7, №8, №9, №10.
 The testing dates: 18.07.2020 - 12.09.2020.
 The environmental conditions
 temperature: (16 – 24) °C;
 air pressure: (96 – 101) kPa;
 humidity: (60 – 75) %.

1. Tested samples:

Technical characteristics

Model and type: PA 25
 Conductors cross-sections: 2 - 4x(16 – 25) mm².
 Bolt tightening torque: -.
 Minimum breaking load of the clamp declared by the manufacturer (SMFL): 2 kN.
 Batch number: 07/19.
 Installation temperature: from -10 °C to +50 °C.

Conductors:

Type:	AsXSn 4x25	AsXSn 2x16
Conductor cross-section:	25 mm ²	16 mm ²
Cable diameter:	20,9 mm	15,0 mm
Conductor material:	Aluminum	Aluminum
Insulation thickness:	1,3 mm	1,2 mm
Insulation material:	XLPE	XLPE
Manufacturer / country:	PJSC «Yuzhcable works» / Ukraine	PJSC «Yuzhcable works» / Ukraine
Standard:	HD626:S1	HD626:S1

2. Testing procedure:

2.1 Tensile test.

The tests were performed in accordance with EN 50483-2:2009 clause 8.1.3.

Two samples of clamp were tested with maximum and minimum cables' cross-sections, which are indicated at the clamp. Dimension stabilization of cables insulation is performed during 1 hour in heat chamber with temperature which exceed rated temperature of the ABC to 30 °C.

The clamps were mounted at the conductors in accordance with manufacturer installation instruction and were installed into testing machine for tensile test as is shown at Fig. 1.

The length of free ends of the cable on the unloaded side of the clamps shall be a minimum of 350 mm with a minimum radius of 250 mm.

The span between two clamps shall be a minimum of $100 \times \sqrt{D}$, where D is the circumscriber diameter of the areal bundled cable (ABC).

The test was carried out with a static load 18% of the clamp's minimum breaking load (SMFL) for 2-core ABC and 20% of SMFL for 4-core ABC.

The temperature was verified by passing current through the conductors. For 2-conductors ABC the current was flowing in both conductors and for 4-conductor ABC the current was flowing in 3 conductors.

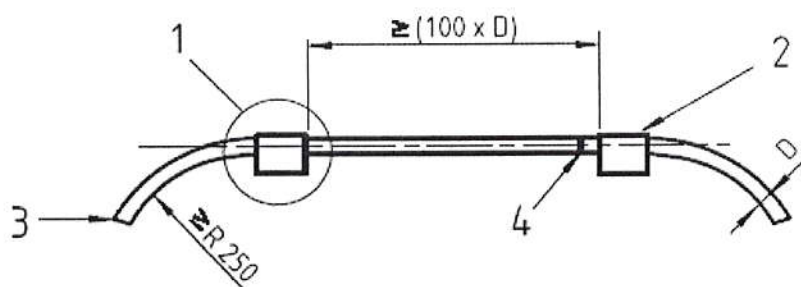
When the test load was reached for the first time, the cores were marked where they exit the clamps. These marks were used for reference purposes to measure slippage.

The clamps were not tightened or adjusted during the test.

The test was comprised of 100 heat cycles at a rate of 2 cycles per day during which time the tensile load was stabilized at $\pm 10\%$. The temperature was measured underneath the insulation with a thermocouple.

Each temperature cycle consisted of:

- Initial temperature was ambient;
- The conductor temperature was gradually increased to $(70 \pm 3) ^\circ\text{C}$ in less than 2 h;
- This high temperature was maintained for 8 h;
- The conductor was allowed to cool naturally to ambient temperature before the next cycle begins.



- | | |
|--|--------------------------------------|
| 1. Anchoring clamp; | 3. Length of free end ≥ 350 mm; |
| 2. Second anchoring clamp undergoing test; | 4. Marking. |

Fig.1 – Tensile test of the anchoring clamps

Dielectrical voltage tests of the clamps and ABC were performed after the tensile test at high temperature.

2.2 Dielectrical voltage test of the clamps.

The test was performed with EN 50483 - 2:2009 clause 8.3.1.

The conductors were replaced by conductive rods with the same diameter for conductors' insulation damaging simulation. The length of the rods were such that they protrude by 2 cm from both ends of the clamp.

A voltage 4 kV a.c. was applied between the conductive rods and the clamp's metallic components during 1 minute.

2.3 Dielectrical voltage test of the ABC.

The test was performed in accordance with EN 50483 - 2:2009 clause 8.3.2.

The clamp was removed from the ABC. The ABC was immersed in water with ensuring that the section on which the clamp was mounted is completely immersed. The separate conductors of the ABC were electrically interconnected.

After the ABC was immersed in water during 4 hours a test voltage 4 kV during 1 minute was applied between the interconnected conductors and an electrode in contact with water in which the ABC is immersed.

3. Requirements:

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

Slippage of the cores of the cable relative to the clamp parts which are in contact shall not exceed 10 mm after 10 days of the testing.

Slippage of the cores of the cable relative to the clamp parts which are in contact shall not exceed 12 mm at the end of the testing.

No failure or flashover of the clamps or ABC shall occurs during or after the dielectrical voltage test with voltage 4 kV during 1 min. The maximum leakage current shall not exceed $(10 \pm 0,5)$ mA in accordance with EN 50483-1:2009 clause 9.1.5.

4. Testing results:

Table 1 – Tensile test at high temperature results

№ n/n	Identification number of the clamp	Quantity and cross-section of the conductors, pcs. x mm ²	Minimum braking load of the clamp (SMFL), kN	Applied load 18% (20%) of SMFL during the cycles, kN	Slippage after 10 days of testing, mm	Slippage after 100 cycles of testing, mm	Damages
1	7	2 x 16	2,0	0,36	1,0	2,0	Absent
2	8				0,0	1,0	Absent
3	9	4 x 25	2,0	0,4	0,0	1,0	Absent
4	10				1,0	2,0	Absent

Table 2 – Dielectrical voltage tests of clamps and ABC results after the tensile test at high temperature

№ n/n	Identification number of the clamp	Leakage current at dielectrical voltage test of the clamps with voltage 4 kV, mA	Failures, flashovers during dielectrical voltage test of the clamps with voltage 4 kV	Quantity and cross-section of the conductors, pcs. x mm ²	Leakage current at dielectrical voltage test of the ABC with voltage 4 kV, mA	Failures, flashovers during dielectrical voltage test of the ABC with voltage 4 kV
1	7	0	Absent	2 x 16	4,5	Absent
2	8	0	Absent		4,0	Absent
3	9	0	Absent	4 x 25	5,0	Absent
4	10	0	Absent		5,0	Absent

5. Conclusion:

No damage occurs which would affect the correct function of the anchoring clamps PA 25 after the tensile test at high temperature 70 °C.

The slippage of ABC concerning the clamp not exceeds 10 mm after 10 days of the testing.

The slippage of ABC concerning the clamp not exceeds 12 mm at the end of the testing.

The clamps and ABCs have passed the dielectrical voltage test.

Anchoring clamps PA 25 passed the tensile test at high temperature 70 °C, satisfy manufacturer declared characteristics and requirement of EN 50483-2:2009 clause 8.1.3.

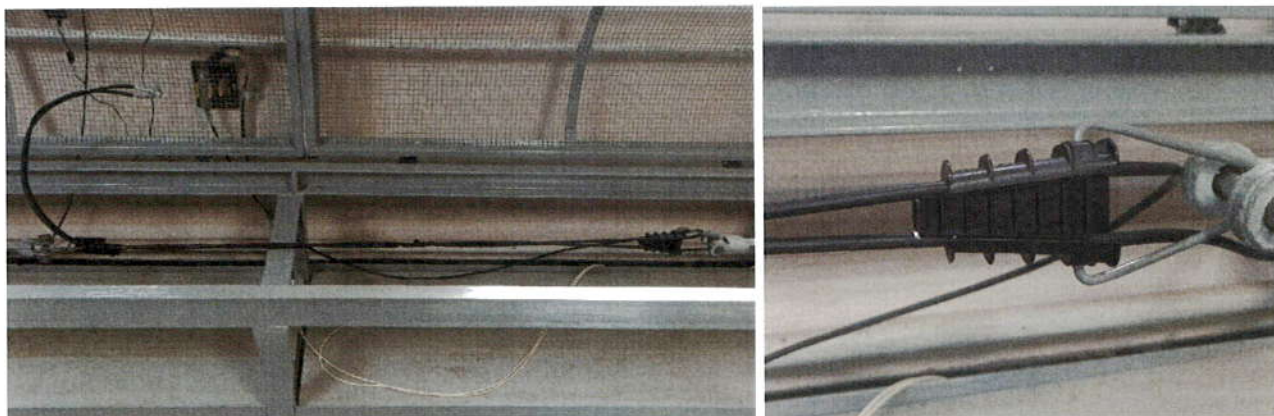
6. Pictures:

Fig. 2 – The clamp during the tensile test

7. Test equipment:

№	Type	Model	Latest calibration date
1	Stopwatch	СОСnp-26-2-010 №2284	24.04.2020
2	Ruler 1m	VaGo-Tools зав.№003	24.04.2020
3	Tensile test machine №001	ЛІЗО №001	Don't need calibration
4	Load sell	FB 50K №0032	06.04.2020
5	Current course for heat testing	ЛІЗО №001	Don't need calibration
6	Measurement and control device with resistive temperature transducer	PT-0102 №14-196 ТСП-0287 №14-011, №14-012	08.04.2020
7	Tensile test machine №002	ЛІЗО №001	Don't need calibration
8	Load sell	FB 20K №0048	06.04.2020
9	Current course for heat testing №2	ЛІЗО №001	Don't need calibration
10	Measurement and control device with resistive temperature transducer	PT-0102 №16-269 ТСП-0287 №16-021, №16-022	08.04.2020
11	High voltage set	ЛІЗО №001	Don't need calibration
12	Voltmeter	E365-1 №913751	08.04.2020
13	Milliamperemeter	E377 №777768	08.04.2020
14	Heat chamber	ILKA №20200113	Don't need calibration
15	Measurement and control device with resistive temperature transducer	PT-0102 №14-070 ТСП-1388 №14-352	08.04.2020

The tests were performed by:

Deputy head of the testing laboratory:

 S. S. Lakhovskyi


Engineer:

 O. O. Nepyivoda

Engineer:

 D. S. Denys

Engineer:

 A. S. Shevtsiv



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ДСТУ ISO/IEC 17025

Атестат акредитації
№ 2H1383
Дійсний до
16 червня 2021 року

79035, Україна, м. Львів
вул. М.Пимоненко, 3
тел.:(032) 294-82-87,
e-mail: lablizo@ukr.net

Accreditation certificate
№ 2H1383
Expiry date:
16 June, 2021

79035, Ukraine, Lviv
st. Pymonenko, 3
Tel. :(032) 294-82-87,
e-mail: lablizo@ukr.net



Approved by
The head of the
testing laboratory
of "LIZO Ltd."

 D.R. Dovgun
26 » 11 2020

TESTING REPORT № 42/20-5

Tensile test of anchoring clamps PA 25 at low temperature

Requirements: EN 50483-2:2009 clause 8.1.4.4.

The test methods: EN 50483-2:2009 clause 8.1.4.

Product name:	Anchoring clamp
Model and type:	PA 25
Manufacturer:	"FEMAN" D.O.O Vihorska 1, 35000 Jagodina, Serbia
Customer:	"FEMAN" D.O.O Vihorska 1, 35000 Jagodina, Serbia
Reason:	Contract № 12-06-20 of 25.06.2020
Testing results:	<i>Anchoring clamps PA 25 passed tensile test at low temperature, satisfies manufacturer's declared characteristics and requirements of EN 50483-2:2009 clause 8.1.4.</i>

This testing report is valid only for the tested samples.

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Lviv - 2020

Samples' receiving date:	15.07.2020
Quantity of the tested samples:	4.
Identification numbers of the samples:	№11, №12, №13, №14.
The testing dates:	13.09.2020 - 14.09.2020.
The environmental conditions	
temperature:	(22,4 – 22,9) °C;
air pressure:	(96,6 – 97,8) kPa;
humidity:	(68 – 71) %.

1. Tested samples:

Technical characteristics

Model and type:	PA 25
Conductors cross-sections:	2 - 4x(16 – 25) mm ² .
Bolt tightening torque:	-.
Minimum breaking load of the clamp declared by the manufacturer (SMFL):	2 kN.
Batch number:	07/19.
Installation temperature:	from -10 °C to +50 °C.

Conductors:

Type:	AsXSn 4x25	AsXSn 2x16
Conductor cross-section:	25 mm ²	16 mm ²
Cable diameter:	20,9 mm	15,0 mm
Conductor material:	Aluminum	Aluminum
Insulation thickness:	1,3 mm	1,2 mm
Insulation material:	XLPE	XLPE
Manufacturer / country:	PJSC «Yuzhcable works» / Ukraine	PJSC «Yuzhcable works» / Ukraine
Standard:	HD626:S1	HD626:S1

2. Testing procedure:

2.1 Tensile test.

The tests were performed in accordance with EN 50483-2:2009 clause 8.1.4.

Two samples of clamp were tested with maximum and minimum cables' cross-sections, which are indicated at the clamp. Dimension stabilization of cables insulation is performed during 1 hour in heat chamber with temperature which exceeds rated temperature of the ABC to 30°C.

The clamps were mounted at the conductors in accordance with manufacturer installation instruction and were installed into testing machine for tensile test as is shown at Fig. 1. One clamp was put into the cold chamber.

The length of free ends of the cable on the unloaded side of the clamps shall be a minimum of 350 mm with a minimum radius of 250 mm.

The span between two clamps shall be a minimum of $100\sqrt{D}$, where D is the circumscriber diameter of the areal bundled cable (ABC).

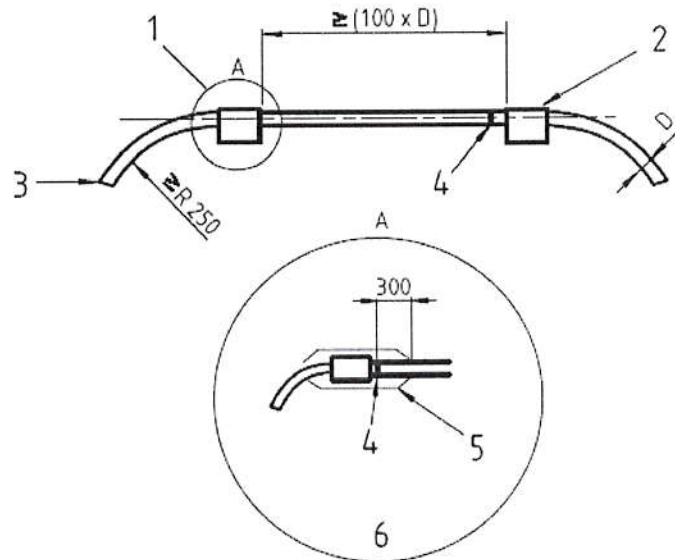
The cores were marked where they exit the clamps when the testing load reached 10N/mm² before cooling. These marks were used for reference purposes to measure slippage.

The test was carried out with a static load 40% of the clamp's minimum breaking load (SMFL) for 2-core ABC and 25% of SMFL for 4-core ABC.

One tension clamp and a 300 mm section of the ABC was put into the cold chamber and cooled to the temperature $(-10 \pm 3) ^\circ\text{C}$ for 24 h during which time a tensile load was maintained at the determined value with tolerance $\pm 10 \%$.

The clamps were not tightened or adjusted during the test.

The slippage measurement was performed after the end of testing.



- | | |
|--|--|
| 1. Anchoring clamp; | 4. Marking; |
| 2. Second anchoring clamp undergoing test; | 5. Low temperature zone; |
| 3. Length of free end ≥ 300 mm; | 6. Device for testing at low temperature |

Fig.1 – Tensile test of the tension clamps

3.Requirements:

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

Slippage of the cores of the cable relative to the clamp parts which are in contact shall not exceed 10 mm at the end of the testing.

4.Testing results:

Table 1 – Tensile test at low temperature $-10 ^\circ\text{C}$ results

№ n/n	Identification number of the clamp	Quantity and cross-section of the conductors, pcs. x mm ²	Minimum braking load of the clamp (SMFL), kN	Applied load 40% (25%) of SMFL during the testing, kN	Slippage after the testing, mm	Damages
1	11	2 x 16	2,0	0,36	0	Absent
2	12				0	Absent
3	13	4 x 25	2,0	0,4	0	Absent
4	14				0	Absent

5. Conclusion:

No damage occurs which would affect the correct function of the anchoring clamps PA 25 after the tensile test at low temperature $-10 ^\circ\text{C}$.

The slippage of ABC concerning the clamp not exceeds 10 mm at the end of the testing.

Anchoring clamps PA 25 passed the tensile test at low temperature $-10 ^\circ\text{C}$, satisfy manufacturer declared characteristics and requirement of EN 50483-2:2009 clause 8.1.4.

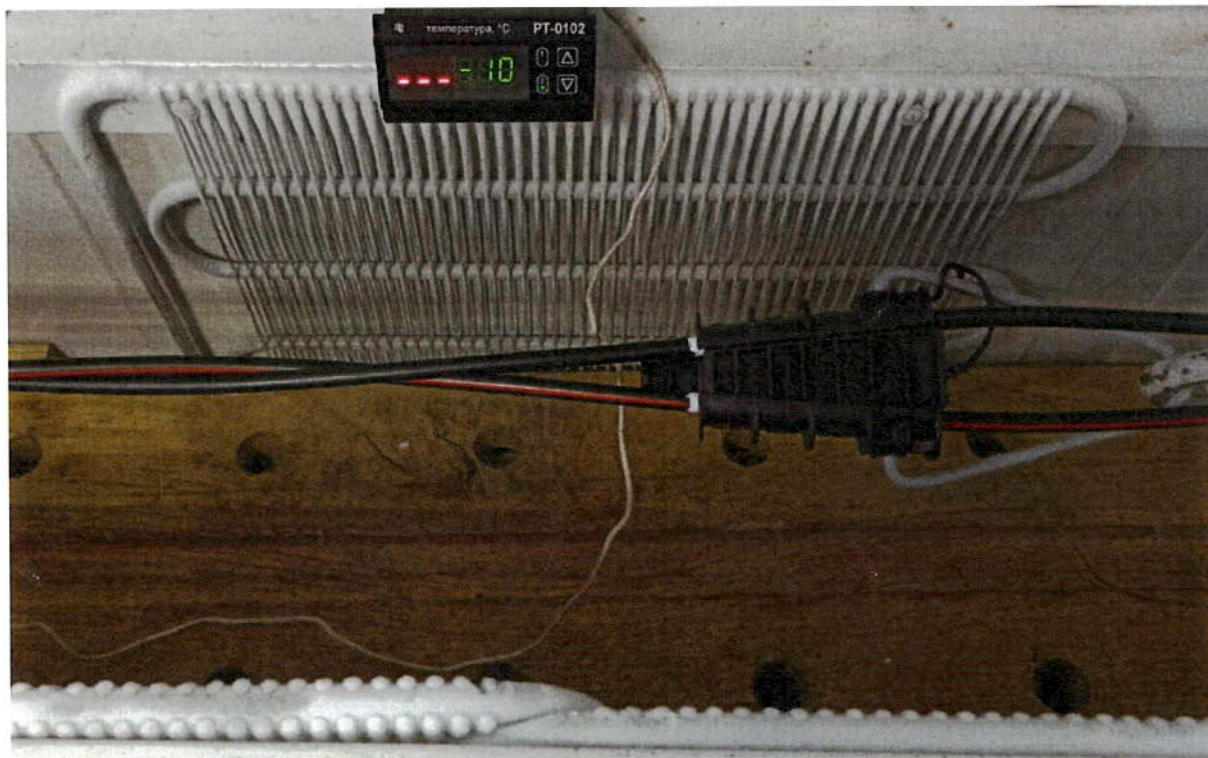
6. Pictures:

Fig. 2 – The clamp during the tensile test

7. Test equipment:

№	Type	Model	Latest calibration date
1	Stopwatch	СОСпр-26-2-010 №2284	24.04.2020
2	Ruler 1m	VaGo-Tools зав.№003	05.04.2020
3	Tensile test machine	ЛІЗО №001	Don't need calibration
4	Load sell	FB 50K №0032	06.04.2020
5	Cold chamber	ЛІЗО №001	Don't need calibration
6	Measurement and control device with resistive temperature transducer	PT-0102 №14-571 ТСП-1388 №14-039	08.04.2020
7	Heat chamber	ILKA №20200113	Don't need calibration
8	Measurement and control device with resistive temperature transducer	PT-0102 №14-070 ТСП-1388 №14-352	08.04.2020

The tests were performed by:

Deputy head of the testing laboratory:

S. S. Lakhovskyi

Engineer:

O. O. Nepyivoda

Engineer:

D. S. Denys



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79035, Україна, м. Львів
вул. М.Пимоненко, 3
тел.: (032) 294-82-87,
e-mail: lablizo@ukr.net

Accreditation certificate
№ 2H1383
Expiry date:
16 June, 2021

79035, Ukraine, Lviv
st. Pymonenko, 3
Tel.: (032) 294-82-87,
e-mail: lablizo@ukr.net



Approved by
The head of the
testing laboratory
of "LIZO Ltd."

D.R. Dovgun

26 » 2020

TESTING REPORT № 42/20-6
Corrosion aging test of anchoring clamp PA 25

Requirements: EN 50483-2:2009 clause 8.5.1.1.2.

The test methods: EN 50483-2:2009 clause 8.5.1, 8.5.1.2.1 method 1,
EN 50483-6:2009 clause 8.4.1 and clause 8.4.2 method 1.

Product name: Anchoring clamp
Model and type: PA 25
Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia
Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia
Reason: Contract № 12-06-20 of 25.06.2020
Testing results: ***Anchoring clamps PA 25 have passed the corrosion tests and satisfy the manufacturer's declared characteristics and requirements of EN 50483-2:2009 clause 8.5.1 method 1.***

Samples' receiving date: 15.07.2020
Quantity of the tested samples: 4.
Identification numbers of the samples: №17, №18, №19, №20.
The testing dates: 01.10.2020 - 25.11.2020.
The environmental conditions
temperature: (16 – 24) °C;
air pressure: (96 – 101) kPa;
humidity: (45 – 75) %.

1. Tested samples:

Technical characteristics

Model and type: PA 25
Conductors cross-sections: 2 - 4x(16 – 25) mm².
Bolt tightening torque: -.
Minimum breaking load of the clamp declared by the manufacturer (SMFL): 2 kN.
Batch number: 07/19.
Installation temperature: from -10 °C to +50 °C.

Conductors:

Type:	AsXSn 4x25	AsXSn 2x16
Conductor cross-section:	25 mm ²	16 mm ²
Cable diameter:	20,9 mm	15,0 mm
Conductor material:	Aluminum	Aluminum
Insulation thickness:	1,3 mm	1,2 mm
Insulation material:	XLPE	XLPE
Manufacturer / country:	PJSC «Yuzhcable works» / Ukraine	PJSC «Yuzhcable works» / Ukraine
Standard:	HD626:S1	HD626:S1

2. Testing procedure:

The tests were performed in accordance with EN 50483-2:2009 clause 8.5.1 method 1.

Two samples of clamps were tested with maximum and minimum cables' cross-sections, which are indicated at the clamp.

The tests were performed in 4 cycles of 14 days. The 14-day cycle consists of 7 days of continuously stay at salt fog chamber and of 7 days of continuously stay at chamber with higher temperature and humidity atmosphere saturated by sulfur dioxide (SO₂) in accordance with EN 50483-6:2009 clause 8.4.1 and clause 8.4.2.

2.1. Tensile test before the corrosion test.

Tensile test at ambient temperature was carried out in accordance with EN 50483-2:2009 clause 8.1.1 with the load reduced to 75% of the testing load. Testing procedure of the anchoring clamp PA 25 tensile test at ambient temperature is shown in the testing report №42/20-3.

2.2. Climatic aging test in the salt fog chamber.

The testing equipment and the testing procedure are corresponded with the requirements of EN60068-2-11:1999.

Dispersion of the salt fog are controlled during the tests by two prefabricated manifold with area 80 cm² of each. The fog gathered in each manifold with speed 1 – 2 ml/hour with average time of dispersion not less than 16 hours. At the testing chamber is utilized near 80 ml/hour of the brine on the area of the chamber's pan 550x550 mm.

The brine which is used for testing has weight-part concentration $(5 \pm 2) \%$. The pH of the brine is within the normal range of 6,5 to 7,2.

Compressed air without impurities of dust and oils with maintaining pressure 120 kPa \pm 50 kPa is used to generate the fog. The air is warmed and moistened before feeding to the pulverizer by passing through the heated to 40 °C water.

The temperature in the testing chamber is maintained $(35 \pm 2) ^\circ\text{C}$.

2.3. Climatic aging test in chamber with higher temperature and humidity atmosphere saturated by sulfur dioxide (SO₂).

The testing equipment and the testing procedure satisfy requirements of EN ISO 3231.

$(2 \pm 0,2)$ liters of distilled water are filled into the chamber before each cycle.

Sulfur dioxide in chamber with concentration 0,0667 % is made with the help of the reaction: sodium pyrosulfate (Na₂S₂O₅) and sulfamic acid (HSO₃ NH₂).

The temperature in the chamber is maintained $(40 \pm 3) ^\circ\text{C}$ for 8 hours. After that, the camera is open for 16 hours.

2.4. Tensile test after the corrosion test.

Repeat tensile test at ambient temperature was carried out in accordance with EN 50483-2:209 clause 8.1.1 after the corrosion test with the load, which was reduced to 55 % of the testing load. Testing procedure of the anchoring clamp PA 25 tensile test at ambient temperature is shown in the testing report №42/20-3.

3. Requirements:

At visual control, there shall be no significant traces of red rust (over 10% of the open surface of metal parts of the samples).

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

No deterioration of the main parts of the connectors shall occur which would impair their normal function.

The clamps have to satisfy requirement of the tensile test in accordance with EN 50483-2:2009 clause 8.1.1 for reduced to 55% value of the testing load after the corrosion test.

4. Testing results:

Table 1: Tensile testing at ambient temperature results before the corrosion tests

№	Identification number of clamp	Quantity and cross-section of the cable conductors, pcs.xmm ²	Minimum breaking load of the conductor (SMFL), kN	Load (75% of the testing load)		Damages
				After 6 houer, kN	After 60 s, kN	
1	17	2 x 16	2,0	0,3	1,2	Absent
2	18					Absent
3	19	4 x 25	2,0	0,3	1,2	Absent
4	20					Absent

The rust traces not exceed 10% of the open surface of metal parts of the samples. The sample's identification marking is legible when examined with normal or corrected vision without magnification. There are no deteriorations of the main parts of the clamp, which would impair their normal function.

The clamps satisfy requirement of the tensile test in accordance with EN 50483-2:2009 clause 8.1.1 for reduced to 55 % value of the testing load after the corrosion test.

Table 2: Tensile test at ambient temperature results after the corrosion tests

№	Identification number of clamp	Quantity and cross-section of the cable conductors, pcs.xmm ²	Minimum breaking load of the conductor (SMFL), kN	Load (55% of the testing load)		Damages
				After 6 houer, kN	After 60 s, kN	
1	17	2 x 16	2,0	0,2	0,9	Absent
2	18					Absent
3	19	4 x 25	2,0	0,2	0,9	Absent
4	20					Absent

5. Conclusion:

Anchoring clamps PA 25 after stay in the salt for chamber and in the chamber with higher temperature and humidity atmosphere saturated by sulfur dioxide passed the corrosion tests and satisfy manufacturer's declared characteristics and EN 50483-2:2009 clause 8.5.1 method 1.

6. Pictures:

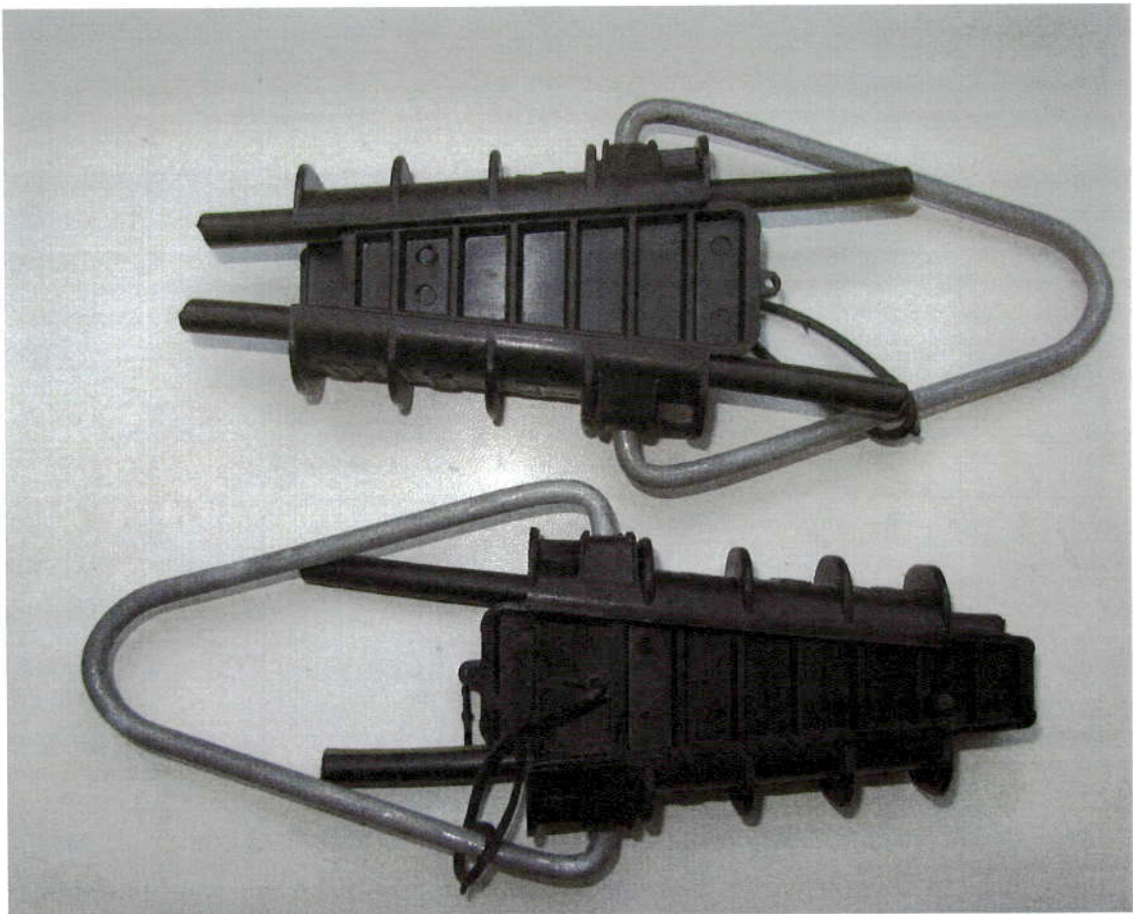


Fig.1 Clamps before the tests

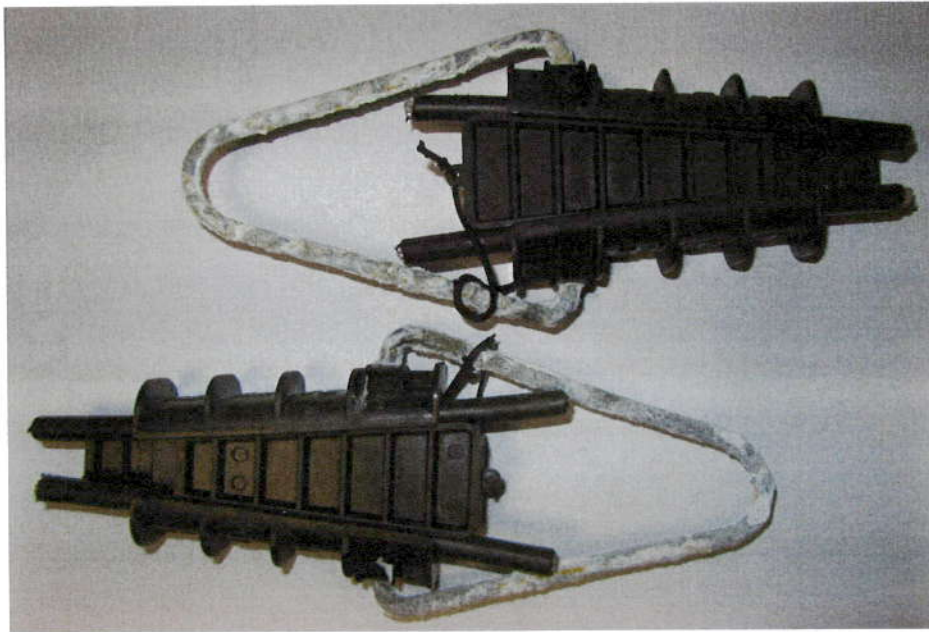


Fig.2 Clamps after the testing

7. Test equipment:

№	Type	Model	Latest calibration date
1	Stopwatch	СОСпр-26-2-010 №2284	24.04.2020
2	Ruler 1m	VaGo-Tools зав.№003	05.04.2020
3	Tensile test machine	ЛІЗО №001	Don't need calibration
4	Load sell	FB 50K №0032	05.04.2020
5	Salt fog chamber	ЛІЗО №1	Don't need calibration
6	Temperature measurement and control device with resistive temperature transducer	PT 0102 №14-558 ТСП-1388 №15-201	08.04.2020
7	pH meter	PH-009 inv.№00133	Calibrated before using
8	Working standard pH	PH 4,01±0,01	15.06.2020
9	Working standard pH	PH 7,00±0,01	15.06.2020
10	Chamber with higher temperature and humidity atmosphere saturated by sulfur dioxide	ЛІЗО №001	Don't need calibration
11	Temperature measurement and control device with resistive temperature transducer	PT 0102 №14-557 ТСП-1388 №15-201	08.04.2020
12	Heat chamber	ILKA №20200113	Don't need calibration
13	Measurement and control device with resistive temperature transducer	PT-0102 №14-070 ТСП-1388 №14-352	08.04.2020

The tests were performed by:

Deputy head of the testing laboratory:

 S. S. Lakhovskyi

Engineer:

 O. O. Nepyivoda

Engineer:

 D. S. Denys

Engineer:

 A. S. Shevtsiv



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79035, Україна, м. Львів
вул. М.Пимоненко, 3
тел.: (032) 294-82-87,
e-mail: lablizo@ukr.net

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79035, Ukraine, Lviv
st. Pymonenko, 3
Tel.: (032) 294-82-87,
e-mail: lablizo@ukr.net



Approved by
The head of the
testing laboratory
of "LIZO Ltd."

D.R. Dovgun

2020

TESTING REPORT № 42/20-7

Climatic aging test (UV-radiation) of anchoring clamp PA 25

Requirements: EN 50483-2:2009 clauses 8.5.2.3.

The test methods: EN 50483-2:2009 clauses 8.5.2, 8.5.2.2 method 2,
EN 50483-6:2009 clause 8.5.2.

Product name: Anchoring clamp

Model and type: PA 25

Manufacturer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Customer: "FEMAN" D.O.O
Vihorska 1, 35000 Jagodina, Serbia

Reason: Contract № 12-06-20 of 25.06.2020

Testing results: ***Anchoring clamps PA 25 have passed the climatic aging test (UV-radiation). Clamps satisfy the manufacturer's declared characteristics and requirements of EN 50483-2:2009 clauses 8.5.2 method 2.***

This testing report is valid only for the tested samples.

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Samples' receiving date: 15.07.2020
 Quantity of the tested samples: 4.
 Identification numbers of the samples: №21, №22, №23, №24.
 The testing dates: 16.07.2020 - 10.09.2020.
 The environmental conditions
 temperature: (16 – 24) °C;
 air pressure: (96 – 101) kPa;
 humidity: (45 – 75) %.

1. Tested samples:

Technical characteristics

Model and type: PA 25
 Conductors cross-sections: 2 - 4x(16 – 25) mm².
 Bolt tightening torque: -.
 Minimum breaking load of the clamp declared by the manufacturer (SMFL): 2 kN.
 Batch number: 07/19.
 Installation temperature: from -10 °C to +50 °C.

Conductors:

Type:	AsXSn 4x25	AsXSn 2x16
Conductor cross-section:	25 mm ²	16 mm ²
Cable diameter:	20,9 mm	15,0 mm
Conductor material:	Aluminum	Aluminum
Insulation thickness:	1,3 mm	1,2 mm
Insulation material:	XLPE	XLPE
Manufacturer / country:	PJSC «Yuzhcable works» / Ukraine	PJSC «Yuzhcable works» / Ukraine
Standard:	HD626:S1	HD626:S1

2. Testing procedure:

The tests were performed in accordance with EN 50483-2:2009 clause 8.5.2 method 2.

Two samples of anchoring clamps were tested with maximum and minimum cables' cross-sections, which are indicated at the clamp.

2.1. Tensile test before the climatic aging test.

Tensile test at ambient temperature was carried out in accordance with EN 50483-2:2009 clause 8.1.1 with the load reduced to 75% of the testing load. Testing procedure of the anchoring clamp PA 25 tensile test at ambient temperature is shown in the testing report №42/20-3.

2.2 Climatic aging test (UV-radiation).

Samples were tested for climatic aging in the solar radiation simulation chamber.

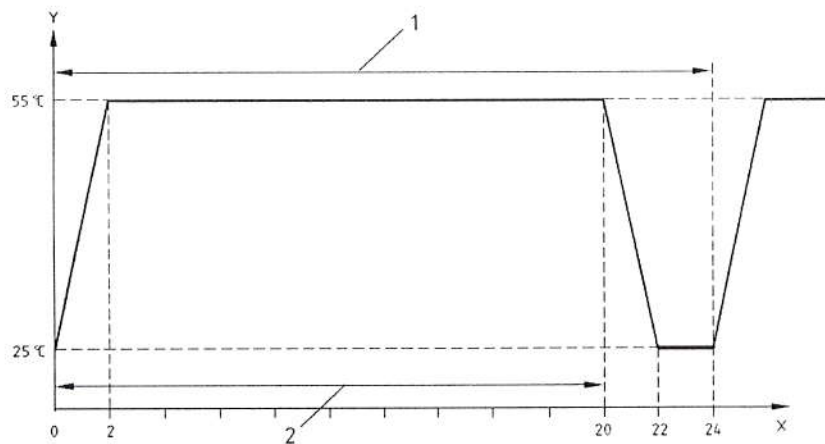
Testing chamber ensured radiation 1,120 kW/m² ±10% in the measuring plane with the spectral distribution according to Table 1. Radiation was irradiated by the cylindrical lamp with xenon arc, with power 1 kW, which was situated vertically at the center of the chamber. The clamp's samples were situated at the lamp center plane at the distance from the lamp center, which ensures the indicated power (1,120 kW/m² ±10%). The radiation was controlled by the radiometer in the

range of 300nm...400nm at the beginning of each cycle. Radiated power value was set 4,3 mW/cm² by the lamp electrical current change in case of necessity.

56 cycles with 24 hours durability were performed. Each cycle includes 20 hours of radiation and 4 hours with radiation power off with temperature modes in accordance with Fig. 1. The temperature was measured by the shielded from the heat source thermometer in the plane, which was situated 50 mm lower from the radiation measurement plane, at the middle of the distance from the sample to the chamber wall.

Table 1: Spectral energy distribution and the tolerance.

№	Spectral range	Ultraviolet B	Ultraviolet A	Visible light			Infrared radiation
1	Wavelength	0,28nm-0,32nm	0,32nm-0,40nm	0,40nm-0,52nm	0,52nm-0,64nm	0,64 nm - 0,78 nm	0,78 nm - 3,0 nm
2	Radiation power	5 W/m ²	63W/m ²	200W/m ²	186W/m ²	174 W/m ²	492 W/m ²
3	Tolerance	±35%	±25%	±10%	±10%	±10 %	±10 %



1. 1 cycle;
 2. Radiation period (20 hours);
 3. Y = temperature axis;
 4. X = time axis in hours.

Fig.1 Temperature - Radiation – Time dependence

2.3 Dielectrical voltage test

The dielectrical voltage test were performed in accordance with EN 50483-2:2009 clause 8.3.1.

The conductors were replaced by conductive rods with the same diameter for conductors' insulation damaging simulation. The length of the rods were such that they protrude by 2 cm from both ends of the clamp.

A voltage of 4 kV a.c. was applied between the conductive rods and the clamp's metallic components.

2.4. Tensile test after the corrosion test

Repeat tensile test at ambient temperature was carried out in accordance with EN 50483-2:209 clause 8.1.1 after the corrosion test with the load, reduced to 55% of the testing load. Testing procedure of the anchoring clamp PA 25 tensile test at ambient temperature is shown in the testing report №42/20-3.

3. Requirements:

There shall be no degradation of the main parts which will influence to the samples characteristics. The sample's identification marking should be legible when examined with normal and corrected vision.

No failure or flashover of the clamps shall occurs during or after the dielectrical voltage test with voltage 4 kV during 1 min. The maximum leakage current shall not exceed $(10 \pm 0,5)$ mA in accordance with EN 50483-1:2009 clause 9.1.5.

The clamps have to satisfy requirement of the tensile test in accordance with EN 50483-2:2009 clause 8.1.1 for reduced to 55 % value of the testing load after the corrosion test.

4. Testing results:

Table 2: Tensile testing at ambient temperature results before the climatic aging test

№	Identification number of clamp	Quantity and cross-section of the cable conductors, pcs.xmm ²	Minimum breaking load of the conductor (SMFL), kN	Load (75% of the testing load)		Damages
				After 6 houer, kN	After 60 s, kN	
1	17	2 x 16	2,0	0,3	1,2	Absent
2	18					Absent
3	19	4 x 25	2,0	0,3	1,2	Absent
4	20					Absent

The sample's identification marking remained legible when examined with normal and corrected vision.

There was no degradation of the main parts, which will influence to the samples characteristics.

Anchoring clamps satisfy requirement of the dielectrical voltage test in accordance with EN 50483-2:2009 clause 8.3.1.

The anchoring clamps PA 25 satisfy requirement of the tensile test in accordance with EN 50483-2:2009 clause 8.1.1 for reduced to 55 % value of the testing load after the climatic aging test.

Table 3: Tensile test at ambient temperature results after the climatic aging test

№	Identification number of clamp	Quantity and cross-section of the cable conductors, pcs.xmm ²	Minimum breaking load of the conductor (SMFL), kN	Load (55% of the testing load)		Damages
				After 6 houer, kN	After 60 s, kN	
1	17	2 x 16	2,0	0,2	0,9	Absent
2	18					Absent
3	19	4 x 25	2,0	0,2	0,9	Absent
4	20					Absent

5. Conclusion:

The anchoring clamp PA 25 have passed the climatic aging test (UV-radiation). Clamps satisfy the manufacturer's declared characteristics and requirements of EN 50483-2:2009 clauses 8.5.2 method 2

6. Pictures:

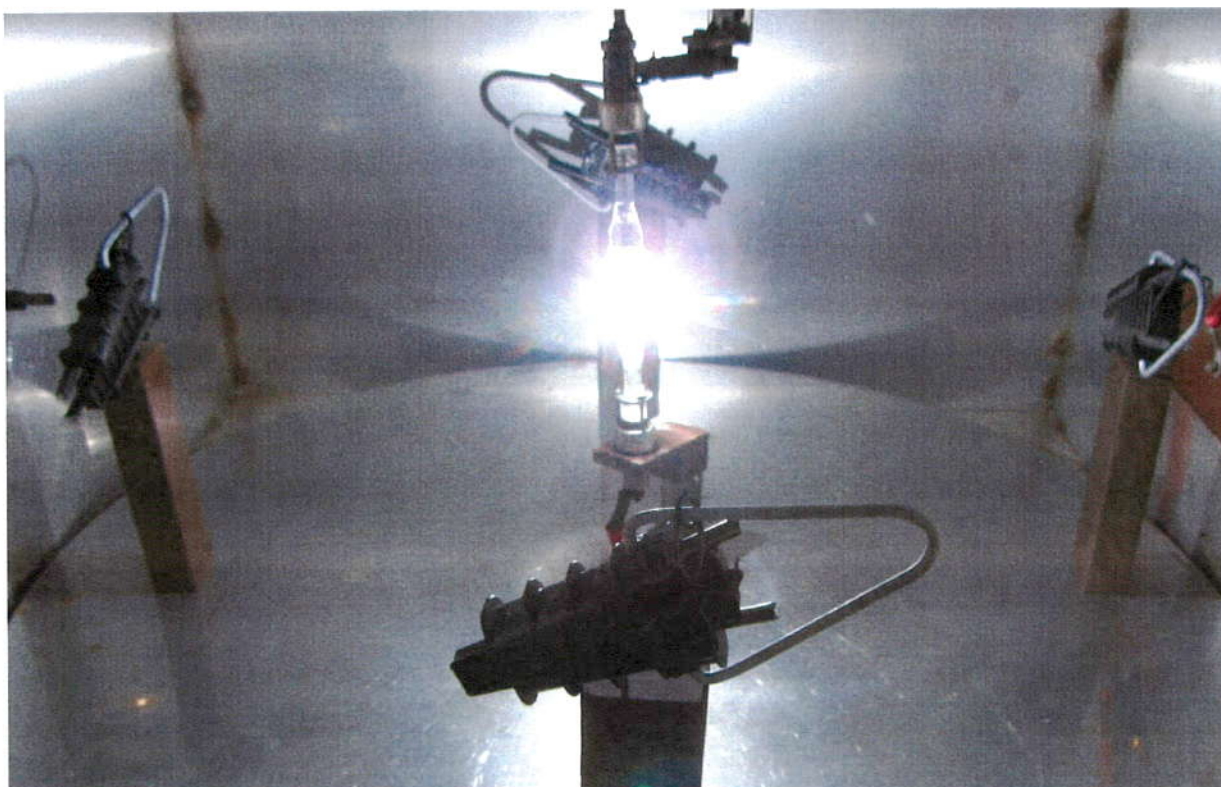


Fig. 2: Anchoring clamp during the testing in the solar radiation simulation chamber

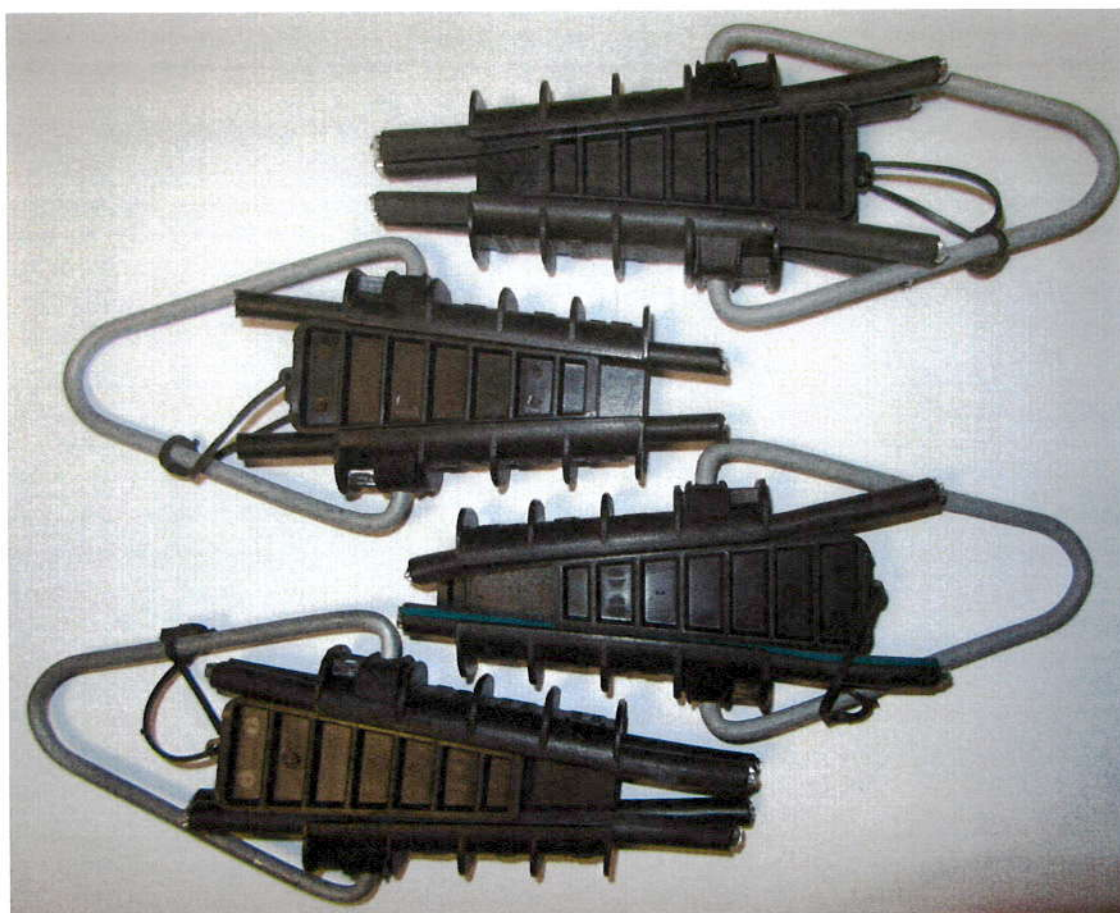


Fig. 3: Visibility of the tension clamp marking after the climatic aging test

7. Test equipment:

№	Type	Model	Latest calibration date
1	Stopwatch	СОСпр-26-2-010 №2284	08.04.2020
2	Ruler 1m	VaGo-Tools зав.№003	08.04.2020
3	Tensile test machine	ЛІЗО №001	Don't need calibration
4	Load sell	FB 50K №0032	08.04.2020
5	Solar radiation simulation chamber	ЛІЗО №001	Don't need calibration
6	Measurement and control device with resistive temperature transducer	PT-0102 №14-513 ТСП-1388 №14-026	31.03.2020
7	UV radiometer	ТЕН3ОР-31 №P028/2014	31.03.2020
8	High voltage set	ЛІЗО №001	Don't need calibration
9	Voltmeter	E365-1 №913751	08.04.2020
10	Milliamperemeter	E377 №777768	08.04.2020
11	Heat chamber	ILKA №20200113	Don't need calibration
12	Measurement and control device with resistive temperature transducer	PT-0102 №14-070 ТСП-1388 №14-352	08.04.2020

The tests were performed by:

Deputy head of the testing laboratory:


 S. S. Lakhovskyi


Engineer:


 O. O. Nepyivoda

Engineer:


 D. S. Denys

Engineer:


 A. S. Shevtsiv