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TECHNICAL REQUIREMENTS FOR HOMOLOGATION AND PRE-HOMOLOGATION OF
AUTOMATIC RECLOSERS

1. Scope

1.1 This document (Technical Requirements for Homologation and Pre-homologation – TRHP) aims to establish technical requirements and criteria for pre-homologation and homologation of automatic reclosers for electrical power distribution systems, in accordance with the technical specifications of CEMIG.

1.2 In case of divergences between the requirements of this document and the specification 02.111-PA/EA-1, shall prevail those in this document.

2. General Conditions

2.1 In addition to the requirements set out in this document, the supplier must meet the conditions specified in:

02.118 - Cemig-395 – Automatic Reclosers for Overhead Distribution Lines.
02.111 - PA/EA-1- Criteria for Homologation and Pre-Homologation of Material for Cemig.
02.111 - PA/AD-134 – Automation Requirements for Automatic Reclosers, Voltage Regulators and Capacitors Banks for Overhead Distribution Lines.

2.2 The technical documentation which needs to be presented to begin the homologation process must be as defined along the item 4.1.

2.3 For purposes of homologation shall be accepted the validation of type tests reports and/or special tests reports according to the technical specifications applied, except for special tests of the electronic control. The listed tests in 4.2.5 and 4.4 must be made with the presence of Cemig.

2.4 The maintenance criteria status of pre-homologation and homologation is the one established in PA/EA-1. Modifications of firmware are considered as change on the material.

3. Material Information

| Table 1 - TRHP – Three-Phase Recloser 24.2 kV |
|---|---|
| **Material/Equipment:** | **Merchandise Group:** |
| 273003 - THREE-PHASE RECLOSE, 24.2 kV, 560 A,12 kA, 60Hz, 60/125/ - kV, VACUUM, INSULATING IN POLYMERIC MATERIAL, INSTALLATION ON CONCRETE OR WOODEN POLES, FOR SCADA AUTOMATION SYSTEM, ACCESSORIES FOR SETTING AND DATA ACQUISITION. TS-02118-CEMIG-395I, 02111-TD/SD-1002B | 9060 |
| **Technical Specification:** | **Standard Drawing Cemig:** |
| Cemig – 395 PA/AD – 134 | NA |
| **Necessary sampling for tests of pre-homologation and homologation:** | |
| Sampling: item 4.2.3. | |
Table 2 - TRHP – Single-Phase Recloser 15 kV

<table>
<thead>
<tr>
<th>Material/Equipment:</th>
<th>Merchandise Group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>269936 - SINGLE-PHASE RECLOSER, 15 kV, 100 A, 2 kA, 60Hz, 50/110/-kV, VACUUM, OIL INSULATING OR ORGANIC INSULATING IN POLYMERIC MATERIAL MEDIUM, ACTUATING CURRENT 10-200A. TS-02118-CEMIG-395I.</td>
<td>9060</td>
</tr>
</tbody>
</table>

Technical Specification:
- Cemig – 395
- PA/AD – 134

Necessary sampling for tests of pre-homologation and homologation:
- Sampling: item 4.2.3.

Table 3 - TRHP – Three-Phase Recloser 36.2 kV

<table>
<thead>
<tr>
<th>Material/Equipment:</th>
<th>Merchandise Group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>THREE-PHASE RECLOSER, 36.2 kV, 560 A, 12kA, 60Hz, 70/150/-kV, VACUUM, POLYMERIC MATERIAL INSULATING MEDIUM, ELECTRONIC CONTROLLED, ACCESSORIES FOR SETTING AND DATA ACQUISITION, INSTALLATION ON CONCRETE OR WOODEN POLES, FOR SCADA AUTOMATION SYSTEM. TS-02118-CEMIG-395I.</td>
<td>9060</td>
</tr>
</tbody>
</table>

Technical Specification:
- Cemig – 395
- PA/AD – 134

Necessary sampling for tests of pre-homologation and homologation:
- Sampling: item 4.2.3.

4. Requirements and Procedures for Material Homologation

4.1 Technical Documentation

In addition to the requirements set out in PA/EA-1, the supplier must present the following documents:

a) Table of Warranted Technical Data and Characteristics filled (annexed with the respective technical specification CEMIG) for each material code;

b) Supplier’s documents informing which manufacturing units will manufacture the equipments to be homologated;

c) Datasheet and manufacturer’s instruction manual for each recloser code;

d) Reports of the routine, type e special tests;

e) Drawing of external dimensions or catalogs showing the tank dimensions, control boxes, support for attachment in pole, bushings, terminals, connexion plugs;

f) Wiring diagrams and control schematics, current transformers and other devices, including connections to terminal blocks, ports for computer connections, and voltage and power consumption indicators required for the recloser operation;

g) Characteristics of umbilicals and feeding cables;

h) A copy of the parameterization software in CD/DVD or pen drive;

i) Basic documentation related to the implementation of the protocol DNP3, including the map of points associated to the control device used in the manufacturer’s product, with explicit indication of objects that the control effectively supports, list of analog and digital input and
output points of the equipment, counters and other information about protocol configuration, which must be foreseen on the standard DNP communication profile;

j) Model and manufacturer of the vacuum chamber;

k) Addendum A of this document;

l) Other documents listed in the technical specifications;

NOTES:

1) The drawing of the control box must detail all the components and accessories existent on the box (internal and external), recognizing the characteristics which can be identified in future verifications of the product:

   • Batteries: voltage, capacity (A/h) and supplier’s list;
   • Ferrous hardware: Material e treatment type;
   • Resistance: Feeding power and voltage;
   • Firmware version;
   • Plugs: detailment of pins;
   • Circuit Breaker: current and actuation curve;
   • Plates and/or Modules: hardware version.

2) Other drawing and information can be required by Cemig during the homologation process in order to warrant the characterization of the product homologated.

4.2 Type and Special Tests

4.2.1 The validation of the reports about type and/or specials tests will occur observing the criteria of the PA/EA-1.

4.2.2 The tested material in the report must be similar to the one which the supplier intends to homologate. In order to reach this exigency, the material must be clearly identified on the reports through constructive information, drawings, and pictures (equipment, assembly, plates, and others).

4.2.3 The type tests in which the reports were not validated must be made observing the criteria of tests realization and validation described on the reports of the PA/EA-1.

NOTE: In case of being necessary the achievement of type test, the manufacturer will be responsible for defining the extra quantity to be manufactured.

4.2.4 The Addendum A of this document must be filled when the documentation is delivered.

4.2.5 Type tests must be made with the presence of Cemig:

   • Rated supportable voltage of atmospheric impulse;
   • Rated supportable voltage in industrial frequency over rain conditions;
   • Tightness of the control box;
   • Tests in the integrated control – Isolation – Supportability to the impulse voltage;
   • Tests in the integrated control – Isolation – Supportable rated voltage in industrial frequency on the auxiliar and command circuits;
   • Susceptibility tests;
   • Vibration tests;
4.3 Routine Tests

4.3.1 The requirements of the PA/EA-1 must be observed in the PA/EA-1 in the realization of the routine tests.

4.3.2 The routine tests will be made in 3 complete units and identical to the project in homologation.

NOTE: In case of being necessary the achievement of type test, the manufacturer will be responsible for defining the extra quantity to be manufactured.

4.3.3 The routine tests will be made and followed in the company unit indicated by the supplier on the documentation of homologation process.

4.4 Special Test of Electronic Control – Reclosers

4.4.1 Test to be made in the installations of Cemig. The local will be defined during the homologation process.

4.4.2 The test is made in accordance to the criteria established in the PA/AD-134. At this moment, the Cemig will also make a visual inspection, control functions evaluation, the fixation support, and of all the recloser components.

4.4.3 The supplier is responsible for offering and transporting the samples for the achievement of this test and also for their return.

NOTE: The equipment which will be submitted to this test must have all the accessories required in the technical specification of Cemig, and it must be on the conditions that would be delivery to Cemig.

5. Requirements and Procedures for Material Pre-homologation

5.1 The supplier will get the pre-homologation status if it meet the requirements established in PA/EA-1, and who present the following type test report, in accordance to TS 02.118-Cemig 395 or the IEC 62.271-111/IEEE C37.60-2012 standard:

- Interruption tests – Operation cycle;
- Rated Supportable current of short duration and the rated value of the crest related to the supportable current;
- Interruption of line currents and unloaded cables;
- Interruption tests – Critical current test;

6. Requirements for Industrial Technical Habilitation by Cemig

6.1 It must be predicted the technical habilitation during the period of analysis of the documentation sent to the Cemig for the reclosers manufacturers. The period of achievement must be awake between Cemig and manufacturer.

6.2 The manufacturing units that are not habilitated will not be able to supply its products for Cemig.

NOTE: According to the supplying history of the manufacturing unit indicated, the Cemig shall dispense, in its criteria, the technical habilitation.
6.3 The addendum B must be filled during the industrial Technical Habilitation.

7. Warranty and Technical Assistance of the Material

7.1 The suppliers with homologated reclosers must offer technical assistance and maintenance in Brazil.

7.2 The qualification of the technical assistance must be confirmed in the homologation request through training certificates, supervision reports of assembling performed, reports of repairs in Brazil or other reports of provided services, and through technical visit performed by Cemig.

7.3 In respect to the technical assistance and warranty execution, the supplier must ensure the following terms:
   • Diagnosis: 15 days after the warranty claim;
   • Devolution of the repaired equipment: 60 days after the diagnosis;

7.4 The technical assistance and maintenance must be performed in a local where is possible to make the following tests after the intervention:
   • Visual Inspection;
   • Dimensional checking;
   • Rated supportable voltage in dry industrial frequency in the main circuit;
   • Reclosing and calibration of the trip current;
   • Mechanical operation;
   • Partial discharges;
   • Measurement of the ohmic resistance of the circuit;
   • Rated supportable voltage in industrial frequency—auxiliar circuits and command;
   • Verification of the simultaneity of contacts;
### Addendum A – Table for Qualification/Validation of Type Reports

<table>
<thead>
<tr>
<th>Item</th>
<th>Manufacturing unit of the equipment to be homologated: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cemig Code of the Material to be homologated: ____________</td>
</tr>
<tr>
<td></td>
<td>Manufacturer name: ____________</td>
</tr>
<tr>
<td></td>
<td>Description and identification of test/ Pages: ____________</td>
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<tr>
<td></td>
<td>Date/ Page</td>
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<tr>
<td></td>
<td>Standard/ Page</td>
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<tr>
<td></td>
<td>Model of the tested equipment/ Page</td>
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<tr>
<td></td>
<td>Manufacturing unit of the tested equipment/ Page</td>
</tr>
<tr>
<td></td>
<td>Certificate of Conformity from Matrix to Branch/ Page</td>
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<tr>
<td></td>
<td>Date: ________________</td>
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<tr>
<td></td>
<td>Lab/ (Name Local/ Page)</td>
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<tr>
<td></td>
<td>Monitoring of CEMIG/ Page/ Page</td>
</tr>
<tr>
<td></td>
<td>Monitoring of the Independent Certification Body/ (Yes/No)</td>
</tr>
</tbody>
</table>

Companhia Energética de Minas Gerais – 02.111- PA/EA-24a
Addendum B – Quiz of Technical Habilitation

Supplier: ..........................................................   Date: ..........................................................

Equipment: Automatic Recloser   Manufacturing unit: .................................

Model: ..........................................................

Cemig Code:   ☐ 273003  ☐ 269936  ☐ 375259

Routine Tests performed in the factory

☐ Visual inspection   ☐ Dimensional checking

☐ Rated supportable voltage in dry industrial frequency in the main circuit

☐ Reclosing and calibration of the trip current

☐ Mechanical operation   ☐ Partial discharges

☐ Measurement of the ohmic resistance of the circuit

☐ Rated supportable voltage in industrial frequency – auxiliary circuits and command

☐ Verification of the simultaneity of contacts

☐ Tests in the insulating oil (code 269936)

☐ Paint – Adhesion of the film   ☐ Paint – Film thickness

☐ Hot dip galvanization

Comments: ........................................................................................................................................
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Technical Assistance

Contact: ..........................................................   Phone: ..........................................

Provided services by the technical assistance: ................................................................................
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