



COMPANY OF ROSATOM STATE CORPORATION
JSC on Adjustment, Enhancement,
Operation and Management
**Of Nuclear Power Plants of
ATOMTECHENERGO**
(JSC Atomtechenergo)

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Attn: Deputy Director General on Science of
SKB EP, LLC
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15.06.2016. № 045-08-03/584
Ha № _____ OT _____

[Reference to Contract # ТД-7/2016]

Dear Nikolay Afanasievich,

As per Cl. 2.2.9 of Contract # ТД-7/2016 dated 04.03.2016 you are forwarded a reference on the PKV/M7 instrument used by Moscow Branch of Centratomtechenergo from 20.03.2016 till 20.05.2016.

The reference can be used for the purpose of advertisement on the site and in any materials of SKB EP.

S. V. Lyulchak
[Signature]

Chief Engineer

V.V. Lyulchak

Korshunov S.E.
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Reference on the PKV/M7 instrument

In the period between 20.03.2016 and 20.05.2016 specialist of the laboratory of electric measurements of the Moscow Branch of Centratomtechenergo of JSC Atomtechenergo used the PKV/M7 analyzer (of SKB EP manufacture, 2016) for HV circuit breaker control during commissioning of SF6 circuit breakers.

The analyzer was tested for adequacy to requirements of the following standardization documents:

- GOST 525665-2006. AC circuit breakers for the voltage ranging from 3kV to 750kV. General Specification.
 - Electrical Installation Code Ed. 7, Ch. 1.8;
 - WD 34.45-51.300-97. Scope and standards for electric equipment tests.
- Tests of SF6 circuit breakers included:
- External inspection;
 - Check of the availability of metal connection between a circuit breaker and the grounding device; check of ground wire cross-section;
 - Check of the control wiring isolation;
 - Check of the circuit breaker parameters.

Circuit breaker parameters were tested and a Protocol was documented.

The PKV/M7 was connected to a circuit breaker via grounding blades that at the moment of measurements were disconnected from the earthing device.

The PKV/M7 merits and demerits identified in the course of works:

The PKV/M7 merits include:

- Maximum measurement time of 5.2 s allows measurement of time characteristics of circuit breakers, as well as those of earthing and disconnecting devices;
- Availability of contact state check function prior to measurements;
- Protection of a switchgear against fault close-in
- An option of a remote start-up against voltage occurrence in the On/Off coil;
- High accuracy of measurements.

The PKV/M7 drawbacks:

- A small number of cursors for determining the duration of transient processes (only two are available). [Manufacturer's comment: Previous users never mentioned this as a drawback. This is rather subjective].

Recommendations for the instrument enhancement:

- The maximum current increase up to 100A for closing and tripping outputs of Local Start-Up should be provided;
- Software should allow for shifting the zero point along the time axis on the graphs;
- The option of cable length extension upon order should be allowed.

- The option of putting in the transient process time on the graph between the cursors (to allow captions on the graph) should be available.
- An operator should be able to decide on the number of cursors himself.

Deputy Head of Electrical Board
of Moscow Branch of
Centratomtechenoergo
of JSC Atomtechenoergo

S.E. Korshunov

CERTIFICATE OF TRANSLATION

This is to certify that the foregoing translation from Russian into English was made by the undersigned translator Galliamova Vera of the City of Irkutsk, Russia who is conversant with both these languages, and that, to the best of my knowledge and understanding, it is a true and complete rendition of the corresponding original document.

"Association of translation and interpreters" Plc.

[Seal: The Russian Federation; Irkutsk; Public limited company; "Association of translation and interpreters"; Primary state registration number 1073808003961; TIN 3808162520]

Address: office 208, Sukhe-Batora str., 7, Irkutsk, 664011, Russia; tel: +7 (3952) 588-122

Signed: _____

Sworn before me at the City of Irkutsk, this 4th day of September, 2015.

