



**TECHNICAL SPECIFICATION C2/121**  
**FOUR-POLE DISCONNECTORS FOR USE IN METER CABINETS**  
Edition 1.0

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## 1 Object and Scope

Synergrid offers the possibility to homologate four-pole disconnectors for use in meter cabinets in accordance with the technical requirements described in the present document. The disconnector must comply with the characteristics defined by the distribution system operator (DSO).

The technical prescription C1/107 – General technical requirements for connecting a user's electrical installation to the low-voltage distribution network applies to:

- New connections to the public low-voltage distribution network.
- Situations in which certain components, including the disconnector, are replaced in an existing installation.

This technical specification describes the disconnectors for use in “standard” meter cabinets (e.g., type “25D60”) as well as disconnectors with smaller dimensions that can also be used in compact meter cabinets. This latter type of disconnectors is referred to as “disconnectors for compact meter cabinets” throughout the remainder of this technical specification.

## 2 References

The homologated disconnectors must, at the time of submission and throughout the entire validity period, comply (and continue to comply) with the current technical specifications and the most recently published version of the applicable technical standards and all underlying standards, including any addenda.

The technical specification S1/01 – Procedure for applying for homologation and extension of homologation of materials describes the different steps to be followed when changes are made to homologated disconnectors, or when unannounced modifications or anomalies are detected. If such modifications or anomalies have a negative impact on the grid, Synergrid will take the appropriate actions in accordance with the same technical specification.

### 2.1 Technical standards, regulations and documents

The most recent published version of the following standards, regulations and documents, including any addenda, are used as references for this technical specification (non-exhaustive list):

|        |                                                                                                                                                                                                                                                                                                       |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S1/01  | Technische specificatie: procedure voor aanvraag tot homologatie en verlenging van homologatie van materialen<br><br>Spécification technique: procédure pour la demande d'homologation et de prolongation d'homologation de matériels                                                                 |
| C1/107 | Algemene technische voorschriften voor de aansluiting van een elektrische installatie van een gebruiker op het laagspanningsdistributienet<br><br>Prescriptions techniques générales relatives au raccordement d'une installation électrique d'un utilisateur au réseau de distribution basse tension |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AREI                          | Koninklijk besluit van 08/09/2019 tot vaststelling van boek 1 betreffende de elektrische installaties op laagspanning en op zeer lage spanning, boek 2 betreffende de elektrische installaties voor hoogspanning en boek 3 betreffende de installaties voor transmissie en distributie van elektrische energie, met inbegrip van alle bijlagen<br><br>Arrêté royal du 08/09/2019 établissant le Livre 1 sur les installations électriques à basse tension et à très basse tension, le Livre 2 sur les installations électriques à haute tension et le Livre 3 sur les installations pour le transport et la distribution de l'énergie électrique, y compris toutes les annexes |
| CODEX                         | Codex over het welzijn op het werk (wet van 04/08/1996) en zijn uitvoeringsbesluiten<br><br>Code sur le bien-être au travail (loi du 04/08/1996) et ses arrêtés                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ARAB                          | Algemeen Reglement voor de Arbeidsbescherming<br>Règlement général pour la Protection du Travail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| NBN EN 60947-1                | Low-voltage switchgear and controlgear - Part 1: General rules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| NBN EN 60947-3                | Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NBN EN 60715<br>(ex-EN 50022) | Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of switchgear, controlgear and accessories                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| DIN 46230                     | Terminal ends for solderless connections; pin type, without insulating sleeve, for copper conductors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| NBN ISO 4762                  | Hexagon socket head cap screws                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| NBN EN ISO 4757               | Cross recesses for screws                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NBN EN ISO 9001               | Quality management systems — Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NBN EN ISO/IEC 17025          | General requirements for the competence of testing and calibration laboratories                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 3 Definitions

Disconnecter: a switching device located at the end of the connection cable, before the service circuit breaker. It allows the equipment in the meter cabinet to be de-energized manually.

For the other definitions, reference is made to standards NBN EN 60947-1 and NBN EN 60947-3.

## 4 Requirements

This paragraph sets out the technical requirements for the disconnectors, both the standard disconnector and the disconnectors for compact meter cabinets. Both types of disconnectors comply with the same requirements, except for their dimensions (see §4.5.2). Unless explicitly stated otherwise, the requirements apply to both types of disconnectors.

### 4.1 Applicable standards

The disconnectors must comply with the relevant applicable standards, rules, and regulations (see section 2).

Standards NBN EN 60947-1 and NBN EN 60947-3 apply in full, taking into account the requirements of this technical specification.

In the event of any contradiction between standards NBN EN 60947-1 and NBN EN 60947-3 and this technical specification, Synergrid will clarify the applicable requirement.

### 4.2 General requirements

The disconnectors are designated as follows and must comply with the following specifications :

- Number of poles: 3P+N or 4P
- Frequency: AC 50 Hz
- Rated and limiting values for the main circuit: see §4.2.2
- Utilization category: see §4.2.3

#### 4.2.1 Normal service conditions

The normal service conditions are those specified in NBN EN 60947-3. The disconnector is designed for a minimum pollution degree of 2.

#### 4.2.2 Rated and limiting values for the main circuit

Rated voltages :

- Rated operational voltage ( $U_e$ ): min. 400 V
- Rated insulation voltage ( $U_i$ ): min. 440 V
- Rated impulse withstand voltage ( $U_{imp}$ ): min. 4 kV

Currents :

- Conventional enclosed thermal current ( $I_{the}$ ): 125 A
- Rated operational current ( $I_e$ ): 125 A
- Rated uninterrupted current ( $I_u$ ): 125 A
- Rated short-time withstand current ( $I_{cw}$ ): min. 2.5 kA-1s
- Rated conditional short-circuit current ( $I_q$  according to NBN EN 60947-3): must be at least 10 kA (peak) when protected with a gG 125 A<sup>1</sup> fuse. The verification whether protective devices other than 125 A gG fuses can be used for the rated conditional short-circuit current is part of the homologation process. In all cases, the rated value of the protective device must correspond to the rated operational current ( $I_e$ ).

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<sup>1</sup> Note: the fuse may not be part of the disconnector.

### 4.2.3 Utilization category

- Minimum AC-21B (AC, infrequent switching, resistive loads, including moderate overload)
- Independent manual operation<sup>2</sup> or semi-independent manual operation<sup>3</sup>
- Suitable for isolation

The number of switching cycles with and without load (mechanical and electrical endurance) is specified in the technical dossier.

### 4.3 Clearances and creepage distance

The disconnecter must comply with the dielectric requirements according to standard NBN EN 60947-3 for pollution degree 2.

### 4.4 Power loss per pole

@ 125 A : maximum 10 W.

### 4.5 Constructional requirements

#### 4.5.1 General

The disconnecter is four-pole (4P) or has 3 poles and a neutral pole (3P+N). In a 3P+N configuration, the neutral pole is also opened when the disconnecter is operated.

When the disconnecter is correctly installed, the degree of protection on the front side (e.g. operating shaft and terminal screws) is at least IP2X.

#### 4.5.2 Dimensions

The disconnecter complies with the maximum dimensions specified in §4.5.2.1.

The disconnecter for compact meter cabinets also complies with the maximum dimensions specified in §4.5.2.2.

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<sup>2</sup> 'Independent manual operation' according to NBN EN 60947-1

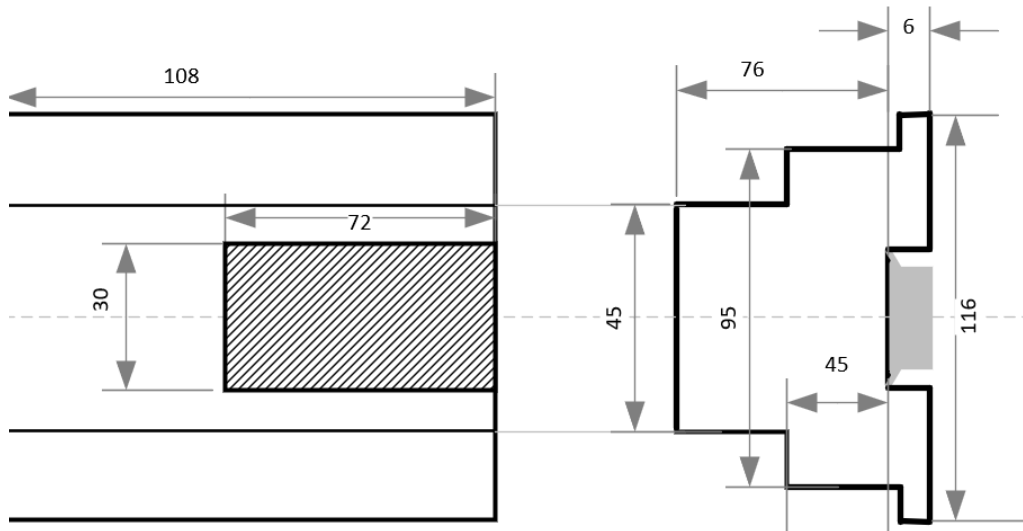
<sup>3</sup> 'Semi-independent manual operation' according to NBN EN 60947-3

#### 4.5.2.1 Maximum dimensions

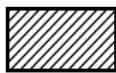
The following dimensions are the maximum dimensions of the disconnector alone (without phase barriers), expressed in mm :

Front view

Side view



Comment :



: zone for operating shaft

The operating shaft is located at the front within the zone indicated on the diagram.

Additional phase barriers are required for the incoming terminals (the terminals located at the bottom in the normal mounting position of the disconnector). They may be fixed to the disconnector or removable.

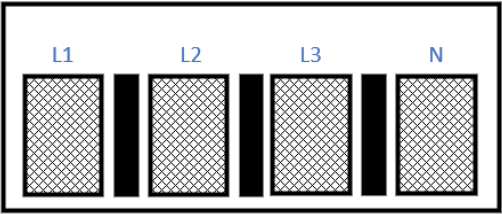
When the phase barriers are installed:

- It must still be possible to see the terminals of the disconnector when connecting a cable. The phase barriers must therefore, for example, be transparent or must not obstruct the view of the terminals from the front of the disconnector.
- The terminal screws of the disconnector must remain accessible so they can be tightened or loosened using appropriate insulated tools (see §4.5.6).

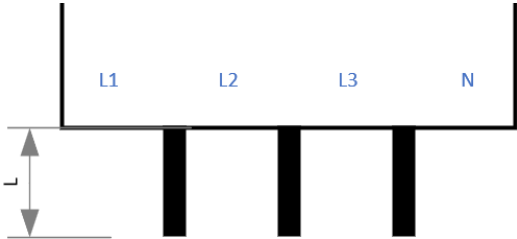
The phase barriers must be sufficiently high to separate at least two adjacent phases of the disconnector, with a length  $L$  between 15 and 20 mm. The length  $L$  may be greater if the disconnector is less tall (up to a maximum height of 95 mm).



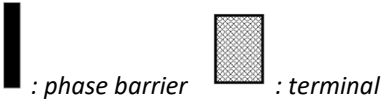
Illustration of a possible geometry for the phase barriers, other geometries that meet the above requirements are also acceptable :



Front view of the incoming terminals of the disconnecter with phase barriers



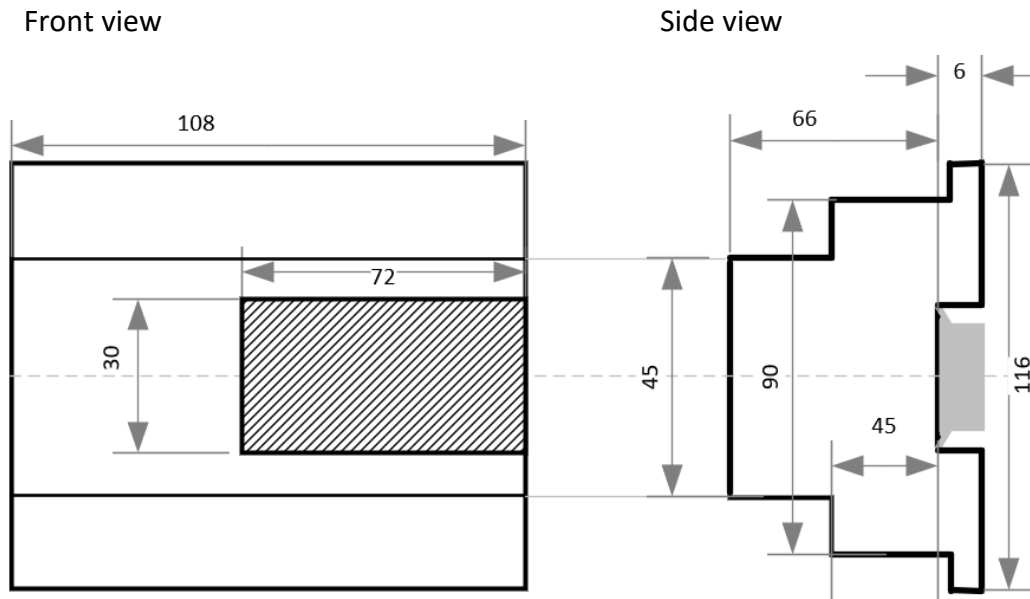
Comment :



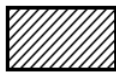
Other dimensions of the disconnecter and the phase barriers may be approved upon request, after verification during the homologation process that they are compatible with the intended use (see in particular §5.3.4).

#### 4.5.2.2 Maximum dimensions of disconnectors for compact meter cabinets

The following dimensions are the maximum dimensions of the disconnector alone (without phase barriers), expressed in mm :



Comment :



: zone for operating shaft

The operating shaft is located at the front within the zone indicated on the diagram.

Additional phase barriers are required for the incoming terminals (the terminals located at the bottom in the normal mounting position of the disconnector) and must comply with the requirements for phase barriers specified in §4.5.2.1.

Other dimensions of the disconnector for compact meter cabinets and the phase barriers may be approved upon request, after verification during the homologation process that they are compatible with the intended use (see in particular §5.3.5).

#### 4.5.3 Indication of the open position

The requirements of standard NBN EN 60947-3 apply.

#### 4.5.4 Switching operations

The switching operations must be performed simultaneously on all 4 poles, or the neutral pole must not open before the other poles nor close after the other poles, in accordance with §8.1.9 of NBN EN 60947-3.

#### 4.5.5 Mounting conditions

The disconnector must be capable of being snapped onto a 35 × 7.5 mm symmetrical rail in accordance with NBN EN 60715, as well as onto a 35 mm symmetrical rail with a flat front surface according to NBN EN 60715 ("mounting rail TH 35").

It must be equipped with at least one fastening device (e.g., hooks). If multiple fastening devices are present, they may be held in the open position.

#### **4.5.6 Terminals**

The terminals are of the cage-clamp type ("clamping unit with indirect pressure" according to Annex D of NBN EN 60947-1) or of the screw-type with pressure plate ("clamping unit with pressure plate" according to NBN EN 60947-1) for copper external conductors.

They must be designed for copper conductors from at least 6 mm<sup>2</sup> up to at least 50 mm<sup>2</sup>. This applies to solid, stranded, and flexible conductors. However, flexible conductors must be equipped with a flat cable lug according to DIN 46230 or with a ferrule.

The connection terminals must be tightened using an insulated 4 mm or 5 mm hex key (male Allen type) for hexagon socket screws (NBN ISO 4762). Screws with an internal hexagon and a Pozidriv no. 2 head according to NBN EN ISO 4757 are also permitted.

All tightening elements must be captive.

The disconnectors are delivered with the terminals in the open position.

The terminals must be designed so that, when in the open position, they remain open regardless of the inclination of the disconnector.

For the 3P+N disconnectors : when the disconnector is mounted in the normal position, in accordance with the manufacturer's marking, the terminal of the neutral pole is located to the right of the terminals of the other poles and is indelibly marked with the letter "N".

#### **4.5.7 Operating mechanism**

The operating mechanism must be located at the front of the device, as indicated in §6.5.2. It can only be operated using a 5 mm hex key.

The disconnector is switched on by rotating the operating shaft clockwise.

If the operating shaft is removable, it must be impossible to reinstall it in an incorrect position (safety feature).

#### **4.5.8 Storage conditions**

The disconnectors must, unless otherwise agreed, be capable of being stored within extreme temperature limits of -15 °C to +50 °C and at an average temperature of up to 35 °C.

### **4.6 Marking**

In addition to the marking required by NBN EN 60947-3, the device is marked to ensure that the production site and the batch can be traced. The marking must be indelible.

## **5 Tests**

### **5.1 General**

To be homologated, the disconnectors must have passed all type tests with one exception: the test in §5.3.5, "Verification of the suitability of the disconnector for compact meter cabinets," applies only to the disconnectors intended for compact meter cabinets.

All tests must be carried out:

- in a recognized laboratory in accordance with ISO/IEC 17025,
- in the manufacturer's laboratory under the supervision of an appointed expert
  - from a laboratory accredited in this field according to ISO/IEC 17025, or
  - from a body accredited in this field according to ISO/IEC 17020.

No other test sequence than the one specified in this document may be applied without Synergrid's prior agreement.

The requirements relating to the test reports are explained in section 6.3.

All tests are carried out at the expense of the manufacturer/supplier, in accordance with the procedures described in this document.

## **5.2 Definitions and handling of the various tests**

### **5.2.1 Type tests**

These tests are mandatory to validate the design and the technical characteristics of the products.

### **5.2.2 Routine and sampling tests**

These tests are carried out by the manufacturer on the manufactured products in order to control quality and ensure the required characteristics.

The routine tests (individual tests) are performed on all products from the production batch. The sampling tests are performed on one or more specimens of the product from each production batch.

## **5.3 Type tests**

### **5.3.1 Tests according to NBN EN 60947-3**

The tests specified in standard NBN EN 60947-3 apply in full.

### **5.3.2 Verification of power loss per pole**

The test is carried out in accordance with NBN EN 60947-3.

### **5.3.3 Verification of the withstand capability against the rated conditional short-circuit current**

The disconnector must be tested for its resistance to the rated conditional short-circuit current in accordance with NBN EN 60947-3, using a circuit that meets the minimum values required by §4.2.2 of this specification.

### **5.3.4 Verification of the suitability of the disconnector for the 25D60 meter cabinet**

The test is carried out by installing and operating the disconnector in a fully equipped mounting cabinet of the type "25D60."

### **5.3.5 Verification of the suitability of the disconnector for compact meter cabinets**

The test applies only if the applicant wishes to qualify the device as a "disconnector for compact meter cabinets."

The test is carried out by installing and operating the disconnector in a fully equipped mounting cabinet of the type "compact meter cabinets," type "20D55."<sup>4</sup>

### **5.3.6 Verification of the pull-out force of the disconnector on a 35 mm symmetrical rail**

The verification is performed by mounting the disconnector on :

- a symmetrical metal rail, type TH, according to NBN EN 60715, of 35 × 7.5 mm

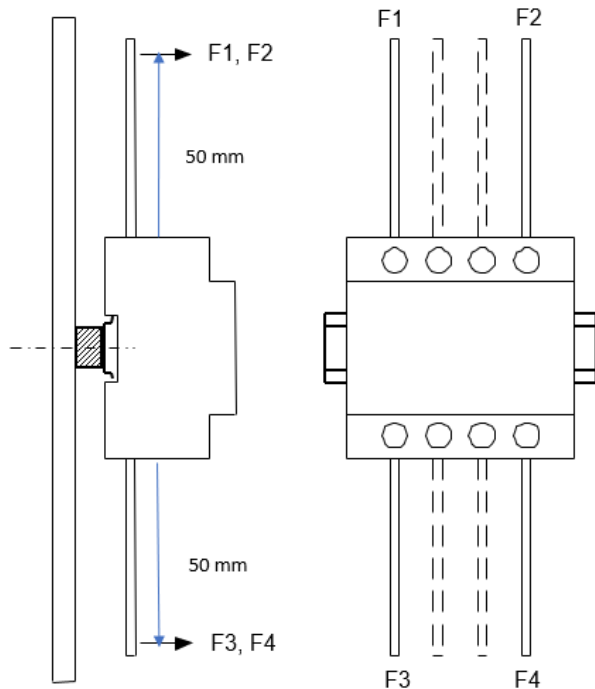
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<sup>4</sup> Detailed information, such as exact dimensions, can be obtained upon request from Synergrid.

- a symmetrical plastic rail, type TH, with a flat front surface according to NBN EN 60715, of 35 × 7.5 mm, type 25D60

The test is carried out on 2 disconnectors.

The setup and the point at which the force is applied are explained in the following figure :



The forces F1, F2, F3, and F4 are applied successively to a steel or copper threaded rod of at least 50 mm (M8 or M10 diameter), which is inserted into the corresponding terminal of the device (i.e., the terminals at the ends of the device) and tightened with the rated torque. All four forces are applied to the same device.

The force is applied at a point 5 cm from the bottom of the disconnector.

Requirement: the minimum force is 20 N in each case. At this value, the disconnector must not come loose from the rail, the rail must not break, and the hooks of the device must not detach, break, or become damaged in such a way that the device can no longer be correctly mounted.

## 5.4 Routine and sampling tests

The manufacturer shall draw up a quality plan that defines the tests to be carried out (see also section 6.5 of this specification). This quality plan shall specify at least the routine tests and sample tests provided for in the NBN EN 60947-3 standard.

No modifications may be made to the product during these tests. The mechanical operation must be satisfactory, and no malfunctions may be observed during switching. The manufacturer shall prepare an inspection report containing the results of all mandatory tests, along with the conclusions regarding the conformity of the product with this specification.

The manufacturer must keep this report for at least ten years.

## 5.5 Inspection of the goods and the processes

The inspection of the goods, the production processes and related processes may be carried out (before, during and after approval) by an appointed expert of Synergrid.

To this end, the manufacturer shall grant the latter free access to its workshops, laboratories and warehouses.

## **6 Homologation**

### **6.1 General**

A disconnecter can only be homologated if it meets the requirements of this technical specification. To demonstrate this conformity, a technical homologation file must be submitted.

If a manufacturer wishes to qualify its disconnecter as a “disconnecter for compact meter cabinets,” this must be explicitly stated in its technical file.

Any modification to a qualified product, to the manufacturing or control processes or to the production sites of that product, to the packaging, or to the accompanying documentation must be submitted in advance for the explicit approval of Synergrid and may lead to a revision of the homologation.

The manufacturer shall provide an additional document to the homologation file in which the planned modifications are described in detail, together with a schedule regarding the type tests aimed at validating these modifications, as well as a justification explaining the importance of these modifications and the relevance of the proposed planned tests.

The transmission of these documents to Synergrid shall in no case imply their tacit approval.

Any failure to comply with any requirement of this specification may lead to the withdrawal of the homologation.

### **6.2 Technical homologation file**

The applicant shall submit a technical dossier in electronic format.

To do so, the application document (an Excel file) must be completed. Through this Excel file, the applicant provides all required information and indicates compliance with the various technical requirements, supported by clear references to the accompanying evidence material demonstrating this compliance.

### **6.3 Test reports**

The test reports must make it possible to :

- Clearly identify the tested specimen, its manufacturing date, and the date of the test. Unless stated otherwise, all tests performed concern the same sample. If this is not the case, the report must clearly specify which samples were subjected to the reported tests.
- Verify whether the tested samples are sufficiently representative of the product as it will be delivered to the customers and of the actual manufacturing process(es). If applicable, the selection and number of tested samples must be justified.
- Verify compliance with the requirements in this technical specification, in accordance with the provisions and reference standards defined in this document.

For more detailed information, ISO/IEC 17025 shall be consulted. The test results shall be documented in a report issued under ISO/IEC 17025 by an accredited body, including the relevant accreditation certificate and scope.

The certificates or reports must refer to tests that are sufficiently recent to remain representative of the products.

## **6.4 Samples**

To enable the technical analysis of the proposed products, the supplier/manufacturer shall provide samples together with the technical file. To this end, they must first contact Synergrid to determine which samples need to be delivered to Synergrid or its members.

## **6.5 Quality plan**

The supplier shall provide, as part of the technical file, a quality plan containing a concise description (which may take the form of a flow chart, table, or list) of the tests and inspections carried out before, during, and after manufacturing. The file may, where applicable, refer to more detailed procedures, indicating the test and inspection parameters, the frequency (and the number of samples), the location/moment within the manufacturing process, the methodology, the resources used, the required results, the recording of these results, and the responsible/executing department.