

WIRES, CABLES AND CORDS

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|--------------|---------------------------|----------------|---------------|
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1 – PURPOSE

This document presents the complementary criteria for the “Product Certification Rule” – RC-002 for certification and for maintenance of the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.

SBAC - “Sistema Brasileiro de Avaliação da Conformidade” on which means Conformity Evaluation Brazilian System.

2 – APPLICATION FIELD

Applicable to all companies in the segment of:

- NBR NM-247-3:2002 - Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V- Part 3: Non-sheathed cables for fixed wiring (IEC 60227-3, MOD) to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.
- NBR 13249:2000 - Flexible cables and cords of rated voltages up to and including 450/750V–Specification to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.
- NBR 7288:1994 - Power cables with solid insulation extruded of polyvinyl chloride (PVC) or polyethylene (PE) for rated voltages from 1 kV to 6 kV to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.
- ABNT NBR 14898:2002 - Flexible cables insulated with ethylenepropylene rubber (EPR) for special applications in connecting cords of electric household appliances in rated voltages up to 500V to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.
- ABNT NBR 14897:2002 - Flexible cables and cords insulated with polyvinyl chloride (PVC) for special applications in connecting cords of electric household appliances in rated voltages up to 500V to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.
- ABNT NBR 14633:2000 - Flexible cords with insulation extruded of chlorosulfonated polyethylene (CSP) for rated voltages up to and including 300 V – Performance requirements - to grant and maintain the license to use of the conformity marking of SBAC, INMETRO and TÜV Rheinland do Brasil Ltda.

3 – COMPLEMENTARY DOCUMENTS

PI-028 – Constitution and Attributions of Technical Commissions

Inmetro rule (Portaria) nº 87 of May 20th, 2003

Inmetro rule (Portaria) nº 85 of May 26th, 2003

Inmetro rule (Portaria) nº 86 of May 26th, 2003

Inmetro rule (Portaria) nº 281 of July 19th, 2007

Inmetro rule (Portaria) nº 282 of July 19th, 2007

Inmetro rule (Portaria) nº 286 of July 19th, 2007

NBR NM-247-1:2002 - Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V Part 1: General Requirements (IEC 60227-1, MOD);

NBR NM-247-2:2002 - Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V Part 2: Test methods (IEC 60227-2, MOD);

ABNT ISO/IEC Guide 2:2006 – Standardization and related activities – general vocabulary;

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NBR ISO 9001:2000 - Quality Management Systems – Requirements;
NBR ISO/IEC 17030:2005 - Conformity assessment - General requirements for third-party marks of conformity;
NBR ISO/IEC 17025:2005 - General requirements for the competence of testing and calibration laboratories
NBR ISO/IEC 17000:2005 - Conformity assessment - Vocabulary and general principles;
ABNT ISO/IEC Guide 67:2005 - Conformity assessment - Fundamentals of product certification;
ABNT ISO/IEC Guide 28:2005 - Conformity assessment - Guidance on a third-party certification system for products;
ABNT ISO/IEC Guide 65:1997 - General requirements for bodies operating product certification systems;
Law nº 8.078/1990 - Consumer Protection and Defense Code, section IV – On Abusive Practices.

4 – LICENSE TO USE THE CONFORMITY MARKING

Complements RC 002;

The license to use the Conformity Marking for Wires, Cables and cords will have validation for 2 years, and must contain:

Number of the certificate issued;

Certificate validity term;

Product description;

Applicant (Corporate Name / Address);

Manufacturer (Corporate Name / Address);

Technical standards applicable to the certified product;

Granting for conformity marking use (license to use SBAC conformity marking); and

Issue date of the certificate.

5 – WIRES, CABLES AND CORDS TESTS AND SAMPLING

The tests described in this CRC are defined in the specific standards and any errata, amendment or update in the versions of these standards may only be used with Inmetro's authorization.

5.1 – INITIAL TESTS

The initial tests are specified in the specific standards as follows:

5.1.1 - NBR NM 247-3

Annex A, section A.1 of the RAC of Inmetro's rule (Portaria) nº 87 of May 20th, 2003

The quantity of the samples required to perform the tests corresponds to the highest and lowest conductor sections of each strand class made.

RAC – “Regulamento de Avaliação de Conformidade” on which means Conformity Evaluation Regulation.

5.1.2 - NBR 13249

Annex A, section A.1 of the RAC of Inmetro rule (Portaria) nº 87 of May 20th, 2003.

The quantity of the samples required to perform the tests is prescribed in the NBR 13249 and the products to be tested (number of cores x conductor section in mm²) are the ones indicated in the table as follow:

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| Product | N° of cores | Strand classes | Voltage (V) | Type tests | Flexing test |
|-------------------------|-------------|----------------|-------------|------------|--------------|
| Parallel Flexible Cord | 2 | 4, 5 or 6 | 300 | 2 x 2,5 | 2 x 0,5 |
| Twisted Flexible Cord | 2 | 4, 5 or 6 | 300 | 2 x 2,5 | --- |
| Circular Flexible Cable | 2 to 5 | 4, 5 or 6 | 300 | 2 x 0,75 | 3 x 0,75 |
| | | | 750 | 3 x 2,5 | 2 x 0,75 |
| Flat Flexible Cable | 2 and 3 | 4, 5 or 6 | 300 | 2 x 0,75 | 3 x 0,75 |
| | | | 750 | 2 x 2,5 | 3 x 2,5 |

Note:

- (1) If the manufacturer does not produce any of the cables indicated, the closest one must be used.
- (2) The table 1 is applicable to the lowest strand class among the ones requested by the manufacturer. In the other classes routine and flexing tests are performed in the sections and constructions established in the table above.
- (3) If the manufacturer produces 300V and 750V cables, the tests in table 1 are performed at the highest voltage, while the routine and flexing additional tests are performed at the lowest voltage.

5.1.3 - NBR 7288

Annex A, tables 1 and 2 of the RAC of Inmetro's rule (Portaria) nº 86 of May 26th, 2003.

The quantity of the samples required to perform the tests is prescribed in the NBR 7288 and the products to be tested (number of cores x the conductor section in mm²) are the ones indicated in the table as follow:

| Cable type | Strand classes | Initial tests | |
|----------------------------|----------------|---|------------------------------------|
| | | Type | Additional |
| Single core or Multiplexed | 1, 2, 4, 5 | On the lowest section of the highest strand class and on the highest section of the lowest stringing category produced. | On the lowest section class 1 or 2 |
| Multicore | 2, 4, 5 | On the lowest section of the highest strand class and on the highest section of the lowest strand class made | On the lowest section class 1 or 2 |

The maximum cable section is of 120mm² to perform the initial tests, except in the vertical flame test, section 6.1.3(a) of the NBR 7288:1994, where the maximum section is 50mm².

5.1.4 – ABNT NBR 14898

Are all the tests prescribed in the NBR 14898 (routine and type).

The quantity of the samples required to perform the tests is prescribed in NBR 14898 and the products to be tested (number of cores x the conductor section in mm²) are the ones indicated in the table as follow:

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| Product | Nº of cores | Strand class | Voltage (V) | Type tests | Flexing |
|-------------------------|-------------|--------------|-------------|------------|---------|
| Circular Flexible Cable | 2 to 3 | 4, 5 or 6 | 500 | 3 x 1,5 | 2 x 0,5 |
| Flat Flexible Cable | 2 and 3 | 4, 5 or 6 | 500 | 3 x 1,5 | 2 x 0,5 |

Note:

- (1) If the manufacturer does not make any of the cables indicated, the closest one must be used.
- (2) The table 1 is applicable to the lowest strand class among the ones requested by the manufacturer. In the other classes routine and flexing tests are performed in the sections and constructions established in the table above.
- (3) The insulation must be in EPR and the sheath in thermofixed compound ES 130.

5.1.5 – ABNT NBR 14897

Are all the tests prescribed in the NBR 14897 (routine and type)

The quantity of the samples required to perform the tests is prescribed in the NBR 14897 and the products to be tested (number of cores x the conductor section in mm²) are the ones indicated in the table as follow:

| Product family | Nº of cores | Strand class | Rated voltage (V) | Type tests | Flexing followed by voltage test |
|-------------------------|-------------|--------------|-------------------|------------|----------------------------------|
| Parallel Flexible Cord | 2 | 4, 5 or 6 | 300 | 2 x 2,5 | 2 x 0,5 |
| Circular Flexible Cable | 2 to 5 | 4, 5 or 6 | 500 | 3 x 1,5 | 2 x 0,5 |
| Flat Flexible Cable | 2 and 3 | 4, 5 or 6 | 500 | 3 x 1,5 | 2 x 0,5 |

Note:

- (1) If the manufacturer does not make any of the cables indicated, the closest one must be used.
- (2) The table 1 is applicable to the lowest strand class among the ones requested by the manufacturer. In the remaining classes of each family, all the tests called in the standard as routine and flexing followed by voltage test are performed in the sections and constructions established in the table above.
These tests complements the scope range.
- (3) The insulation will be in polyvinyl chloride of the PVC/EB type and the sheath in PVC/ST10 type.

5.1.6 – ABNT NBR 14633

Are all the tests prescribed in the NBR 14633 (routine and type)

The quantity of the samples required to perform the tests is prescribed in the NBR 14633, corresponding to the highest and smallest section of cords made.

5.2 – SAMPLE COLLECTION:

The sample collection for the trials is performed by TÜV Rheinland do Brasil.

Note: In the case of prototypes, the manufacturer can collect and send the samples necessary to the Laboratory/TÜV Rheinland do Brasil through an agreement among them and under the responsibility of TÜV Rheinland do Brasil. The prototype approval in the initial tests does not exempt TÜV Rheinland do Brasil from validation of the products after the beginning of the production line operation.

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5.3 – SURVEILLANCE TESTS

The surveillance tests will be performed at each 6 months, after the granting of the license to use the conformity marking, in one section of each strand class made. At each sampling, the section will be alternated.

The surveillance tests and the sample collect will be performed by TÜV Rheinland do Brasil, being taken from the market and the plant's expedition, alternately.

The surveillance tests will be performed as indicated:

5.3.1 - NBR NM 247-3

At each six months will be always checked the correct functioning of the spark test equipment regarding the obligation to use it according to the conditions specified by the NBR NM 247-2 and regarding its calibration in the electric voltage range used by the manufacturer.

Furthermore, it will be always performed the type tests on each one of the samplings collected as follow:

- Marking;
- Wire/cable construction requirements;
- Conductor and insulation dimension;
- Voltage test;
- Conductor resistance;
- Insulation resistance at 20° C;
- Oxygen index.

5.3.1.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to the use of the conformity marking.

- 1st Semester: Electrical Resistivity, pressure at high temperature, loss of mass.
- 2nd Semester: Tensile strenght and elongation at break (before and after ageing), cold bending for insulation, copper elongation.
- 3rd Semester: Heat shock; insulation resistance at 70° C
- 4th Semester: Water Absorption, Tensile strenght and elongation at break (before and after ageing).

5.3.2 - NBR 13249

The surveillance tests must be performed after the granting of the license to use the conformity marking on one section of each product. At each sampling, the section must be alternated.

At each six months will be always checked the correct functioning of the spark test equipment regarding the obligation to use it according to the conditions specified by the NBR 13249 and regarding its calibration in the electric voltage range used by the manufacturer.

Furthermore the following type tests will be performed on each one of the samplings collected as follow:

- Marking;
- Cable/cord construction requirements;
- Voltage test;
- Conductor resistance;
- Core separation (for parallel cords);
- Insulation resistance to room temperature.

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5.3.2.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to the use of the conformity marking.

For PVC insulation/sheath

- 1st Semester: Electrical resistivity, pressure at high temperature, Flexing;
- 2nd Semester: Tensile strength and elongation at break (before and after ageing), cold bend or elongation at low temperature, copper elongation, impact test at low temperature.
- 3rd Semester: Heat shock, flame resistance, voltage test on cores.
- 4th Semester: Water absorption, insulation resistance at 70° C, Tensile strength and elongation at break (before and after ageing).

5.3.3 - NBR 7288

The surveillance tests must be performed after the granting of the license to use the conformity marking.

The following checking and tests defined must be performed at each six months.

- Cable construction;
- Conductor resistance;
- Voltage test;
- Insulation resistance at room temperature.

5.3.3.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to the use of the conformity marking.

a) For PVC insulation/sheath

- 1st Semester: Electrical resistivity and pressure at high temperature;
- 2nd Semester: Tensile strength and elongation at break (before and after ageing), cold bend, impact test at low temperature and copper elongation;
- 3rd Semester: voltage test at long term, flame resistance test (for PVC compound with no special characteristic of non-fire spread) and heat shock test; and
- 4th Semester: Water absorption, insulation resistance at 70°C and non-contamination test.

b) For PVC insulation / PE/ST3 sheath

- 1st Semester: Electrical resistivity, carbon black content and pressure at high temperature;
- 2nd Semester: Tensile strength and elongation at break (before and after ageing) and copper elongation;
- 3rd Semester: Voltage test at long term and heat shock; and
- 4th Semester: Water absorption, insulation resistance at 70°C and non-contamination test.

5.3.4 – ABNT NBR 14898

The surveillance tests will be performed after the granting of the license to use the conformity marking in one section of each product. At each sampling, the section must be alternated.

At each six months will be always checked the correct functioning of the spark test equipment regarding the obligation to use it according to the conditions specified by the NBR 14898 and regarding its calibration in the electric voltage range used by the manufacturer.

Furthermore the following type tests will be performed on each one of the samplings collected as follow:

- Marking;
- Cable construction;

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- Voltage test;
- Conductor resistance;
- Insulation resistance at room temperature.

5.3.4.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to use the conformity marking.

For Rubber insulation/coating

- 1st Semester: Ozone resistance and insulation resistance at 130°C;
- 2nd Semester: Tensile strength and elongation at break (before and after ageing) and non-contamination test;
- 3rd Semester: Flame resistance, hot set test (insulation / sheath) and flexing test; and
- 4th Semester: Tensile test after ageing in an air bomb (insulation / sheath), voltage test at long term and immersion in oil.

5.3.5 – ABNT NBR 14897

The surveillance tests must be performed after the granting of the license to use the conformity marking in one section of each product. At each sampling, the section must be alternated.

At each six months will be always checked the correct functioning of the spark test equipment regarding the obligation to use it according to the conditions specified by the NBR 14897 and regarding its calibration in the electric voltage range used by the manufacturer.

Furthermore the following type tests will be performed on each one of the samplings collected as follow:

- Marking;
- Cable/cord construction;
- Voltage test;
- Conductor resistance;
- Insulation resistance at room temperature; and
- Core separation (only for cords).

5.3.5.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to use the conformity marking.

For PVC insulation/sheath

- 1st Semester: Pressure at high temperature (insulation / sheath) and voltage test on cores;
- 2nd Semester: Tensile strength and elongation at break (before and after ageing) and thermal stability of the sheath;
- 3rd Semester: Heat shock, flame resistance and flexing test; and
- 4th Semester: Non-contamination test and insulation resistance at 105°C.

5.3.6 – ABNT NBR 14633

The surveillance tests must be performed after the granting of the license to use the conformity marking in one section of each product. At each sampling, the section must be alternated.

At each six months will be always checked the correct functioning of the spark test equipment regarding the obligation to use it according to the conditions specified by the NBR 14633 and regarding its calibration in the electric voltage range used by the manufacturer.

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Furthermore the following type tests will be performed on each one of the samplings collected as follow:

- Marking;
- Cord construction;
- Insulation adherence over the conductor;
- Voltage test;
- Conductor resistance;
- Core separation; and
- Insulation resistance at room temperature.

5.3.6.1 – Beyond the tests mentioned in the previous section, the tests listed below will be performed according to the established periodicity, based on the license granting to use the conformity marking.

For CSP insulation

- 1st Semester: Resistance at high temperature;
- 2nd Semester: Tensile strenght before and after ageing;
- 3rd Semester: Flame resistance and voltage test at long term; and
- 4th Semester: Insulation resistance at (90°C or 105°C).

5.4 – At the end of the cycle of 4 (four) semesters, a new sequence of tests must be initiated.

6 – ACTIONS REGARDING THE NON-CONFORMITIES

6.1 – The initial tests must not present non-conformities.

6.2 – Whenever a non-conformity is observed in any surveillance test, the same test must be repeated in two new samples, counterproof and witness for the non-conformity attribute, not admitting the confirmation of any non-compliance.

Note 1: If TÜV Rheinland do Brasil deems adequate and in agreement with the manufacturer, the non-conformity might be confirmed without the performing of the counterproof and witness tests.

Note 2: For products made according to NBR NM 247-3, in the specific case of oxygen index, the obtained values in the samples must result approximately equal to the oxygen index obtained in the initial tests of section A.1. In the event of discrepancy, the vertical flame test will be performed.

6.3 – When the non-conformity confirmation, TÜV Rheinland do Brasil will immediately suspend the license to use the conformity marking, requesting to the manufacturer the pertinent treatment with establishment of corrective actions and implementation deadlines.

Note: If the non-conformity found does not put at risk the safety of the user, under TÜV Rheinland do Brasil's analysis and responsibility, the manufacturer can not have its license to use the conformity marking suspended, since it ensures to TÜV Rheinland do Brasil through corrective actions, the correction of the non-conformity on the existing products in the market and the implementation of these actions in the production line.

7 – LICENSE USE, LOT CERTIFICATION

Regarding the license use for lot certification see the Inmetro's RAC listed below:

7.1 – NBR NM 247-3 – Inmetro rule (Portaria) nº 87 of May 20th, 2003

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7.2 – NBR 13249 – Inmetro rule (Portaria) nº 85 of May 26th, 2003

7.3 – NBR 7288 – Inmetro rule (Portaria) nº 86 of May 26th, 2003

7.4 – ABNT NBR 14898 – Inmetro rule (Portaria) nº 281 of July 19th, 2007

7.5 – ABNT NBR 14897 – Inmetro rule (Portaria) nº 282 of July 19th, 2007

7.6 – ABNT NBR 14633 – Inmetro rule (Portaria) nº 281 of July 19th, 2007

8 – EVALUATION OF THE MANUFACTURING QUALITY CONTROL SYSTEM

8.1 – The initial and periodical evaluation of the manufacturing quality control system will be performed by TÜV RHEINLAND DO BRASIL.

8.2 – The initial and periodical evaluation of the manufacturing quality control system must check the compliance with the requirements listed below, when applicable, in the Manufacturer's Quality Management System Scope:

1. Control of records - (*) complying with section 4.2.4 of the standard
2. Control of Production - (*) complying with section 7.5.1 and 7.5.2
3. Identification and traceability - (*) complying with section 7.5.3 of the standard
4. Preservation of the product - (*) complying with section 7.5.5 of the standard
5. Control of the measuring and monitoring devices - (*) complying with section 7.6 of the standard
6. Monitoring and measurement of product - (*) complying with section 8.2.4 of the standard
7. Control of non-conforming product - (*) complying with section 8.3 of the standard
8. Corrective action - (*) complying with section 8.5.2 of the standard
9. Preventive action - (*) complying with section 8.5.3 of the standard

Note: For this evaluation will be used as reference the content presented in NBR ISO 9001:2000 Quality Management Systems – Requirements.

8.3 – In the initial and periodical evaluation of the manufacturing quality control will be checked the correct functioning of the spark test equipment regarding its efficacy and its calibration in the electric voltage range used by the manufacturer according the conditions specified by NBRNM-247-3.

8.4 – In the initial and periodical evaluation of the manufacturing quality control will be checked the performance by the manufacturer of the routine tests prescribed in the NBR NM 247-3 and its results.

8.5 – If the manufacturer has a quality system certified by an CB (Certification Body) accredited by Inmetro according to the standard NBR ISO 9001:2000, TÜV RHEINLAND DO BRASIL must analyze the documentation related to the quality system certification, ensuring that the requirements described above have been assessed focusing the product to be certified. Otherwise TÜV RHEINLAND DO BRASIL must check the compliance with the requirements described in items B.2, B.3 and B.4.

8.6 – The periodical evaluation of the manufacturing quality control must be performed at least on each 6 (six) months after the granting of the license to use the conformity marking.

9 – CONFORMITY LOGO

SECURITY



Pantone 1235

- 100%
- 80%

CMYK

- C0 M27 Y76 K2
- C0 M20 Y75 K2



Tone in Gray

- 100%
- 90%
- 70%

Compact



Single color

Single color

Minimum size

50 mm



20mm



11mm



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Fontes
 Univers
Univers-Black



Pantone 1235

- 100%
- 80%

CMYK

- C0 M27 Y76 K2
- C0 M20 Y75 K2

Compacto



Tons de Cinza

- 100%
- 90%
- 70%



Uma Cor

Uma Cor



SOON UC: to be used only for customers who still use it in its products and packings.

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NOTES:

- a) On the product, the Conformity Identification Seal, on which, due to its dimensions, make it impossible to have a clear printing of the TÜV Rheinland marking, it will be allowed, as an alternative, the use of the full fantasy name of the TÜV Rheinland, followed by its identification number (OCP-0004). If necessary, it will be allowed the conformity identification on flexible cables and cords for the sections smaller than or equal to 2,5 mm², the use of the Inmetro and the TÜV Rheinland names followed by its identification number (OCP-0004). For the sections smaller than or equal to 1mm², the conformity identification seal is optional. However, the same is obligatory on packaging / labels;
- b) Preferably the colored and grey tones versions must be used. The black and white version can also be used on the packaging / label;
- c) On the product, it is allowed the compact conformity identification seal, being optional the use of the word "Segurança";
- d) The maximum reduction of the colored conformity identification seal is 35 mm.

10 – REVISION STATUS

Item 3 – COMPLEMENTARY DOCUMENTS
