



Federal Public Service

MINISTRY OF DEVELOPMENT, INDUSTRY AND FOREIGN TRADE NATIONAL INSTITUTE OF METROLOGY, QUALITY AND TECHNOLOGY-INMETRO

Ordinance no. 640, November 30, 2012.

THE PRESIDENT OF THE NATIONAL INSTITUTE OF METROLOGY, QUALITY AND TECHNOLOGY-INMETRO, is using its powers conferred in paragraph 3 of article 4 of law no. 5,966, December 11, 1973, subheadings I and IV article 3 of law No. 9,933, December 20, 1999, and in item V of article 18 of the Procedural Structure of the Institution, approved by Decree no. 6,275, November 28, 2007;

Whereas the sub-item 4.2, subparagraph (f) of the Terms of Reference of the Brazilian System of Conformity Assessment, approved by Resolution Conmetro no. 04, December 2, 2002, which assigns to Inmetro the competence to establish the guidelines and criteria for conformity assessment activity;

Whereas the Conmetro resolution no. 05, May 6, 2008, which approves the Regulation of the Mandatory Conformity Assessment for Product Registration through the program coordinated by National Institute of Metrology, Quality and Technology - Inmetro, published in 'Diário Oficial da União' (the Official Gazette) of May 9, 2008, section 01, pages 78 to 80;

Whereas the Ministerial Order Inmetro no. 491 of December 13, 2010, approving the procedure for the granting, maintenance and renewal of the Product Registration, published in the Official Gazette of December 15, 2010, section 01, page 161 or its replacement;

Whereas the Ministerial Order Inmetro no. 361, September 6, 2011, approving the General Requirements for Product Certification – RGCP, published in 'Diário Oficial da União' of September 9, 2011, section 01, page 76 or its replacement;

Whereas the Mercosul Technical Regulation on essential safety Regulations for low-voltage electrical products, MERCOSUL/GMC Resolution/RES. No 35/08;

Whereas the status of the wires, cables and electrical cord, marketed in the country and not covered by current regulations, provide minimum security regulation;

Whereas the necessity of perfecting the Conformity Assessment Program for wires, cables and flexible electrical cords, hereby decides to enact the following provisions:

Art. 1 To approve the revision of requirements of Conformity Assessment for wires, cables and flexible electrical cords, available on the website [www.inmetro.gov.br](http://www.inmetro.gov.br) or at the following address:

Instituto Nacional de Metrologia, Qualidade e Tecnologia - Inmetro  
Divisão de Programas de Avaliação da Conformidade – Dipac  
Rua da Estrela n.º 67 - 2º andar – Rio Comprido  
CEP 20,251-900 – Rio de Janeiro – RJ

Art. 2 Give notice that the Public Consultation that led to the requirements as currently adopted was disclosed by Ordinance Inmetro no. 387, July 24, 2012 published in 'Diário Oficial da União' of July 26, 2012, section 01, page 63.

Art. 3 Maintain and expand, within the framework of the Brazilian System of Conformity Assessment-SBAC, the compulsory certification for wires, cables and flexible electrical cords, which must be performed by a Product Certification Agency – OCP, accredited by Inmetro, as established in the regulations hereby approved.

§1 These Regulations apply to wires, electrical cables and flexible electrical cords, bellow delimited by Specific Addenda of this RAC hereby approved:

I - Power Cables with extruded solid insulation polyvinyl chloride (PVC) polyethylene (PE) for voltages of up to and including 1 kV;

II - Flexible cords with extruded insulation of chlorosulfonated polyethylene (CSP) for voltages up to and including 300V;

III - Flexible cords and cables insulated with polyvinyl chloride (PVC), for special applications in household electrical appliance power cords with voltages up to and including 500V;

IV - Flexible cords and cables insulated with ethylene propylene rubber (EPR), for special applications in household electrical appliance power cords with voltages up to and including 500V;

V - Power cables and insulated conductors without cover, with extruded insulation and with low smoke emission for voltages up to and including 1kV;

VI - Flexible twisted cords for voltages up to and including 300 V;

VII - Conductors insulated with polyvinyl chloride (PVC) for rated voltages up to and including 450/750V (insulated conductors - without cover - for fixed installations);

VIII - Cables insulated with polyvinyl chloride (PVC) for voltages up to and including 450/750V (flexible cables);

IX - Flexible cables insulated with silicone rubber, single core without cover and multi core with cover, heat resistant, for rated voltages up to and including 450/750 V;

X - Cables insulated with thermoset elastomeric compounds, for rated voltages up to and including 450/750V (silicone rubber insulated cables with braid, heat resistant);

XI - Cables insulated cables with thermoset elastomeric compounds, for rated voltages up to and including 450/750V (cords and flexible cables).

§2 Wires, cables and flexible cords not specified in the previous paragraph and laid down in Specific Addenda of this RAC hereby approved are excluded from these regulations.

Art. 4 Determine that from 18 (eighteen) months from the date of publication of this Order, wires, electrical cables and flexible cords shall be manufactured and imported only in accordance with requirements now approved and duly registered with Inmetro.

Sole paragraph - from 6 (six) months, counting from the end of the period referred to above, wires, electrical cables and flexible electrical cords shall be marketed in the national market, by manufacturers and importers , only in accordance with the regulations now approved and duly registered with Inmetro.

Art. 5 Determine that from 36 (thirty six) months from the date of publication of this Order, wires, electrical cables and flexible cords shall be marketed, on the national market, only in accordance with requirements that are currently approved and duly registered with Inmetro.

Sole paragraph - The order contained in the heading of this article shall not apply to manufacturers and importers, who must comply with the time limits specified in the preceding article.

Art. 6 The manufacture, importation and marketing of cables insulated with polyvinyl chloride (PVC) for rated voltages up to and including 450/750 V, (flexible cables) and cables insulated with thermoset elastomeric compounds, for rated voltages up to and including 450/750 V, (cords and flexible cables), falling within the scope of the Specific Addenda VIII e XI, of the RAC hereby approved and belonging to class 4, is prohibited

Art. 7 The manufacture, importation and marketing of cables insulated with polyvinyl chloride (PVC) for rated voltages up to and including 450/750 V, (insulated conductors - without cover - for fixed installations), falling within the scope of the Specific Addenda VII of the RAC hereby approved and belonging to class 4, intended for use in household appliances and electronic equipment is prohibited

Art. 8 Determine that the enforcement of compliance with the provisions contained in this Ministerial Order, nationwide, will be the responsibility of Inmetro and of the public law bodies bound to it by arrangement of delegation.

Sole Paragraph: Enforcement shall observe the time limits set in articles 4 and 5 of this order.

Art. 9 To revoke Inmetro Order no.85, May 26, 2003, published in 'Diário Oficial da União' of May 27 2003, section 1, page 226, within 36 (thirty six) months after the publication of this order.

Art. 10 To revoke Inmetro Order no.86, May 26, 2003, published in the 'Diário Oficial da União' of May 27, 2003, section 1, page 226, within 36 (thirty six) months after the publication of this order.

Art. 11 To revoke Inmetro Order no.87, May 20, 2003, published in the 'Diário Oficial da União' of May 27, 2003, section 1, page 226 to 227, within 36 (thirty six) months after the publication of this order.

Art. 12 To revoke Inmetro Order no. 281, July 19, 2007, published in the 'Diário Oficial da União' of July 23, 2007, section 1, page 82, within 36 (thirty six) months after the publication of this order.

Art. 13 To revoke Inmetro Order no. 282, July 19, 2007, published in the 'Diário Oficial da União' of July 23, 2007, section 1, page 82, within 36 (thirty six) months after the publication of this order.

Art. 14 To revoke Inmetro Order no. 286, July 19, 2007, published in the 'Diário Oficial da União' of July 23, 2007, section 1, page 86, within 36 (thirty six) months after the publication of this order.

Art. 15 This Ministerial Order shall enter into force on the date of its publication in the 'Diário Oficial da União'.

 <b>INMETRO</b>	<b>CONFORMITY ASSESSMENT REGULATIONS FOR WIRES, CABLES AND FLEXIBLE ELECTRICAL CORDS</b>
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## 1 OBJECTIVE

To establish the requirements for the Conformity Assessment Program for wires, cables and flexible electrical cords, with focus on safety, through the certification mechanism, taking into account the Technical Quality Regulations (RTQ) for wires, cables and flexible electrical cords, aiming to reduce the risk resulting from use of the product. The requirements for each type of wire, cable and flexible electrical cord are determined in Specific Addenda of this document.

For the sake of simplicity, wires, cables, conductors and flexible electrical cords are called ‘cables’ in this document.

### 1.1 Scope of application

The scope of this program is specified by the Specific Addenda, as in the following table.

SPECIFIC ADDENDUM	SCOPE
I	Power cables with insulation of extruded solid polyvinyl chloride (PVC) or polyethylene (PE) for a voltages of up to and including 1 kV, covered by ABNT NBR 7288
II	Flexible cords with extruded insulation of chlorosulfonated polyethylene (CSP) for voltages up to and including 300V, covered by ABNT NBR 14633
III	Flexible cords and cables insulated with polyvinyl chloride (PVC), for special applications in household electrical appliance power cords with voltages up to and including 500V, covered by ABNT NBR 14897
IV	Flexible cords and cables insulated with ethylene propylene rubber (EPR), for special applications in household electrical appliance power cords with voltages up to and including 500 V, covered by ABNT NBR 14898
V	Power cables and insulated conductors without cover, with extruded insulation and with low smoke emission for voltages up to and including 1kV, covered by ABNT NBR 13248
VI	Flexible twisted cords for voltages up to and including 300 V, covered by ABNT NBR 15717
VII	Conductors insulated with polyvinyl chloride (PVC) for rated voltages up to and including 450/750V, covered by ABNT NBR NM 247-3 (insulated conductors - without cover - for fixed installations)
VIII	Cables insulated with polyvinyl chloride (PVC) for voltages up to and including 450/750V, covered by ABNT NBR NM 247-5 (flexible cables)
IX	Flexible cables insulated with silicone rubber single core without cover and multi core with cover, heat resistant, for rated voltages up to and including 450/750V, covered by ABNT NBR NM 274
X	Cables insulated with thermoset elastomeric compounds, for rated voltages up to and including 450/750V, covered by ABNT NBR NM 287-3 (silicone rubber insulated cables with braid, heat resistant)
XI	Cables insulated with thermoset elastomeric compound for voltages up to and including 450/750V, covered by ABNT NBR NM 287-4 (cords and flexible cables)

## 1.2 Grouping for the purpose of Certification and Product Registration

**1.2.1** The concept of families applies for certification of items covered in each specific addendum of this RAC.

**1.2.2** The certification and registration of wires, cables and flexible electrical cords must be performed for each Specifications Addendum of this RAC.

## 2 ACRONYMS

For this RAC the abbreviations defined in RGCP are valid, supplemented by the following:

NM	Mercosul standard
RGCP	General Requirements for Product Certification

## 3 ADDITIONAL DOCUMENTS

For purposes of this RAC, additional documents mentioned below and those cited in the Specifications Addendum for each type of cable are included.

Inmetro Act in force	General Requirements for Products Certification
Inmetro Act in force	Technical Quality Regulations for wires, cables and flexible electrical
Ministerial Order no. 335, August 29, 2011	Prescribes on mandatory information for low voltage electrical products
Norm ABNT NBR 5426	Trial guidelines and procedures for inspection by attribute

## 4 DEFINITIONS

Definitions of item 4 of RGCP apply to this RAC, supplemented by those below and those mentioned in the specifications addenda of each type of cable.

### 4.1 Critical Components

Characteristics which directly impact on the safety and performance of the final product. For this RAC all raw materials used in the manufacture of wires, cables and electrical cords up to 1 kV are considered critical.

## 5 CONFORMITY ASSESSMENT MECHANISM

The conformity assessment mechanism for wires, cables, flexible electrical cords and the certification.

## 6 STEPS OF CONFORMITY ASSESSMENT

### 6.1 Definition of Certification Model used

This RAC prescribes the use of certification Model 5, which consists of type test, evaluation and approval of the Quality Management System of the manufacturer, monitoring through audits at the manufacturer and testing on samples taken from the market place, as defined in the current RGCP.

## **6.2 Initial Assessment**

### **6.2.1 Certification Request**

The supplier must send a formal request to the OCP, along with the following documents:

- a) Identification of the families to be certified and their respective products, according to the specifications addenda of this RAC;
- b) List of raw materials and their respective suppliers;
- c) Technical specification of the product;
- d) Documentation of the Quality Management System, produced in accordance with that stipulated in RGCP referring to verification items ABNT NBR ISO 9001.

### **6.2.2 Analysis of request and of the Conformity of the Documentation**

The criteria for analysis in the request and the conformity of the documentation must follow the requirements set out in RGCP.

### **6.2.3 Initial Audit of the Management System(s)**

The criteria for the initial audit of the Quality Management System must follow the requirements set out in RGCP, in addition to those described in the following items.

#### **6.2.3.1** The following must be checked during the initial audit:

- Quality control tests of production as laid down in each specifications addendum of the RTQ for this item;
- Measuring equipment for quality control testing of production, which shall be specifications compliant with regulations requirements and be properly calibrated;
- The existence of a procedure for the treatment of non-conforming products detected in production;
- The traceability of the manufacturing process, which should be able to identify the lots of all the raw materials used and tests performed, from the finished product.

**6.2.3.2** In the evaluation of the quality management system, the correct functioning of the spark-gap must be verified, in accordance with the methods prescribed by ABNT NBR NM 244. The spark-gap must be assessed as to its effectiveness and its calibration in the range of electrical voltage applied by the supplier within the conditions specified by the standards of the products, listed in the Specifications Addenda of this RAC.

### **6.2.4 Plan for Initial Trials**

The criteria for the initial trial plan should follow the requirements laid down in the RGCP, complemented by those in the specifications addenda for each type of cable.

#### **6.2.4.1 Definition of trials to be performed**

The criteria for the definition of the trials to be carried out should follow the requirements laid down in the RGCP, complemented by those in the specifications addenda for each type of cable.

#### **6.2.4.2 Definition of Sampling**

The criteria for the definition of sampling should follow the requirements laid down in specific addenda complemented the RGCP of each type of cable.

**6.2.4.2.1** If the cable trial sample has been deemed conforming to all the tests laid down in its specifications addendum,

it is not necessary to test and inspect the rebuttal and witness sample.

**6.2.4.2.2** If the test sample fails any of the trials, all trials shall be repeated on the counter sample and control sample, and both meet the requirements laid down in the specifications addendum.

**6.2.4.2.3** In case of trial failure of the rebuttal or witness sample, the sample shall be considered non-compliant and cable's family must have its certification process cancelled.

#### **6.2.4.3 Definition of Laboratory**

The criteria for definition of the laboratory should follow the requirements laid down in the RGCP.

#### **6.2.5 Treatment of non conformity in the Initial Evaluation stage**

The criteria for treatment of non-conformities in the initial assessment stage must follow the requirements set out in the RGCP.

#### **6.2.6 Issue of Certificate of Conformity**

The criteria for issue of the Certificate of Conformity must follow the requirements set out in the RGCP.

##### **6.2.6.1 Certification Committee**

The criteria for the Certification Committee must follow the requirements set out in the RGCP.

##### **6.2.6.2 Certificate of Conformity**

The Certificate of Conformity shall be valid for 2 (two) years. In addition to the provisions of RGCP, the Certificate of Conformity shall contain at least the following information:

- a) Identification of the standard(s) of the product(s) with their corresponding(s) year(s) of publication and reference to the Order that approved this RAC;
- b) Registered company name, CNPJ, full address and name of the supplier, where applicable;
- c) Description of critical components;
- d) Number and date of the trial reports.

#### **6.3 Maintenance Trials**

The maintenance assessment process occurs between the initial certification and recertification. The frequency of these evaluations is biannual.

##### **6.3.1 Maintenance Audit**

The criteria for maintenance audit must follow the requirements laid down in the RGCP, supplemented by the following requirements and those contained in the specifications addenda for each product.

**6.3.1.1** During the audit the following requirements should be checked:

- Trials on control of quality of production which are being carried out in the production line of the certified product;
- Measuring equipment for quality control testing of production, which shall be specifications compliant with regulations requirements and be properly calibrated;
- The existence of a procedure for the treatment of non-conforming products detected in production;
- The traceability of the manufacturing process, which should be able to identify the lots of all the raw materials used and tests performed, from the finished product.

**6.3.1.2** During the periodic assessment of the Quality Management System of the manufacturer the correct functioning of

the spark-gap must be verified, in accordance to the methods prescribed by the ABNT NBR NM 244. The spark-gap must be assessed as to its effectiveness and its calibration in the range of electrical voltage applied by the supplier within the conditions specified by the standards of the products, listed in the specific addenda of this RAC.

### **6.3.2 Plan for Maintenance Trials**

The criteria for the maintenance trials plan should follow the requirements laid down in RGCP, complemented by those in the specifications addenda for each type of cable.

#### **6.3.2.1 Definition of trials to be performed**

**6.3.2.1.1** The criteria for defining trials to be carried out must follow the conditions described in the RGCP, complemented by those in the specifications addenda for each type of cable and by the following requirements.

**6.3.2.1.2** Maintenance trials are divided into basic trials and additional trials. Both are held bi-annually, however the basic trials for the product are always the same, while the additional vary each semester.

**6.3.2.1.3** In the case a non-conformity is found in the biannual trials, the next periodic assessment must perform the tests prescribed for that semester with the addition of all tests for the semester in which the non-compliance has occurred.

#### **6.3.2.2 Definition of maintenance trials**

The provisions of RGCP shall apply to this RAC, complemented by those cited in the specifications addenda for each type of cable.

**6.3.2.2.1** If the cable trial sample has been deemed conforming to all the trials laid down in its specifications addendum, it is not necessary to test and inspect the rebuttal and witness sample.

**6.3.2.2.2** If the trial sample fails any of the trials, all trials shall be repeated on the rebuttal and witness sample, and both meet the requirements laid down in the specifications addendum.

**6.3.2.2.3** In case of trial failure of the rebuttal or witness sample, the sample shall be considered non-compliant and cable's family must have its certification process suspended.

#### **6.3.2.3 Definition of Laboratory**

The criteria for definition of the laboratory should follow the requirements laid down in the RGCP.

### **6.3.3 Treatment of non-conformities at Maintenance Assessment stage**

The criteria for treatment of non-conformities in the maintenance assessment stage should follow the requirements laid down in RGCP.

### **6.3.4 Confirmation of Maintenance**

The criteria for confirmation of maintenance must follow the requirements set out in the RGCP.

### **6.4 Assessment for Recertification**

The criteria for recertification assessment should follow the requirements laid down in the RGCP and the RAC. This evaluation should be performed every 24 (twenty four) months and shall examine the results of the documentation conformity, recertification audit of the Quality Management System and the recertification trials plan.



#### **6.4.1 Treatment of non conformity in recertification stage**

The criteria for treatment of non-conformities in the recertification assessment stage must follow the requirements set out in RGCP.

#### **6.4.2 Confirmation of recertification**

The criteria for confirmation of recertification must follow the requirements set out in the RGCP.

### **7 PROCESSING OF COMPLAINTS**

Criteria for processing of complaints must follow the requirements set out in the RGCP.

### **8 ACTIVITIES PERFORMED BY FOREIGN OACS (ACCREDITED CONFORMITY ASSESSMENT BODIES)**

The criteria for activities performed by a foreign OCA must follow the requirements set out in the RGCP.

### **9 TERMINATION OF CERTIFICATION**

The criteria for termination of certification must follow the requirements set out in the RGCP.

### **10 IDENTIFICATION LABEL OF CONFORMITY**

The criteria for the Identification Label of Conformity are covered in the RGCP and in Addendum A of this RAC.

### **11 AUTHORIZATION FOR USE OF THE IDENTIFICATION LABEL OF CONFORMITY**

The criteria for authorization to use the Identification Label of Conformity must follow the requirements set out in RGCP.

### **12 RESPONSIBILITIES AND OBLIGATIONS**

The criteria for responsibilities and obligations must follow the requirements set out in the RGCP.

### **13 SUPPORT IN THE MARKET PLACE**

The criteria for monitoring should follow the requirements laid down in the RGCP.

### **14 PENALTIES**

The criteria for application of penalties should follow the requirements laid down in the RGCP.

## ADDENDUM A - LABELING AND IDENTIFICATION LABEL OF CONFORMITY


### A. 1 Labeling on the cable, rolls, reels and spools


The cables, rollers, spools and reels shall, obligatorily, be labeled in Portuguese with the following information:

- Required information for each type of cable as prescribed in the respective Specifications Addendum of the RTQ;
- Identification Label of Conformity (on product, rolls, reels and spools), conforming to items A.1.1 and A.1.2.

#### A.1.1 Use of the Identification Label of Conformity on cable

A.1.1.1 The following information must be shown on the body of the cable:

“” + “Registration Number of the Product” + “name of agency (logo or name in full)” + “OCP-xxxx (identification number of the agency) ”.

A.1.1.2 In the case of wires, cables and cords, composed of only one conductor, with a cross-section of 2.5 mm<sup>2</sup> or smaller, which, because of their dimension, would preclude the clear impression of the Identification Label of Conformity, the use of the name Inmetro in full will be allowed to replace the logo “”.

#### A.1.2 Use of the Identification Label of Conformity on rolls, reels and spools

Regardless of the type of packing (transparent, opaque, etc.), which should always exist, and nominal cross-section of cable that it holds, the use of the full Identification Label of Conformity is compulsory, either printed or affixed using an adhesive sticker.

##### A.1.2.1 Template of Identification Label of Conformity

The Identification Label of Conformity to be applied to the packaging of rolls, reels and spools are as follows:

Minimum size

35 mm



Pantone 1235

- 100%
- 80%

CMYK

- C2 M34 Y94 KO
- C2 M34 Y94 KO

Font

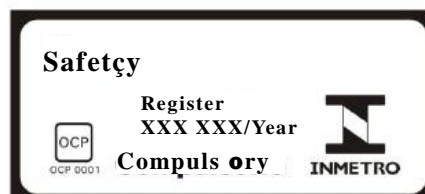
Univers

**Univers Black**



Shades of Grey

- 100%
- 90%
- 70%



## SPECIFIC ADDENDUM I

### 1 OBJECTIVE

This specific addendum applies specifically to power cables with insulation of extruded solid polyvinyl chloride (PVC) or polyethylene (PE) for a voltage of up to and including 1 kV covered by ABNT NBR 7288.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional documents apply:

ABNT NBR 7288	Power cables with insulation of extruded solid polyvinyl chloride (PVC) or polyethylene (PE) for fixed installations for voltages of 1 kV to 6 kV
NBR NM IEC 60332-3-23	Trials methods for electrical cables under fire conditions – Parte 3-23: trial of propagation vertical transmission of flame in conductors or cables vertically mounted bundles - Category B.

### 3 ACRONYMS

NM	Mercosul standard
PE	Polyethylene
PVC	Polyvinyl chloride

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this Specific Addendum are divided into the following families:

##### Group 1

- a. Power cord insulated with PVC/A and with a of PVC/ST1 cover, with rigid conductor class 1;
- b. Power Cable insulated with PVC/A and with a of PVC/ST1 cover, with rigid conductor class 2;
- c. Power cable insulated with PVC/A and with a of PVC/ST1 cover, with flexible conductor classes 4 or 5;

##### Group 2

- d. Power Cable insulated with PVC/A and with a of PE/ST3 cover, with rigid conductor class 1;
- e. Power cable insulated with PVC/A and with a of PE/ST3 jacket, with rigid conductor class 2;
- f. Power Cable insulated with PVC/A and with a of PE/ST3 cover, with flexible conductor classes 4 or 5.

##### Group 3

- g. Power Cable insulated with PE and with a of PVC/ST1 cover, with rigid conductor class 1;
- h. Power Cable insulated with PE and with a of PVC/ST1 cover, with rigid conductor class 2;
- i. Power Cable insulated with PE and with a of PVC/ST1 cover, with flexible conductor classes 4 or 5;

##### Group 4

- j. Power Cable insulated with PE and with a of PE//ST3 cover, with rigid conductor class 1;
- k. Power Cable insulated with PE and with a of PE//ST3 cover, with rigid conductor class 2;
- l. Power cable insulated with PE and with a of PE/ST3 cover, with flexible conductor classes 4 or 5.

## 5 INITIAL ASSESSMENT

### 5.1 Certification Request

On request of certification the supplier must declare if the cable is designed in such a way as to present special features related to the non propagation of fire. Depending on this declaration, the certificate must show if the product is designed ‘with special features related to the non propagation of fire’.

### 5.2 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.2.1** The initial trials are type trials, presented in Specifications Addendum I of the RTQ for this product.

**5.2.2** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll, with a nominal length of 100 m minimum or, in the case of cable wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. For the vertical burning test the sample quantity must be calculated on the basis of the cross-section of the sample to be tested, in accordance with NBR NM IEC 60332-3-23.

**5.2.3** The required amounts of samples, per family group, for the carrying out of the trials are those indicated in the table below

Cable Type	Cabling class	Initial Trials
		Type
Single core or multi core	1, 2, 4, 5	On the smallest cross-section of the largest class and on the largest cross-section of the smallest class of cabling produced.
Multi core	2, 4, 5	On the largest section of the largest class and in the smallest section of the smallest class of cabling produced.

**Note 1:** the maximum cable cross-section is 120 mm<sup>2</sup> for the achievement of the initial trials, except in the vertical burning trial, item 6.1.3 (a) of the standard ABNT NBR 7288, where the maximum cross-section is 35 mm<sup>2</sup>.

**Note 2:** the vertical burning test should be carried out when the supplier identifies the product as having special features related to the non propagation of fire. Otherwise the flame resistance test should be performed.

**5.2.4** A sample must be taken for evidence, rebuttal and witness, in accordance with item 6.2.4.2, of main part of this document.

**5.2.5** If a family has not been tested with the sampling criteria set out in item 5.2.3, this family must be subjected to the following trials: electrical resistance of conductor, electrical voltage and insulation resistance at room temperature.

## 6 MAINTENANCE TRIALS

### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of the trials and their requirements are laid down in Specific Addendum I of the RTQ for this product.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** Maintenance trials must be conducted on samples collected from the market-place, after certification, on a nominal cross-section for each product family. With each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.2.1** Samples must be collected for testing, counter sample and control sample, in accordance with item 6.2.4.2 in the main part of this document.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of the construction of the cable;
- Verification of electrical resistance;
- Electrical voltage;
- Insulation resistance at ambient temperature.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

a) For PVC/A insulation and cover in PVC/ST1:

- 1st Semester: electrical resistance of conductor and heat deformation;
- 2nd Semester: mechanical characteristics of insulation and cover, bending/stretching cold, cold impact strength and elongation of copper;
- 3rd Semester: electrical voltage, flame resistance test (in the case of PVC compound without special features regarding the spread of fire) or vertical-burning and thermal shock;
- 4th Semester: water absorption, insulation resistance test to 70°C and ageing trial on complete cable.

b) For insulation with PVC/A with a PE/ST3 cover:

- 1st Semester: electrical resistance of conductor, carbon black content and heat deformation;
- 2nd Semester: mechanical characteristics of insulation and cover, bending/stretching and lengthening of the conductor;
- 3rd Semester: long-term voltage and flame resistance and thermal shock;
- 4th Semester: water absorption, insulation resistance trial to 70°C and ageing trial on complete cable.

c) For PE insulation and PVC/ST1 cover:

- 1st Semester: electrical resistance of conductor, absorption of water, shrinkage and heat deformation;
- 2nd Semester: mechanical characteristics of insulation and jacket, stretching of conductor, cold bending/stretching and cold impact strength;
- 3rd Semester: long-term electrical voltage, flame resistance and thermal shock;
- 4th Semester: insulation of resistance to 70°C and ageing trial on complete cable.

d) For insulation in PE and with a cover of PE/ST3:

- 1st Semester: electrical resistance of conductor, water absorption of insulation, insulation shrinkage and carbon black content;
- 2nd Semester: mechanical characteristics of insulation and cover and lengthening of the conductor;
- 3rd Semester: long-term voltage and resistance to flame;
- 4th Semester: insulation of resistance to 70°C and ageing trial on complete cable.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.

**6.1.6** In the verification of labeling of the packaging of the product the requirement of special features about fire non propagation and self-extinguishing should be taken into account.

## SPECIFIC ADDENDUM II

### 1 OBJECTIVE

This specific addendum applies to flexible cords with extruded insulation of chlorosulfonated polyethylene (CSP) for voltages up to and including 300 V covered by ABNT NBR 14633.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR 14633	Flexible electrical cords with extruded insulation of chlorosulfonated polyethylene for voltages up to 300 V - Performance Requirements
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### 3 ACRONYMS

CSP - Chlorosulfonated Polyethylene

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this Specification Addendum are just one family, and the thermal class, the nominal cross-section and color may vary.

### 5 INITIAL ASSESSMENT

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial trials are type trials, specific requirements provided for in addendum II of the RTQ for this product.

**5.1.2** The sample to be taken for the carrying out of the trials must be constituted of higher and lower nominal section of the conductors. It must be in the form of a dispatch unit in roll, with a nominal length of 100 m minimum or, in the case of cable wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.2.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

### 6 MAINTENANCE TRIALS

#### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of the trials and their specific requirements are laid down in addendum II of the RTQ for this product.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** The maintenance trials must be performed in samples collected from the market-place. With each maintenance, the cables to be tested must be in accordance with their nominal cross section, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of the construction of the conductor;
- Dimensional verification of insulation;
- Electrical voltage;
- Electrical resistance;
- Separation of single-insulated conductors;
- Insulation resistance at ambient temperature.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: Electrical resistance and resistance to high temperature;
- 2nd Semester: Mechanics of insulation before and after ageing and the adhesion of the conductor on the insulation;
- 3rd Semester: Flame resistance and long-lasting electrical voltage;
- 4th Semester: Resistance of insulation at constant operating temperature (90°C or 105° C) and insulation mechanics before and after ageing.

**Note:** the references to these trials are those for the granting of the Certificate of Conformity.

**6.1.6** In the verification of labeling of the packaging of the product the requirement of special features about fire non propagation and self-extinguishing should be taken into account.



## SPECIFIC ADDENDUM III

### 1 OBJECTIVE

This specific addendum applies to flexible cords and cables insulated with polyvinyl chloride (PVC), for special applications in household electrical appliance power cords with voltages up to and including 500 V covered by ABNT NBR 14897.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR 14897	Cables and flexible electrical cords insulated with polyvinyl chloride, for special applications in household electrical appliance power cords with voltages up to 500 V
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### 3 ACRONYMS

PVC Polyvinyl chloride

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this specification addendum are divided into three classes:

- a. Twin core cable;
- b. Round flexible cable;
- c. Flat flexible cable.

### 5 INITIAL ASSESSMENT

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial tests are the type tests and of flexion tests, as laid down in specific addendum III of RTQ for this product.

**5.1.2** The requirements to be met for testing of cables and cords, according to their families are as follows:

Families of products	No. of single-insulated conductors	Cabling class	Voltage (V)	Type trials (no.x mm <sup>2</sup> )	Flexion trials (no.x mm <sup>2</sup> )
Twin core cable	2	4,5 or 6	300	2 x 2,5	2 x 0.5
Round 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 cables submitted to the certification process are not in the nominal cross-sections indicated, the closest possible nominal cross-section must be used.

**Note 2:** The table above is applicable for the smallest class of cabling submitted for certification. For cables of other classes of cable in each family the tests of production quality control, flexion and testing of electrical voltage, in the cross-sections and forms defined in the table above, as laid down in specifications addendum III of the RTQ.

**Note 3:** The insulation will be in polyvinyl chloride type PVC/EB and cover of type PVC/ST10.

**5.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

## **6 MAINTENANCE TRIALS**

### **6.1 Maintenance trial plan**

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of the tests and their regulations are laid down in specific addendum III of the RTQ for this product.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** The maintenance trials must be performed, in samples collected in the market-place, in a section of each family of product. At each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of construction (dimensions);
- Electrical voltage;
- Electrical resistance of conductor;
- Insulation resistance at room temperature;
- Separation of the single-insulated conductors, only for the parallel strands.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out in accordance with the frequency of maintenance trials,

- 1st Semester: heat deformation of insulation/cover and electrical voltage in the single-insulated conductors;
- 2nd Semester: traction of the insulation/cover before and after ageing and thermal stability of cover;
- 3rd Semester: thermal shock, flame non-propagation and flexion followed by electrical voltage;

- 4th Semester: Aging in full cable and insulation resistance at a temperature of 105°C.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.

## SPECIFIC ADDENDUM IV

### 1 OBJECTIVE

This Addendum applies to flexible cords and cables insulated with ethylene-propylene rubber (EPR) for special applications in household electrical appliance power cords with voltages up to and including 500 V covered by ABNT NBR 14898.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR 14898	Flexible cables insulated with ethylene-propylene rubber for special applications in household electrical appliance power cords with voltages up to 500V.
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### 3 ACRONYMS

EPR Ethylene propylene

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this specific addendum are just one family, of round flexible cable.

### 5 INITIAL ASSESSMENT

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial tests are the type tests and flexion, requirements provided for in specific addendum IV of RTQ for this product.

**5.1.2** The requirements to be met for trials of cables and cords, in accordance with their families, are the following:

Families of products	No. of single-insulated conductors	Cabling class	Voltage (V)	Type trials (no.x mm <sup>2</sup> )	Flexion trials (no.x mm <sup>2</sup> )
Round flexible cable	2 to 5	4,5 or 6	500	3 x 1.5	2 x 0.5

**Note 1:** The table above is applicable for the smallest class of cabling submitted for certification. For cables of other classes of cable in each family the tests of production quality control, flexion and testing of electrical voltage, in the cross-sections and forms defined in the table above, as laid down in specific addendum IV of RTQ of this product.

**Note 2:** the insulation must be in EPR and the cover thermoset composite ES130.

**5.1.3** If the cables submitted to the certification process are not in the nominal cross-sections 5.1.2 indicated, the closest possible nominal cross-section must be used.

**5.1.4** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll, with a

nominal length of 100 m minimum or, in the case of cable wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.4.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

## **6 MAINTENANCE TRIALS**

### **6.1 Maintenance trial plan**

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of the tests and their requirements are laid down in specific addendum IV of the RTQ for this product.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** The maintenance trials must be performed in samples collected from the market-place. With each maintenance, the cables to be tested must be in accordance with their nominal cross section, collected in a random manner within the family to be tested.

**6.1.2.1** Samples must be collected for testing, counter sample and control, in accordance with item 6.2.4.2 in the main part of this document.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of construction (dimensions);
- Electrical voltage;
- Electrical resistance of conductor;
- Insulation resistance at ambient temperature.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: resistance to ozone and insulation resistance to temperature of 130°C;
- 2nd Semester: traction of the insulation/cover before and after aging and aging in full cable;
- 3rd Semester: flame spread non-propagation, heat stretching of the insulation/cover and flexion followed by electrical voltage;
- 4th Semester: mechanics in air pump of the insulation /cover electrical voltage in the single insulated conductors and oil immersion.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.

**6.1.6** In the verification of labeling of the packaging of the product the requirement of special features about fire non-propagation and self-extinguishing should be taken into account.

## SPECIFIC ADDENDUM V

### 1 OBJECTIVE

This Specific Addendum is applicable to power cables and insulated conductors without cover, with extruded insulation and with low smoke emission for voltages up to and including 1kV, covered by ABNT NBR 13248.

### 2 ADDITIONAL DOCUMENTS

In addition the documents of this RAC the following documents apply:

ABNT NBR 13248	Power and control cables and insulated conductors without cover, with extruded insulation and with low smoke emission for voltages up to 1kV.
NBR NM IEC 60332-3-24	Trials methods for electrical cables under fire conditions – Parte 3-23: trial of vertical transmission of flame in conductors or cables on beams built vertically - Category C.

### 3 ACRONYMS

XLPE Cross linked polyethylene

EPR Ethylene propylene

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this specific addendum are divided into the following families:

- a. Solid conductor, insulated in polyolefin thermoplastic compound, 70°C, up to 450/750V, without cover;
- b. Rigid conductor, insulated in thermoplastic polyolefin compound, 70°C, up to 450/750V, without cover;
- c. Flexible conductor, insulated in thermoplastic polyolefin compound, 70°C, up to 450/750V, without cover
- d. Solid conductor, insulated in polyolefin thermosetting compound EPR/B, 90°C, up to 450/750V, without cover;
- e. Rigid conductor, insulated in polyolefin thermosetting compound EPR/B, 90°C, up to 450/750V, without cover;
- f. Flexible conductor, insulated in polyolefin thermosetting compound EPR/B, 90°C, up to 450/750V, without cover;
- g. Solid conductor, insulated in polyolefin thermosetting compound XLPE, 90°C, up to 450/750V, without cover;
- h. Rigid conductor, insulated in polyolefin thermosetting compound XLPE, 90°C, up to 450/750V, without cover;
- i. Flexible conductor, insulated in polyolefin thermosetting compound XLPE, 90°C, up to 450/750V, without cover;
- j. Power cable, insulated in thermosetting compound EPR, polyolefin thermoplastic compound cover 90°C, up to 0,6/1kV;
- k. Power cable, insulated in thermosetting compound EPR, polyolefin thermoset compound cover, 90°C, up to 0,6/1kV;
- l. Power cable, insulated in thermosetting compound XLPE, polyolefin thermoplastic compound cover in, 90°C, up to 0,6/1kV;
- m. Power cable, insulated in thermosetting compound XLPE, polyolefin thermoset compound cover, 90°C, up to 0,6/1kV;
- n. Flexible power cable, insulated in thermosetting compound EPR, polyolefin thermoplastic compound cover, 90°C, up to 0,6/1kV;
- o. Flexible power cable, insulated in thermosetting compound EPR, polyolefin thermoset compound cover, 90°C, up to 0,6/1kV;
- p. Flexible power cable, insulated in thermosetting compound XLPE, polyolefin thermoplastic compound cover , 90°C, up to 0,6/1kV;
- q. Flexible power cable, insulated in thermosetting compound XLPE, polyolefin thermoset compound cover, 90°C, up to 0,6/1kV;

## 5 INITIAL ASSESSMENT

### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

5.1.1 The initial trials are tests of the type, planned in specific addendum V of RTQ for this product.

5.1.2 The requirements to be met for trials of cables, in accordance with their families, are the following:

Families of products	Material of insulation	Cover material	No. of single-insulated conductors	Cabling class	Voltage (V)	Type trials
Solid insulated conductor 70°C	Thermoplastic Pol. Comp.	---	1	1	750	Smallest and largest section
Rigid insulated conductor 70°C	Thermoplastic Pol. Comp.	---	1	2	750	Smallest and largest section
Flexible insulated conductor 70°C	Thermoplastic Pol. Comp.	---	1	4 or 5	750	Smallest and largest section
Solid insulated conductor 90°C	EPR/B	---	1	1	750	Smallest and largest section
Rigid insulated conductor 90°C	EPR/B	---	1	2	750	Smallest and largest section
Flexible insulated conductor 90°C	EPR/B	---	1	4 or 5	750	Smallest and largest section
Solid insulated conductor 90°C	XLPE	---	1	1	750	Smallest and largest section
Rigid insulated conductor 90°C	XLPE	---	1	2	750	Smallest and largest section
Flexible insulated conductor 90°C	XLPE	---	1	4 or 5	750	Smallest and largest section
Power cable	EPR	Thermoplastic Pol. Comp.	1 to 5	2	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Power cable	EPR	Thermosetting Pol. Comp.	1 to 5	2	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Power cable	XLPE	Thermoplastic Pol. Comp.	1 to 5	2	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Power cable	XLPE	Thermosetting Pol. Comp.	1 to 5	2	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Flexible power cable	EPR	Thermoplastic Pol. Comp.	1 to 5	4 or 5	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Flexible power cable	EPR	Thermosetting Pol. Comp.	1 to 5	4 or 5	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Flexible power cable	XLPE	Thermoplastic Pol. Comp.	1 to 5	4 or 5	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>
Flexible power cable	XLPE	Thermosetting Pol. Comp.	1 to 5	4 or 5	0,6/1k	1 x 35mm <sup>2</sup> and 3 x 4mm <sup>2</sup>



**Note 1:** in the case that the power cables submitted to the certification process are not in the sections given in table 5.1.2, then the closest nominal section must be used.

**Note 2:** For cables of class 4 or 5, the above table is applicable to the most flexible cabling class among those requested. The less flexible class must be submitted to quality of production control trials, in rated sections and defined formations in above table, in accordance with specific addendum V of RTQ of this product.

**5.1.4** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll, with a nominal length of 100m minimum or, in the case of cable wrapped on a drum, a minimum sample of length 30 m, sufficient to perform all the trials, except vertical burn. For vertical burn trials the quantity of sample must be calculated on the basis of section to be tested, in accordance with ABNT NBR NM IEC 60332-3-24.

**5.1.4.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

## **6 MAINTENANCE TRIALS**

### **6.1 Maintenance trial plan**

**6.1** Maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of the trials and their requirements are laid down in specific addendum V of the RTQ for this product.

**6.1.1** If any non-conformity is found in the bi-annual trials, the next periodic assessment must perform the trials prescribed for that semester and in addition repeat all trials for the semester in which the non-compliance has occurred.

**6.1.2** The maintenance trials must be performed, in samples collected in the market-place, in a section of each family of product. With every maintenance testing, the cables to be tested shall be in accordance with its nominal cross-sections, collected randomly within the family tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of marking on label and on product;
- Dimensional verification;
- Verification of conformity with construction requirements;
- Electrical voltage applied;
- Electrical resistance of conductor;
- Insulation resistance at ambient temperature.

### 6.1.5 Additional Trials

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

a) Conductor insulated in thermoplastic compound, 70°C (rigid, solid or flexible)

- 1st Semester: determination of degree of acidity, determination of the presence of halogen and sulfur, mechanical characteristics and long-term electrical voltage;
- 2nd Semester: determination of quantity of acidic gas, determination of index of toxicity, water absorption (electrical method) and cold folding/stretching,
- 3rd Semester: density of smoke, loss of mass and vertical burn;
- 4th Semester: heat deformation, thermal shock and resistance of insulation at operational maximum temperature.

b) Conductor insulated in thermoset compound, 90°C in EPR/B (rigid, solid or flexible)

- 1st Semester: Mechanical characteristics, hot stretching, resistance of insulation at operational maximum temperature and electrical voltage of long duration;
- 2nd Semester: Vertical burn and water absorption (gravimetric);
- 3rd Semester: Determination of the presence of halogen, nitrogen and sulfur, determination of the degree of acidity, determination of quantity of acidic gas and determination of index of toxicity;
- 4th Semester: Density of smoke, resistance to ozone and traction after aging in air pump.

c) Conductor insulated in thermoset compound, 90°C in XLPE (rigid, solid or flexible)

- 1st Semester: Mechanical characteristics, heat stretching, resistance of insulation at operational maximum temperature and electrical voltage of long duration;
- 2nd Semester: Vertical burn and water absorption (gravimetric);
- 3rd Semester: Determination of the presence of halogen, nitrogen and sulfur, determination of the degree of acidity, determination of quantity of acidic gas and determination of index of toxicity;
- 4th Semester: Density of smoke and retraction.

d) Power Cables insulated in EPR or XLPE with cover in thermoplastic polyolefin compound 90°C

- 1st Semester: Mechanical characteristics, determination of the presence of halogen nitrogen and sulfur, determination of the degree of acidity and electrical voltage of long duration;
- 2nd Semester: Water absorption (gravimetric method), cold folding/stretching, determination of quantity of acidic gas and determination of index of toxicity,
- 3rd Semester: Loss of mass, density of smoke, aging in air pump (only applicable to EPR), resistance to ozone (only applicable to EPR), vertical burn and aging of complete cable;
- 4th Semester: Heat deformation, resistance to cold impact, hot stretching and resistance of insulation and at operational maximum temperature.

e) Power Cables insulated in EPR or XLPE with cover in thermosetting polyolefin compound 90°C

- 1st Semester: Mechanical characteristics, determination of the presence of halogen nitrogen and sulfur, determination of the degree of acidity and electrical voltage of long duration;
- 2nd Semester: Water absorption of (gravimetric method), determination of quantity of acidic gas and determination of index of toxicity,
- 3rd Semester: Density of smoke, aging in air pump (only applicable to EPR), resistance to ozone (only to EPR) and vertical burn;
- 4th Semester: Heat stretching, aging of complete cable, resistance of insulation at operational maximum temperature and immersion in oil.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.

## SPECIFIC ADDENDUM VI

### 1 OBJECTIVE

This Specific Addendum is applicable to flexible twisted cords for voltages up to and including 300 V, covered by ABNT NBR 15717.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR 15717	Flexible twisted cords for voltages up to 300 V
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### 3 DEFINITIONS

#### 3.1 Family

The products covered by this Specific Addendum only make up one family, the section, the class of cables and color may vary.

### 4 INITIAL ASSESSMENT

#### 4.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**4.1.1** The initial trials are type trials, planned in Specific Addendum VI of RTQ for this object.

**4.1.2** The type trials are applicable to the most flexible stringing class within those submitted to the certification process. The section to be tested is the 2 x 2,5 mm<sup>2</sup>. In other cabling classes trials of verification of construction of cord and electrical resistance of conductor are performed. In the case cables indicated in section highlighted are not submitted to the certification process, the closest possible nominal section must be used.

**4.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**4.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

### 5 MAINTENANCE TRIALS

#### 5.1 Maintenance trial plan

**5.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in Specific Addendum VI of the RTQ for this product.

**5.1.1.1** In the case that a non-conformity is verified in biannual trials, the next periodic assessment must perform the trials prescribed for that semester and in addition repeat all trials for the semester in which the non-compliance occurred.

**5.1.2** The maintenance trials must be performed in samples collected from the market-place. In each maintenance, the cables to be tested must be in accordance with their nominal cross section, collected in a random manner within the family to be tested.

**5.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials

**5.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **5.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of construction of cord;
- Electrical voltage in insulation;
- Electrical resistance of conductor;
- Insulation resistance at ambient temperature.

#### **5.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: electrical resistance and pressure to high temperature (heat deformation);
- 2nd Semester: mechanics of insulation, low temperature flexion and stretching in wire components of conductor,
- 3rd Semester: thermal shock, loss of mass and resistance to flame;
- 4th Semester: electrical voltage of long duration, resistance of insulation to maximum temperature of operation and mechanics of insulation.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.

## SPECIFIC ADDENDUM VII

### 1 OBJECTIVE

This Specific Addendum is applicable to insulated conductors with polyvinylchloride (PVC) for nominal voltage up to and including 450/750 V, covered by ABNT NBR NM 247-3 (insulated conductors - without cover - for fixed installations).

### 2 ADDITIONAL DOCUMENTS

In addition the documents of this RAC the following documents apply:

ABNT NBR NM-247-3	Insulated cables with polyvinyl chloride for nominal voltages up to and including 450/750V, – Part 3: insulated conductors (without cover), for fixed installations (IEC 60227-3, MOD)
ABNT NBR NM-247-1	Insulated cables with polyvinyl chloride for nominal voltages up to and including 450/750 V, – Part 1: General requirements (IEC 60227-1, MOD)
ABNT NBR NM-247-2	Insulated cables with polyvinyl chloride for nominal voltages up to and including 450/750 V, – Part 2: trial methods (IEC 60227-2, MOD)
NBR NM IEC 60332-3-23	Trials methods for electrical cables under fire conditions – Parte 3-23: trial of propagation vertical transmission of flame in conductors or cables vertically mounted bundles - Category B.

### 3 ACRONYMS

MOD	Modified
NM	Mercosul standard
PVC	Polyvinyl chloride

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this Specific Addendum are divided into the following families:

- a. Solid wire (Insulated conductor (without cover), with rigid conductor, for general application, 450/750V). Designation 247 NM 01 C1 – BWF-B;
- b. Rigid wire (Insulated conductor (without cover), with rigid conductor, for general application, 450/750V). Designation 247 NM 01 C2 – BWF-B;
- c. Flexible wire (Insulated conductor (without cover), with flexible conductor, for general application, 450/750V). Designation 247 NM 02 C4 – BWF-B, for class 4, or 247 NM 02 C5 – BWF-B, for class 5;
- d. Insulated conductor (without cover), with solid conductor, for internal wiring and maximum temperature in conductor of 70°C, 300/500V – designation 247 NM 05 C1;
- e. Insulated conductor (without cover, with flexible conductor, for internal wiring and maximum temperature in conductor of 70°C, 300/500V – designation 247 NM 05 C5;
- f. Insulated conductor (without cover), with solid conductor, for internal wiring and maximum temperature in conductor of 90°C, 300/500V – designation 247 NM 07 C1 – 90°C;
- g. Insulated conductor (without cover), with flexible conductor, for internal wiring and maximum temperature in conductor of 90°C, 300/500V – designation 247 NM 08 C5 – 90°C.

**Note:** The families for internal wiring, defined above, cannot be used in alternative to types 247 NM 01 C1 and C2 – BWF-B or 247 NM 02 C4 and C5 – BWF-B as they do not have compactable characteristics of resistance to flame. These products can only be used in installation in control panels and control.

## 5 INITIAL TRIALS

### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial trials must be types trials, planned in Specific Addendum VII of the RTQ for this product.

**5.1.2** The quantity of samples needed for the performance of trials is prescribed in ABNT NBR NM 247-2 and corresponds to the largest and smallest section of conductors of each family. For the specific case of vertical burn trial, the maximum nominal section tested must be limited to 50 mm<sup>2</sup>.

**5.1.3** In the specific case of the family made up of cables of designation 247 NM 02 C4 BWF-B and 247 NM 02 C5 BWF-B, having being put forward to the certification process cables of cabling class 4 or 5, the type of cable with the largest section and of smallest section must be selected for trial, being that the two samples must belong to different cabling classes. In addition, analyzing the criticality among the sections presented, two other cables of distinct sections to the ones submitted to trial must be selected for routine trial, necessarily being of different cabling classes.

**Note:** the referenced trials in norm ABNT NBR NM 247-3 as routine and receipt, must also be understood as routine trials.

**5.1.4** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials (except vertical burn). For vertical burn trials the quantity of sample must be calculated in function of sections to be tested, in accordance with NBR NM IEC 60332-3-23. In addition to this, a 30m sample of elemental copper wire must be collected, before the stringing processes, for the performance of determination of stretching and electrical resistivity trials.

**5.1.4.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

**5.1.5** The oxygen index trial must be perfumed with specimens representative of sample of trial of vertical burn. Presenting satisfactory results, the smallest acquired value in this trial will be considered as reference value.

## 6 MAINTENANCE TRIALS

### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in Specific Addendum VII of RTQ for this object.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** Maintenance trials must be performed, on samples collected in the market-place in a section of each family of product. With each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of conformity with construction requirements;
- Dimensional measurements of conductor and of insulation;
- Electrical voltage;
- Resistance of conductor;
- Resistance of insulation to 20° C;
- Oxygen index, for BWF-B families;
- Non propagation of flame, for families that are BWF-B.

**Note:** In the specific cases of oxygen index trial, the obtained values in samples cannot present results below in up to 0,2 percentage points of value of reference obtained in initial trials. For results below those specified above, a vertical burn trial must be performed. If the vertical burn trial shows satisfactory results, the new index value of oxygen obtained becomes the reference value.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: electrical resistance, heat deformation and loss of mass;
- 2nd Semester: mechanics of insulation, flexion or stretching of insulation and stretching of copper,
- 3rd Semester: thermal shock and resistance of insulation at operational maximum temperature.(70C or 90°C);
- 4th Semester: water absorption and mechanics of insulation

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.



**SPECIFIC ADDENDUM VIII****1 OBJECTIVE**

This Specific Addendum is applicable to insulated cables with polyvinyl chloride (PVC) for voltages up to and including 450/750 V, covered by ABNT NBR NM 247-5 (flexible cables).

**2 ADDITIONAL DOCUMENTS**

In addition the documents of this RAC the following documents apply:

ABNT NBR NM-247-5	Insulated cables with polyvinyl chloride (PVC) for voltages up to and including 450/750V. Part 5: flexible cables (cords) (IEC 60227-5, MOD)
ABNT NBR NM-247-1	Insulated cables with polyvinyl chloride (PVC) for nominal voltages up to and including 450/750V, – Part 1: General requirements (IEC 60227-1, MOD)
ABNT NBR NM-247-2	Insulated cables with polyvinyl chloride (PVC) for nominal voltages up to and including 450/750V, – Part 2: trial methods (IEC 60227-2, MOD)
NBR NM IEC 60332-3-23	Trials methods for electrical cables under fire conditions – Parte 3-23: trial of propagation vertical transmission of flame in conductors or cables vertically mounted bundles - Category B.

**3 ACRONYMS**

MOD	Modified
NM	Mercosul standard
PVC	Polyvinyl chloride

**4 DEFINITIONS****4.1 Family**

The products covered by this Specific Addendum are divided into the following families:

- a. Cord of flat profile without cover (parallel cable). 247 NM 42-C5 and 247 NM 42-C6 designation;
- b. Cord for indoor light garlands. 247 NM 43 C5 designation;
- c. Cord with light cover of polyvinyl chloride (flexible cable 300/300V of flat profile). 247 NM 52 C5 designation;
- d. Cord with light cover of polyvinyl chloride (flexible cable 300/300V of round profile). 247 NM 52 C5 designation;
- e. Cord with common light cover of polyvinyl chloride (flexible cable 300/500V of flat profile). 247 NM 53 C5 designation;
- f. Cord with common cover of polyvinyl chloride (flexible cable 300/500V of round profile). 247 NM 53 C5 designation.

## 5 INITIAL TRIALS

### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial are types trials and flexion, prescribed in specific addendum VIII of RTQ for this object.

**5.1.2** The quantity of samples needed for the performance of trials is prescribed in ABNT NBR 247-5. The requirements to be met for cables and cords trials, in accordance with their families are the following:

Product	No. of single-insulated conductors	Cabling class	Voltage (V)	Profile	Type trials (no.x mm <sup>2</sup> )	Flexion trials (no.x mm <sup>2</sup> )
247 NM 42	2	5 or 6	300	Flat	2 x 2,5	2 x 0.5
247 NM 43	1	5	300	--	1 x 0.75	---
247 NM 52	2	5	300	Flat	2 x 0.5	---
	2 and 3			Round	3 x 0.75	---
247 NM 53	2 and 3	5	500	Flat	2 x 0.75	3 x 1.5
	2 to 5			Round	3 x 2,5	2 x 0.5

**Note:** In the case of cables in the indicated section, these are not those submitted to the certification process. The closest possible section must be tested.

**5.1.2.1** For cables designated 247 NM 42, the smallest class of cables among those requested by supplier must be tested.

**5.1.2.2** In the event of cables designated 247 NM 52 and 247 NM 53 flat and round, the trials of above table must be performed in profile of 52 designation and in round profile of 53 designation. The routine and flexion trials must in addition be performed in flat profile of 53 designation and round profile of 52 designation.

**Note:** the referenced trials in norm ABNT NBR NM 247-5 as routine and receipt, must also be understood as routine trials.

**5.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. For the specific case of sample for flexion trial when the sample taken with indicated section in table of item 5.1.2, have different section of samples from other trials, the minimum cable length for the flexion trial only must be 10m.

**5.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

## 6 MAINTENANCE TRIALS

### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in Specific Addendum VIII of RTQ for this product.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** The maintenance trials must be performed in samples collected from the market-place. With each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of marking on label and on product;
- Dimensional verification;
- Verification of conformity with construction requirements;
- Electrical voltage applied in veins and entire cable;
- Electrical resistance of conductor;
- Separation of single-insulated conductors;
- Resistance of insulation to temperature of 20° C.

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: Electrical resistance of conductor, heat deformation and flexion;
- 2nd Semester: Mechanics of insulation/cover, cold flexion or cold stretching, resistance to cold impact on complete cable and stretching to breaking of conductor;
- 3rd Semester: Thermal shock, non transmission of flame and loss of mass;
- 4th Semester: Insulation resistance to 70° C, mechanics of insulation/cover and non contamination.

**Note:** the references to these trials are those for the granting of the Certificate of Conformity.

## SPECIFIC ADDENDUM IX

### 1 OBJECTIVE

This Specific Addendum is applicable to flexible cables insulated with silicone rubber single core without cover and multi core with cover, heat resistant, for rated voltages up to and including 450/750V, covered by ABNT NBR NM 274.

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR NM 274	Flexible cables insulated with silicone rubber single core without cover and multi core with cover, heat resistant, for rated voltages up to and including 450/750V.
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### 3 ACRONYMS

NM Mercosul standard

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this specific addendum are divided into the following families:

- a. Single core flexible cables insulated with silicone rubber without cover, heat resistant, for maximum temperature in conductor of 180°C, 274 NM SIL 01-CX (flexible cable 300/500 V) designation or 274 NM SIL 02-CX (flexible cable 450/750 V) designation;
- b. Multi core flexible cables insulated with silicone rubber cover, heat resistant, for maximum temperature in conductor of 180°C, 274 NM SIL 03-CX (flexible cable 300/500 V) designation or 274 NM SIL 04-CX (flexible cable 450/750 V) designation;

**Note:** X is equal to 4 or 5, in accordance with class of conductor used.

### 5 INITIAL ASSESSMENT

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial trial must be performed in accordance with specific addendum IX of RTQ for this object and with the table below:

Product	No. of single-insulated conductors	Cabling class	Voltage (V)	Type trials
Single core	1 or 2, 3, 4, 5, 7, 12	4 or 5	300/500	In smallest section of largest cabling class and in largest section of smallest cabling class produced
			450/750	
Multi core	1 or 2, 3, 4, 5, 7, 12	4 or 5	300/500	In smallest section of largest cabling class and in largest section of smallest cabling class produced
			450/750	

**5.1.2** The maximum section for the performance of initial trials must be of 1x120mm<sup>2</sup> or 4x10mm<sup>2</sup>

**5.1.3** These type trials are applicable to single core cables as well as to multi core, in smallest section of largest cabling class and in largest section of smallest cabling class produced and for the cable with higher voltage level, within those submitted to the certification process. In this case the cables with lowest voltage level will be submitted to routine and flexure trials.

**Note:** the referenced trials in norm ABNT NBR NM 274 as routine and receipt must also be understood as routine trials.

**5.1.5** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.5.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

## **6 MAINTENANCE TRIALS**

### **6.1 Maintenance trial plan**

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in specific addendum IX of RTQ for this object.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** The maintenance trials must be performed, on samples collected in the market-place, in a section of each family of product. With each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of conformity with construction requirements;
- Dimensional measurements of conductor, of insulation and cover;
- Electrical voltage;
- Resistance of conductor

### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, in accordance with the frequency of maintenance trials, the following trials must be performed:

- 1st Semester: Electrical voltage in single-insulated conductor, when applicable;
- 2nd Semester: Mechanical characteristics, before and after aging (insulation and cover);
- 3rd Semester: Hot stretching (insulation and cover);
- 4th Semester: There is no specific trial for this semester.

**Note:** the references to these trials are those for the granting of the Certificate of Conformity.

## SPECIFIC ADDENDUM X

### 1 OBJECTIVE

This Specific Addendum is applicable to insulated cables with thermosetting elastomeric compounds, for voltages up to and including 450/750 V, covered by ABNT NBR NM 287-3 (cables insulated with silicone rubber with braid, heat resistant).

### 2 ADDITIONAL DOCUMENTS

In addition to the documents of this RAC the following additional document applies:

ABNT NBR NM287-3	Insulated cables with thermosetting elastomeric compounds, for rated voltages up to and including 450/750V, – Part 3: Cables insulated with silicone rubber with braid, heat resistant (IEC 60245-3 MOD).
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### 3 ACRONYMS

MOD	Modified
NM	Mercosul standard
IE2	Silicone rubber compound.

### 4 DEFINITIONS

#### 4.1 Family

For the purpose of this specific addendum only one family of cables is considered, in accordance with 287 NM 03 designation.

### 5 INITIAL ASSESSMENT

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial trial are types trials planned in Specific Addendum X of RTQ for this object, trials must be performed in smallest and largest section of family.

**5.1.2** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.2.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

### 6 MAINTENANCE TRIALS

#### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in specific addendum X of RTQ for this object.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** Maintenance trials must be performed, on samples collected in the market place for a determined section of cable. At each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

#### **6.1.4 Basic Trials**

Every six months the following trials must take place:

- Verification of labeling;
- Verification of conformity with construction requirements;
- Dimensional measurements of conductor, of insulation and braid;
- Electrical voltage;
- Resistance of conductor;

#### **6.1.5 Additional Trials**

In addition to those mentioned in previous item, the following trials must be carried out: in accordance with the frequency of maintenance trials,

- 1st Semester: Trial of traction to breaking before and after aging in air enclosure;
- 2nd Semester: There is no specific trial for this semester;
- 3rd Semester: Hot stretching trial;
- 4th Semester: there is no specific trial for this semester.

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.



## SPECIFIC ADDENDUM XI

### 1 OBJECTIVE

This Specific Addendum is applicable to insulated cables with thermosetting elastomeric compounds for voltages up to and including 450/750 V, covered by ABNT NBR NM 287-4 (cords and flexible cables).

### 2 ADDITIONAL DOCUMENTS

In addition the documents of this RAC the following documents apply:

ABNT NBR NM-287-4	Insulated cables with thermosetting elastomeric compounds, for nominal voltages up to and including 450/750V, – Part 4: Cords and flexible cables (IEC 60245-4, 2004 MOD)
ABNT NBR NM-287-1	Insulated cables with thermosetting elastomeric compounds, for rated voltages up to and including 450/750V, – Part 1: General requirements (IEC 60245-1, MOD)
ABNT NBR NM-287-2	Insulated cables with thermosetting elastomeric compounds, for rated voltages up to and including 450/750V, – Part 2: Trial methods (IEC 60245-2, MOD)

### 3 ACRONYMS

EPR	Ethylene propylene
IE4	Ethylene propylene rubber compound (EPR)
HEPR	Ethylene propylene rubber compound ‘Hard grade’
MOD	Modified
SE3	Ethylene propylene rubber compound
SE4	Polychloroprene compound

### 4 DEFINITIONS

#### 4.1 Family

The products covered by this Specific Addendum are divided into the following families:

- a. Round Flexible Cable IE4 SE3 300/500V Class 5 - Code: 287 NM 53 C5-60;
- b. Round Flexible Cable EPR or HEPR SE3 300/500V Class 5 - Code: 287 NM 53 C5-90;
- c. Round Flexible Cable IE4 SE4 300/500V Class 5 - Code: 287 NM 57 C5-60;
- d. Round Flexible Cable EPR or HEPR SE4 300/500V Class 5 - Code: 287 NM 57 C5-90;
- e. Round Flexible Cable IE4 SE4 450/750V Class 5 - Code: 287 NM 66 C5-60;
- f. Round Flexible Cable EPR or HEPR SE4 450/750V Class 5 - Code: 287 NM 66 C5-90

### 5 INITIAL TRIALS

#### 5.1 Definitions of Initial Trials, Sampling and Acceptance Criteria

**5.1.1** The initial trials are type trials of the type, planned in Specific Addendum II of RTQ for this object.

**5.1.2** The requirements to be met for trials of cables and cords, in accordance with their families, are the following:

Product	No. of single-insulated conductors	Cabling class	Voltage (V)	Profile	Type trials (no.x mm <sup>2</sup> )
287 NM 53	2 to 5	5	500	Round	One sample of smallest section and of smallest number of single-insulated conductors
287 NM 57	2 to 5	5	500		
287 NM 66	1 to 5	5	750		

**5.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials.

**5.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

**5.1.4** Modifications to insulation of cable necessitate the performance of new trials, in accordance to table above and the division of the families.

## 6 MAINTENANCE TRIALS

### 6.1 Maintenance trial plan

**6.1.1** The maintenance trials are divided into basic trials and additional trials. Both are performed bi-annually however the basic trials for the product are always the same while the additional vary each semester. The description of trials and their requirements are shown in Specific Addendum XI of RTQ for this object.

**6.1.1.1** If a non-conformity is verified in biannual trials, in the next periodic assessment, planned trials must be performed plus the semester trials in which the non conformity was noted.

**6.1.2** Maintenance trials must be performed, on samples collected in the market place, following the certification in one section of each family of product. With each maintenance, the cables to be tested must be in accordance with their nominal sections, collected in a random manner within the family to be tested.

**6.1.3** The sample to be taken for the carrying out of the trials must be in the form of a dispatch unit in roll or box, with a nominal length of 100 m minimum or, in the case of cables wrapped on a drum, a minimum sample of length of 30 m, sufficient to perform all the trials. In addition to this, a 30 m sample of elemental copper wire must be collected, before the stringing process, for the performance trial of determination of stretching and electrical resistance of copper.

**6.1.3.1** Samples must be collected for testing, counter sampling and control, in accordance with item 6.2.4.2, in the main part of this document.

### 6.1.4 Basic Trials

Every six months the following trials must take place:

- Verification of labeling;

- Verification of conformity with construction requirements (including roundness, when applicable);
- Electrical voltage;
- Resistance of conductor;
- Resistance of insulation to 20°C.

### 6.1.5 Additional Trials

In addition to those mentioned in previous item, the following trials must be performed in accordance with the frequency of maintenance trials:

- a) Round Flexible Cable IE4 SE3 300/500V Class 5 or Round Flexible Cable EPR or HEPR SE3 300/500V Class 5
- 1st Semester: flexibility followed by electrical voltage, hardness (HEPR) and electrical resistance;
  - 2nd Semester: mechanical characteristics (insulation/cover), stretching of copper and modulus of elasticity of HEPR;
  - 3rd Semester: thermal shock in single insulated conductor and hot stretching and resistance of insulation at operational maximum temperature.(60C or 90°C);
  - 4th Semester: ozone resistance, traction following aging in air pump and water absorption (EPR or HEPR).
- b) Round Flexible Cable IE4 SE4 300/500V Class 5 or Round Flexible Cable EPR or HEPR SE4 300/500V Class 5
- 1st Semester: flexibility followed by electrical voltage, hardness (HEPR), electrical resistance and cold flexion of cover (only applicable to SE 4 compound);
  - 2nd Semester: mechanical characteristics (insulation/cover), traction following oil immersion and stretching of copper and modulus of elasticity of HEPR;
  - 3rd Semester: electrical tension in single insulated conductors, hot stretching and resistance of insulation at operational maximum temperature.(60C or 90°C);
  - 4th Semester: ozone resistance, traction following aging in air pump and water absorption (EPR or HEPR).
- c) Round Flexible Cable IE4 SE4 450/750V Class 5 or Round Flexible Cable EPR or HEPR SE4 450/750V Class 5
- 1st Semester: flexibility followed by electrical voltage, hardness (HEPR), electrical resistance and cold flexion/stretching;
  - 2nd Semester: mechanical characteristics (insulation/cover), stretching of copper and modulus of elasticity of HEPR;
  - 3rd Semester: electrical voltage in single insulated conductors, hot stretching and resistance of insulation at operational maximum temperature.(60C or 90°C);
  - 4th Semester: ozone resistance, traction following aging in air pump and water absorption (EPR or HEPR).

**Note:** the references for these trials are those for the granting of the Certificate of Conformity.