



ELECTRICAL ENGINEERING INSTITUTE "NIKOLA
TESLA"

Electrical Measurements Center
Koste Glavinića 8a, Belgrade



Report No. 414100

COMPONENTS FOR PRODUCTION OF JOINTS IN ELECTRIC POWER SYSTEMS

User:

„PLAMEN” d.o.o.
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User's request

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SUBJECT OF THE REPORT

The user has submitted components for production of joints in electric power networks in order to verify their compliance with current regulations through tests.

In addition to the request, the user has submitted written evidence that these components have already been tested (type tests) at the Electrical Engineering Institute "Nikola Tesla", which is confirmed by examination of the Institute's documents.

Previous periodic testing was carried out in 2009 when the quality of the majority of catalog products was checked, ie. 203 products of the PLAMEN company and the same number of conclusions was issued (from No. 50932/1 to No. 50932/203).

In the period from 2009 to 2014 a number of newly-developed products has been examined at the Institute and the results are presented in separate reports and conclusions of the Institute.

The user's request, ie. specification of the components will be observed from the conclusions and shall not be given at the beginning of this report in order to avoid unnecessary repetition.

2. DATE, PLACE AND TESTING CONDITIONS

Test were performed in July, August and September 2014 at the Electrical Engineering Institute „Nikola Tesla“, Belgrade, Koste Glavinića 8a, with ambiental conditions Temperature = 22-28°C and Relative Humidity = 68-75%.

3. REFERENCE DOCUMENTATION AND MEASURING EQUIPMENT

The user has classified its products in groups in the application, hence the reference documents are listed in the following groups:

- Cable lug with shear head
SRPS EN 61238-1/2010
- Cable crimping terminal Al
SRPS N.F4.106/1986
- Preinsulated Cable Crimping Termilas Al and AlCu
SRPS EN 50483-4/2010
- Insulated watwrproof jointing sleeve
SRPS EN 50483-4/2010
- Cable connector with shear head bolt
SRPS EN 61238-1/2010
- Unimax clamp
Snap-on grounding clamp
SRPS N.F4.106/1986
- Insulating box
SRPS EN 62208/2011
- Insulation piercing connector
SRPS EN 50483-4/2010

Calibrated measuring equipment for electrical resistance, voltage, current and temperature were used for testing.

4. TEST RESULTS

4.1. The principle of periodic checks

Given the already mentioned earlier testing of products from the PLAMEN company catalog, which is periodically carried out at the Institute for more than 10 years, it was decided that the required periodical inspection is carried out according to the "random sampling" of each of the product groups listed in point 3 of this report.

Bearing in mind that the number (of 166 units) of products for reuse - the periodic examination sampled this way was relatively large, it was decided that the results are recorded in the form of "Records of free-form" and the criteria of "Satisfactory-Unsatisfactory".

4.2. Heating

Since all present components take part in production of joints in electric power networks, and since their main function is to permanently provide high quality connection without overheating at the specified (nominal) currents, so that the temperature rise ΔT is $\Delta T \leq 45^\circ\text{C}$ ie. absolute temperature is lower than $T = 90^\circ\text{C}$, all samples taken for testing were subjected to standard test currents during $t \approx 1$ hour. After the exposure time, temperature was measured in the warmest part of the component. In samples where the temperature was apparently less, warm-up time was shortened to $t \leq 1$ hour. This parameter was considered essential for the quality of the product.

4.3. Watertightness

From the 166 submitted products, 106 are expected to prevent water from entering the clamp if the water column above the clamp is around $l = 30\text{cm}$. Tests were carried out on the sampled parts, at first by measuring the electrical resistance with a universal instrument, in order to reject the components in which water may have penetrated and in order not to expose those parts to high voltages, since this may result in damage of the measuring device. All correct samples were subjected to a test voltage of $U = 4\text{ kV}$. A quality criterion is that at this voltage there is no snapover or breakdown.

4.4. Temperature stability

As in normal operation clamps with protective plastic casing ensuring water tightness may be exposed to cumulative heating due to the action of currents and due to the effect of environment conditions, it is important to determine to what temperature the plastic of the clamps is temperature stable and to which there will be no deformation of the casing. In this regard, recognizing that these are the same type of plastic, samples are taken from major casing and tested according to standard SRPS EN 60695-10-2 "pellet with weight". For all tested samples it was determined that there was no deformation to $T \leq 120^\circ\text{C}$.

4.5. Flammability

Flammability of plastic casing was checked according to standard SRPS EN 60695-2 12/2008 „Glowing/hot-wire based test methods - Glow-wire flammability test method for materials“. Casings are inflammable.

5. CONCLUSION

Products with features as in "Conclusions" of the report, production of the "Plamen", Indjija, **COMPLIES WITH** with the regulations in terms of electrical characteristics. The conclusion refers to 166 different products listed in Conslusions from No. 51453/1 to No. 51453/166.