PVE 4.0
Keurmerk Active and Passive
In-house materials

Document name	PVE Keurmerk v4.0 doc	Document status	Final
Project name	Keurmerk	Completion date	1 juli 2014
Classification	Public	Version no.	V4.0
Author	J.P. Cnossen NLkabel on behalf of College of Experts	Number of pages	51
Location of File	NLkabel Lange Voorhout 90 2514 EJ Den Haag	Approved by	R van Esch NLkabel
		Signature	

Document information

Version control

Version	Date	Reason of update	Initials
0.1	12-12-2007	First draft in document form.	JL
0.2/b	07-02-2008	Adjustments in norm and specs	JL
0.3	04-03-2008	Discussions at Veenendaal	JL
0.4	12-03-2008	Last minor points	JL
1.0	25-03-2008	Final version	JL
1.1	07-05-2008	Additional information	JW
1.2	08-05-2008	Appeal and use of logo	JW
1.3	25-06-2008	Clarify some criteria	JL
1.4	25-09-2008	Round one testing results	JL/JW/JPC
1.5	01-12-2008	Remarks KEURMERKINSTITUUT (S. Stravers) inserted	JPC
1.6	6-1-2009	Remarks CVD 12 December 2008 inserted	JPC
2.0	23-2-2009	Correction page 17 footnote 10 inserted	JPC
2.1	29-4-2009	• Production change added in chapter 7 2nd paragraph to make this article also applicable in case of a new producer • 3 dB relaxation allowance added as footnote 30 chapter 10.2 • Clamping force F-connector changed footnote 81/82 in chapter 10.5	JPC
3.0	11-5-2010	General update and new products added	JPC
3.1	15 -2-2011	Amendment process step added	JPC
4.0 concept	24-5-2012	General update	JPC
4.0 concept 2	20-9-2012	Update chapter 6,7,8	RdD
4.0 concept 3	13-2-2014	General update and review	JPC

Reviewed by

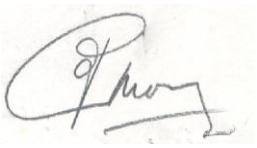
Name	Date	Signature
"College van Deskundigen": Cok Arkestijn Ziggo John Louwerse UPC NL John Raeskin Technetix Henk van Dok Hirschmann Robert Schotman Hemmink Arno Albright Teleste Rogier den Dekker Keurmerkinstituut Jelle Cnossen NLkabel	1-5-2014	p/o 

Table of content

1 Introduction

NLkabel, the association of Dutch cable providers, has issued a quality certification mark for in-house cabling system components under the brand name “Kabel Keur”. Kabel Keur’s goal is to help consumers find and select coaxial cables, splitters, connectors and amplifiers with a quality level that equals or exceeds specification limits set by Kabel Keur. The specifications are set to enable subscribers to enjoy uninterrupted cable services including state-of-the-art multimedia services offered by Dutch cable providers.

The growing number of services demands high performance in-house cabling-systems to meet the necessary high quality of service. Frequently in-house cabling-systems, with components such as coaxial cables, splitters, connectors and amplifiers have become obsolete and are a cause of a reduced quality of service to the subscriber. The subscriber can perceive this as a poor quality of the service provided by the cable provider, though the cause is mostly the subscriber’s poor quality in-home network.

To guide consumers to buy qualified products and materials within a broader market of (sometimes inferior) products, the Dutch cable providers, united in NLkabel (their trade organization) have now introduced the quality mark “Kabel Keur”. “Kabel Keur” identifies independently inspected and approved materials and products. Only materials and products, which have passed approval tests successfully, get the qualification mark “Kabel Keur”.

To create awareness of the Kabel Keur quality mark and its benefits, cable providers promote the certified products by means of several promotional activities, amongst that the Internet site www.Kabelkeur.nl.

To qualify for certification a manufacturer or trader can ask the Keurmerkinstituut to investigate and test its products. The Keurmerkinstituut is an independent accredited agency, selected by NLkabel, and well equipped to ensure that the certification procedure is operated according to the “Kabel Keur” mark rules and regulations. The requesting supplier hands over a completed application form. By handing over this form the requesting supplier enters into consent with NLkabel and Keurmerkinstituut. This consent regulates the full process of acquiring and applying the “Kabel Keur” certification mark. Requesting suppliers bear the costs involved. Application forms can be downloaded from www.keurmerk.nl.

The PVE is a dynamic document. At least once a year a college of experts (CVD) and Keurmerkinstituut decide if the document needs editing to assure that consumers get the quality of products to assure a high quality of service. Proposed alterations are announced and discussed with the participating partners before becoming operational. For all products, both for new products and for products that already received a “Kabel Keur” certification mark, there is a 3-year transition period. It is preferred that new products comply with the latest PVE requirements from the start.
In order to keep up with technical developments and respond to new requirements an amendment to the current PVE can be issued by the college of Experts (CVD). This amendment will be published on the Keurmerkinstituut website and will be distributed directly to the participating manufacturers and traders. The legal impact of the amendment is equal to that of the corresponding PVE. The amendment is considered to be an integral part of the current PVE.

2 Scope

Kabel Keur is a private quality mark for components for a multimedia network. Kabel Keur is applicable to components defined in this document, meant for in-house home networks. A home network that meets the Kabel Keur requirements is suitable for the Dutch cable market.

3 Definitions and normative references

3.1 Definitions

"Kabel Keur"	"Kabel Keur" is a certification mark. Products carrying this mark as a label enable, if applied properly, the construction of a high quality in-home Multimedia network that consumers have no need to complain about.
Consumer packaging	A packaging for end-user application.
Factory packaging	A packaging for private label companies and installation contractors. Not for end-user sale / resell purposes.
Coaxial cable	Asymmetrical cable that is in this context the most suitable transport medium for Multimedia signals of a broad frequency spectrum.
Wall outlet	A device to connect the customer equipment to the fixed in-house network.
Splitter	A device that is a part of the connection between one source to two or more destinations in a multimedia coaxial home network.
Connector	A device that connects a coaxial cable to a source or a destination in a multimedia home network.
Adaptor	A device that enables matching between two connections.
Amplifier	A device that is able to increase the signal level to cover larger distances or/and to split the signal.
HDMI cable	HDMI cable (High-Definition Multimedia Interface) is a compact cable for transmitting uncompressed digital data.
Diplex filter	A device that combines or separates frequency ranges.
Terminator	A device that terminates a connection.
Special product	A device specially designed for Dutch Cable Operators.
"Programma van Eisen" (PVE-document)	Specifications that products have to meet to obtain the "Kabel Keur" certification mark, as well as guidelines and instructions for the use of the "Kabel Keur" Certification mark. The last version of the PVE is called the current PVE.
Amendment	Changes, additions to a PVE, being an integral part of the current PVE
Private label products	Certified product that are sold under a different (private) label.
College of experts (CVD)	Experts drafting the specifications (PVE document).
NLkabel	The branch organization of Dutch cable providers.
Dutch Cable Operators	Dutch Multi Service Operators (MSO's) who are a member of NLkabel.
Participating partners	Parties involved in Kabel Keur certification.
"Kabel Keur" certification Agency	Independent institute contracted by NLkabel to execute the qualification process.
Qualified product certification agency	A qualified product certification agency is an institution accredited by the Council of accreditation (Netherlands), or foreign sister organization, for the concerned subject. The council of accreditation must be dovetailed to the European Cooperation for Accreditation and/or international Accreditation forum, INC.
Qualified lab or laboratory	A qualified lab or laboratory is an accredited organization by the Netherlands Counsel of Accreditation or a foreign sister organization. The Counsel of Accreditation, which looks after the accreditation, must be dovetailed to the European Cooperation for Accreditation and/or the International Accreditation Forum, INC. The laboratory must perceptible

	have qualified its test activities in accordance with the quality system ISO 17025. If the test activities would probably not be within the scope of the accreditation then the institute must in a different way show that the activities are carried out within the existing IS0 17025-quality system.
Vendor statement	A written statement that a product fulfils a requirement in the PVE.
Vefica	The Dutch Society of Manufacturers and Suppliers to the Broadband Industry.

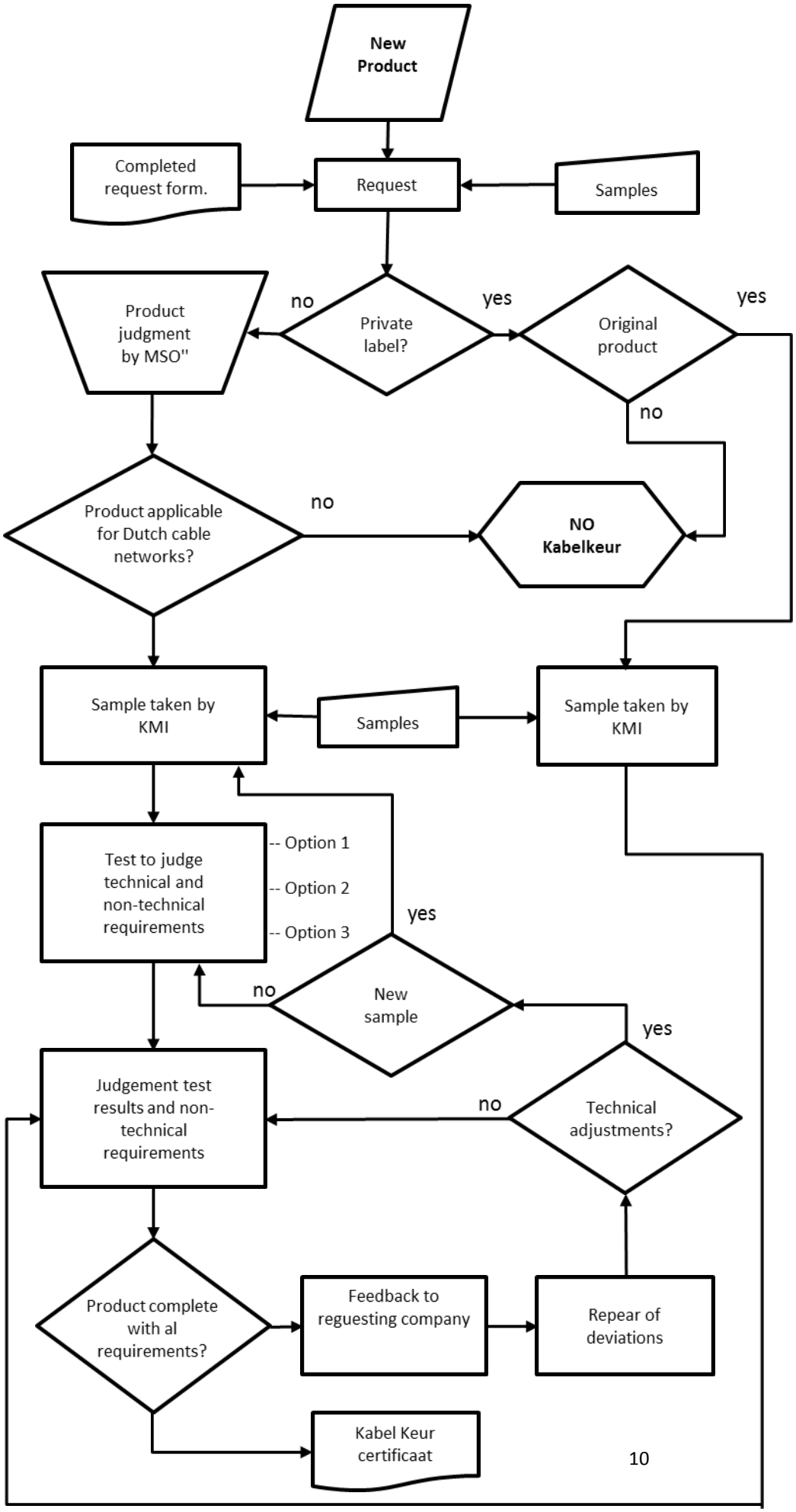
3.2 Normative references

Reference norm	Name	Version
NEN-EN 50083-2	Cable networks for television signals, sound signals and interactive services - Part 2: Electromagnetic compatibility for equipment	2012
NEN-EN 50117-2-1	Coaxial cables - Part 2-1: Sectional specification for cables used in cabled distribution networks - Indoor drop cables for systems operating at 5 MHz - 1000 MHz	2005
NEN-EN 50117-2-4	Coaxial cables - Part 2-4: Sectional specification for cables used in cabled distribution networks - Indoor drop cables for systems operating at 5 MHz - 3000 MHz	2004
NEN-EN 50117-2-4:A1	Amendment A1	2008
NEN-EN 50117-2-4:A2	Amendment A2	2013
NEN-EN 50289-1-6	Communication cables - Specifications for test methods Part 1-6: Electrical test methods - Electromagnetic performance	2002
IEC 61000-4-5	Electromagnetic compatibility (EMC) Part 4-5: Testing and measurement techniques - Surge immunity test	2007
IEC 60068-1	Environmental testing – Part 1: General and guidance	2013
NEN-IEC 60728-2	Cable networks for television signals, sound signals and interactive services - Part 2: Electromagnetic compatibility for equipment	2010
NEN-EN-IEC 60728-3	Cable networks for television signals, sound signals and interactive services - Part 3: Active wideband equipment for cable networks	2011
NEN-EN-IEC 60728-4	Cable networks for television signals, sound signals and interactive services - Part 4: Passive wideband equipment for coaxial cable networks	2008
NEN-EN-IEC 60728-11	Cable networks for television signals, sound signals and interactive services - Part 11: Safety	2010
NEN-EN-IEC 61169-1	NEN-EN-IEC 61169-1:2013 en - Radio-frequency connectors - Part 1: Generic specification - General requirements and measuring methods	2013
NEN-EN-IEC 61169-2	Radio-frequency connectors - Part 2: Sectional specification - Radio frequency coaxial connectors of type 9,52	2007
NEN-EN-IEC 61169-24	Radio-frequency connectors - Part 24: Sectional specification - Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)	2010

4 Procedure: Qualifying for Kabel Keur

The flowchart in figure 1 shows the certification procedure for Kabel Keur. Certified kabel Keur products marketed under private labels need to be certified separately. Aspects that are not subject to difference from the originally certified product (original product), including technical specifications, may be excluded in the certification process for private label products.

Fig 1.


New Product
Completed request form.
Request
Samples
Product judgment by MSO''
no
Private label?
yes
Original product
yes
no
Product applicable for Dutch cable networks?
no
NO Kabelkeur
Sample taken by KMI
Samples
Sample taken by KMI
Test to judge technical and non-technical requirements
-- Option 1
-- Option 2
-- Option 3
yes
no
New sample
yes
Judgement test results and non-technical requirements
no
Technical adjustments?
Product complete with al requirements?
Feedback to reguesting company
Repear of deviations
Kabel Keur certificaat

4.1 Requirements

This document describes the requirements products have to meet to qualify for the “Kabel Keur” certification mark. The “Kabel Keur” certification mark is protected and registered by NLkabel. These requirements are composed by a college of experts consisting of representatives of Dutch Cable Providers as well as leading manufacturers.

4.2 Application

To apply for certification, requesting suppliers can obtain an application form from Keurmerkinstituut. Only completed and signed forms will be considered. This includes the required attachments named on the application form. By signing the form the requesting supplier declares to abide the rules and regulations for using the certification “Kabel Keur” mark as stated in this PVE. After a completed entry form has been received, Keurmerkinstituut will judge whether the products in the application are within the scope of the PVE. The NLkabel members of the CVD will decide whether the products can be applied successfully in the Dutch cable operation environment. The interoperability of products is a key decisive factor. If not, the certification procedure will be stopped. Products omitted from the PVE are not covered.

4.3 Quote

After receipt of a completed and signed application form the Keurmerkinstituut shall offer a proposal for examination and will charge the costs of application upfront. If the contract is granted, these application costs will be deducted from the final bill.

4.4 Certification procedure

To be able to complete the certification procedure for original products, Keurmerkinstituut requires the following:

- Product specification sheet
- Representative product samples (see 6.5 for details)
- Packaging samples, including any directions for use
- Product marking (batch codes, product codes, logo’s, etc.)
- CE-conformity declaration
- Abstract Chamber of Commerce registration
- Complaints procedure
- Any other documents to show compliance with the requirements

For original products, Keurmerkinstituut also needs the following additional document:

- An ISO 9001 certificate for the production process

For the purpose of the certification, a product includes any packaging, information and labeling as it is sold. If factory-packaging is applicable the applier should indicate this.

Testing of compliance to technical requirements is reported to Keurmerkinstituut by a qualified laboratory. A representative sample is tested in one of three ways.

Option 1

The applicant requests a qualified laboratory to test the product. The laboratory reports to Keurmerkinstituut and all communication with the laboratory is through Keurmerkinstituut.

Option 2

Keurmerkinstituut boards testing of the product to a qualified laboratory. The laboratory reports to Keurmerkinstituut and communication with the laboratory is through Keurmerkinstituut.

Option 3

The applicant arranges the product testing. Keurmerkinstituut has a qualified laboratory witness the testing and this laboratory reports to Keurmerkinstituut.

Based on the laboratory report Keurmerkinstituut will evaluate validity of the tests and the compliance with technical requirements. Keurmerkinstituut also evaluates the validity of the tested sample and the qualification of the laboratory.

4.5 Samples

The requesting supplier informs Keurmerkinstituut when the first production batch is available. From this batch a number of samples must be selected for testing and evaluation. The quantity is product related, determined by the spread of production parameters and the batch quantity, but will minimal consist of:

- coaxial cables: 25 samples of 5 meters
- all other passive products (incl fly-leads): 50 samples
- active products: 25 samples

From these samples Keurmerkinstituut will select a number of products to be tested for Kabel Keur.

4.6 Prototypes

If the available samples cannot be considered to be representative for the production series, they will be handled as a prototype. Prototypes can be tested and assessed in the same way as real certification, accept that the prototype product will not be certified. As soon as representative samples become available, test results from the prototype tests can be re-used after an assessment confirms that these samples are technically identical to the prototype.

4.7 Intermediate results

The requesting supplier will be offered the opportunity to solve minor deviations from the requirements if needed. The question whether a deviation is minor will be judged by NLKabel. Extra costs will be charged additionally.

4.8 Use of the “Kabel Keur” quality mark

During the certificate validity period the certificate holder has the right to display the “Kabel Keur” quality mark as long as the applicable regulatory requirements described in ‘Richtlijnen gebruik’ logo “Kabel Keur” (Appendix A) are taken into account.

4.9 Trace-ability of certified products

Keurmerkinstituut will maintain and manage an overview of certified products. This overview will be made available to the consumer on the “Kabel Keur” certification mark website.

4.10 Annual surveillance

Within the time period that the certificate is valid, annual surveillances will be carried out to safeguard continuous fulfillment of the requirements of the “Kabel Keur” certification mark. Keurmerkinstituut has established a process and procedure for this. The costs of these intermediate inspections will be charged to the quality mark holder in agreement with the initial quote for inspection wherever possible.

At least the following aspects will be evaluated during an annual surveillance:

- Verification of the (agreed) specifications or parts of (agreed) specifications[1]
- Evaluation of customer/operator complaint registration
- Inspection of the quality system (of the certification holder and/or of the production location)
- Product labeling

4.11 Recertification

When a certificate expires, the right to use the Kabel Keur mark on a product automatically ends. To continue the use of the mark, the product has to be re-certified. A re-certification assessment has to show that the product meets all the requirements of the PVE version that is applicable at the time.
A re-certification assessment consists of at least an annual surveillance assessment, extended with verification of technical specifications as following:

Verification of the (agreed) technical specifications or parts of (agreed) technical specifications by means of laboratory testing. At least two parameters will be measured if product specifications are unmodified, and requirements are unchanged. If product specifications are modified, at least the modified parameters will be measured. If requirements have changed, at least the changed parameters will be measured.

4.12 Laying an Appeal

Products can be rejected for inspection (see 6.2) or can be given the mark “failed” in the certification process. In either case the requesting supplier can lodge an appeal at the college of appeal. This college is comprised of two independent subject experts who are not employed by any of the parties involved in Kabel Keur. This college will judge whether there are reasons to revise the decision taken by NLkabel to reject a certification. If this is the case the requesting supplier can request the college to ask that the tests are repeated by another qualified laboratory. If possible, costs for this will be charged to the party responsible for the need to re-evaluate the tests.

[1] Administrative check by Keurmerkinstituut

5 Validity and abuse

The validity period of a certificate is 3 years. After this period the product must be recertified. In case the requirements for the product are unchanged there is the possibility to extend this period ones with 2 years. An annual surveillance inspection will be carried out.

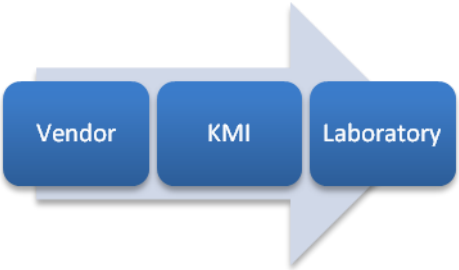
Whenever a supplier changes the product specification or production of certified products it is the supplier's responsibility to immediately communicate the new specifications to Keurmerkinstituut. NLkabel decides whether the result of the changes necessitate re-certification. If so, the supplier will be informed accordingly.

In case a participating or non-participating supplier carries the certification mark illegally NLkabel will take juridical steps to stop and prevent such abuse.

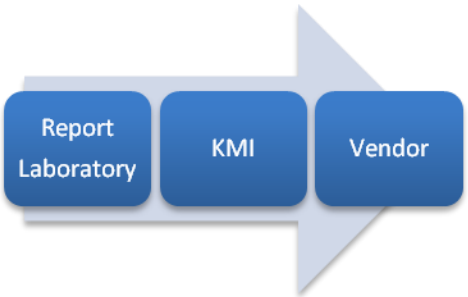
6 Organisation

NLkabel is assisted by a group of experts (“College van Deskundigen”, CVD). This CVD defines the requirements for high performance components for In-house networks. These requirements are documented in this document, called “Programma van Eisen”, abbreviated as PVE. The PVE document is public and, along with other documents, published on NLkabel’s website via links to process partners who are responsible for document distribution. New versions of the PVE documents also will be, as a standard process step, distributed by mail to all participating partners in the “Kabel Keur” certification process. NLkabel has an agreement with Keurmerkinstituut, in which is stated that Keurmerkinstituut will be responsible for all operational activities. Keurmerkinstituut is in this context responsible for version control and distribution of all process documentation and for all operational activities to enable requesting suppliers to obtain the certification mark. All operational costs linked to obtaining the certification mark, such as the costs which Keurmerkinstituut makes and the laboratory costs for the testing, are at the expense of the requesting suppliers.

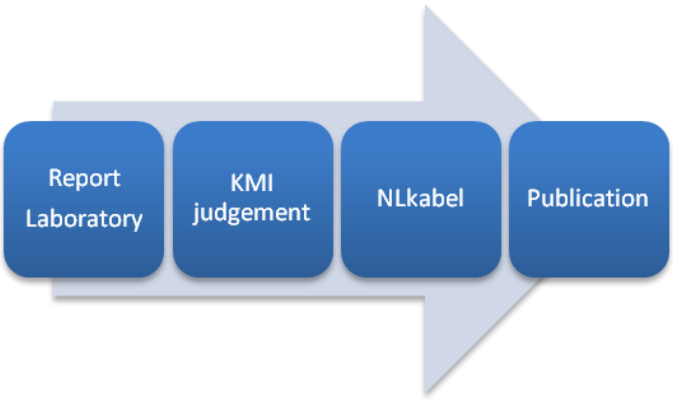
A requesting supplier who wants to acquire the certification mark for certain materials can submit a request for this to Keurmerkinstituut. Materials can only be inspected if the requesting supplier agrees with the set of rules and regulations that have been laid down by NLkabel in the PVE. This set of rules and regulations indicates how the testing process is organized and what the general conditions are. Keurmerkinstituut boards the testing to a qualified laboratory by default (see 4.4 for details).



The laboratory examines the material on behalf of Keurmerkinstituut according to the testing requirements (PVE Active and Passive in-house materials) and reports the results to Keurmerkinstituut. Keurmerkinstituut assesses the outcome and notifies to the requesting supplier on its findings. If the materials are approved then Keurmerkinstituut, after being instructed to do so by NLkabel, will issue a certificate that allows the requesting supplier to bear the certification mark for the examined material. On the certificate the type and validity period of the inspected material is stated.



Keurmerkinstituut reports the results of the certification process and which materials have obtained a certificate to NLkabel. NLkabel ensures that a list of approved material is available for consumers and retailers (for example by publication on the Internet site).



NLkabel and Keurmerkinstituut agreed that only qualified personnel will carry out the tests and appraisal.
Minimal capabilities required for testing:
Training : Applicable technical Bachelor degree
Experience : Two years in testing, for instance in quality control, a laboratory, or certification

Minimal capabilities required for assessment:
Training : Applicable technical Bachelor degree
Experience : Two years within a certification body or comparable

7 Special products

Dutch Cable Operators prefer to certify all in home cable devices. This makes it easier for subscribers to identify high quality approved products. Kabel Keur certified products are normally sold to the customer via a retail shop for use in all Dutch Cable networks.

Special products are developed for a single Dutch Cable Operator or group of Dutch Cable Operators and are not generally available via general retail stores. Distribution of these products takes place via installation kits used by subscribers ("self install kits") or via Dutch Cable Operator's own retail shops.

Requirements for special products are normally not incorporated in this PVE. This is due to the competitor-sensitivity of the specs. However the requirements of Kabel Keur products as specified in chapter 10 are nonetheless also required for special products.

Special products must, apart from the Kabel Keur logo, contain a notification to which Dutch Cable operator the product applies. Special products can also be common and be used by the majority of MSOs and, in this case, the notification is not required.

At the request for certification of a Special Product to Keurmerkinstituut the requesting vendor will supply a list of product requirements as specified by the Cable operator. On the basis of these requirements Keurmerkinstituut will ask Telefication to test the product.

8 General requirements, labeling and packaging

This chapter details general information for all devices that opt for the "Kabel Keur" certification mark. All information that is provided by the applicant may be verified. Any misleading information is not permitted.

8.1 General requirements

Item	Description	Remark
8.1.1	Standard product specification sheet.	In Dutch or English
8.1.2	Copy of the device applicable certificates / statements showing compliance to: CE ROHS WEEE	In Dutch or English. The requirement is that the product complies with these directives if applicable and that this is demonstrable
8.1.3	Besluit beheer verpakkingen en papier en karton[2]	To be demonstrated by a vendor statement
8.1.4	Use of PVC's and PVdC's not allowed	To be demonstrated by a vendor material specification
8.1.5	Durability statement Requesting supplier must hold and demonstrate[3] a valid ISO 9001 certificate for the production process leading to the specified product. Requesting supplier must have a compliant registration system and must report once per half year on the "Kabel Keur" items.	
8.1.6	Usability in Dutch market situation (see 4.2). Before the inspection process starts the usability of a product in the Dutch cable market will be reviewed by the representatives of the Dutch Cable Providers of the College of Experts (CVD)[4].	If the item is usable in the Dutch cable the product will be given permission to enter the inspection process.
8.1.7	Materials used for all contact interfaces. Information on the elements used in the (plating) material must be provided.	Materials must have good electrical-, corrosion-[5], cpd- and durability characteristics.
8.1.8	Operational temperature range	0-55^{o}C,unless specified differently in the product requirements tables hereafter. Vendor statement. Specs will only be tested at a temperature of 20-25^{o}C unless otherwise specified.
8.1.9	Warranty Within the warranty period the provider shall replace failing products for	

[2] Directive 94/62/EC of the European Parliament and of the Council of the European Union of 20 December 1994 on packaging and packaging waste (OJ L 365), as last amended by Directive 2004/12/EC of the European Parliament and the Council of the European Union of 11 February 2004 (OJ L 47) and Articles 10.15 to 10.18, 10.64, second paragraph, and 15.32 of the Environmental Management Act

[3] Demonstration only at the start of the inspection process of a specific supplier

[4] Reviews will be carried out by the technical departments of Dutch Cable Providers on behalf of the CVD

[5] The used alloy materials in the device must have a low step voltage (≤ 0,5V electro chemical potential difference referenced to copper) in relation to each other to minimize corrosion effects.

	free as long they are used in accordance with the instructions for use provided. “Kabel Keur” products must have at least a 3-year warranty period.	

8.2 Product labeling and packaging requirements

Item	description	requirement
8.2.1	Identifications: a. Article number b. Product identification and number c. Batch number d. Contact details vendor e. Logo complete monochrome[6] f. Logo simplified[6] g. Logo complete full colour[6] h. Text “Kabel Keur certified” i. Installation instruction[7] j. User guide[8] k. Area of application[9]	
8.2.2	Requirements Consumer packaging: (Identification refers to 8.2.1)	Box: a, b, d, g, k Blister a, b, d, g, k Reel, roll: a, b, d, g, k Foil: a, b, d, g, k Alternatives: a, b, d, g, k
8.2.3.	Requirements Factory packaging[10] [11] [12] for supply to Private label companies and Installation-Contractors. Not for consumer sale/resell purposes:	Box: a, b, c (in case not on the product itself), d Blister a, b, c (in case not on the product itself), d Reel, roll: a, b, c (in case not on the product itself), d

[6] Refers to: “Richtlijn Logo gebruik Kabel Keur”, (Appendix A)

[7] An installation instruction has the intention to show the user how the product must be assembled, installed, mounted or fitted and what is the purpose of the product. The form of an Installation instruction can be a booklet or leaflet with text and images or the Installation instruction can be printed on the packaging. The installation instruction is packet in combination with the product. The text is drafted (at least) in Dutch.

[8] A user guide, also commonly known as manual, is a technical communication document intended to give assistance to users for installation and usage of the product. There is a user guide per Kabel Keur product and it explains both in written text and associated images the operation of the product and a clear installation instruction.. The user guide is packed in combination with the product and is drafted (at least) in Dutch.

[9] The area of application defines the area where a product can be practiced and must be printed on the Consumer packaging of a product.

[10] Factory packaging is only allowed for supply to Private label companies (re-brand and re-pack) and for direct deliveries to contractors for installation purposes. Factory packaging must not be used for reselling to consumers, except for coaxial cable.

[11] A user guide (i) is not required for a product in Factory packaging.

[12] Suppliers and their customers are not allowed to sell or resell Products without an approved Consumer packaging to consumers. The holder of the certificate, his customers and or resellers have to ensure that this will formally be contracted by means of an agreement between the supplier and the customer (for example in the terms of delivery). For an example of a recommendation letter see appendix G.

	(identification refers to 10.2.1)	Foil: a, b, c (in case not on the product itself), d Alternatives: a, b, c (in case not on the product itself), d
8.2.4	Requirements per product type Wall Outlet Two way splitter Connector Port terminator Adaptor Cable Fly lead Amplifier HDMI cable UTP cable Diplex filter Special product	 b,c,f/g,i/j[13] b,c,f/g,i i not applicable not applicable b, c[13], f/g/h b, c[13], f/g/h b, c, g, j b, c, f/g/h b, c, f/g/h b, c, f/g, i b, c, f/g, i/j

[13] Batch number must be on the product or on the (factory) packaging of the product.

9 Passive components

9.1 Wall outlet

Device description: one port wall-outlet

Item	Description	Remark	Specification	Tolerance	Measurement Protocol
9.1.1	Impedance	5-1218 MHz	75 Ω		vendor statement
9.1.2	Connector in		cable clamp[14] / F (C9, C12)		Appendix D / B
9.1.3	Connectors out		F, IEC		Appendix B, C
9.1.4	Insertion loss	5 - 1006 MHz 1006 – 1218 MHz	≤ 0,5 dB ≤ 1,0 dB		IEC 60728-4 §4.3
9.1.5	Return loss	5 – 15 MHz	≥ 14 dB		IEC 60728-4 §4.6[15]
		15 - 1218 MHz	≥ 18 dB[16]		
9.1.6	Surge protection	On input	1kV		IEC 1000-4-5 level 2[17] [18]
9.1.7	Galv. Isolation 2120 V DC	Inner conductor input > inner conductor output	≤ 0,7 mA		IEC 60728-11 §10
9.1.8	Galv. Isolation 230 V AC 50 Hz	Inner conductor input > inner conductor output	≤ 8.0 mA RMS		IEC 60728-11 §10
9.1.9	Screening effectiveness	5-30 MHz 30-300 MHz 300-470 MHz 470-950 MHz 950-1218 MHz	≥ 95 dB ≥ 95 dB ≥ 90 dB ≥ 85 dB ≥ 70 dB		NEN-EN 50083-2: 2012

[14] No specific design or protocol is mandatory for the cable clamp ('butterfly'), direct screw connection not allowed. Cable clamp must be designed to fit cable types as specified in chapter 11.4.

[15] A relaxation as specified in IEC 60728-4 paragraph 5.3.4.1 is admitted

[16] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct.

[17] 1 kV pulse (rise time 1.2 µsec/fall time 50 µsec)

[18] After this test the unit still has to meet its insertion loss and return loss specifications

9.2 Two way Splitters

Device description: two way splitter

item	Description	Remark	Specification	tolerance	Measurement Protocol
9.2.1	Impedance	5-1218 MHz	75 Ω		vendor statement
9.2.2	Connector in/out [19]		F / IEC		Appendix B, C
9.2.3	Insertion loss in > out[20]	5 – 860 MHz	≤ 4,0 dB		IEC 60728-4 §4.3
		860 – 1006 MHz	≤ 4,3 dB		
		1006 - 1218 MHz	≤ 5.0 dB		
9.2.4	Return loss	5 – 1218 MHz	≥ 18 dB[21]		IEC 60728-4 §4.6
9.2.5	Isolation out > out	5 – 15 MHz	≥ 20 dB		IEC 60728-4 §4.2
		15 – 1218 MHz	≥ 26 dB[21]		
9.2.6	Intermodulation		-105 dBc		A minimum IMD of -105 dBc shall be measured at the output(s) while applying two carriers (60 & 65 MHz), out to out, @ 120 dBµV/60 dBmV, after 1kV Combination Wave (1,2µS rise time/50µS duration) has been applied at each port. Test setup according to IEC 60728-4 §4.8
9.2.7	Screening effectiveness	5-30 MHz 30-300 MHz 300-470 MHz 470-950 MHz 950-1218 MHz	≥ 95 dB ≥ 95 dB ≥ 90 dB ≥ 85 dB ≥ 70 dB		NEN-EN 50083-2: 2012

[19] Component may be equipped with either an IEC or F connector or a combination of both

[20] A relaxation of 0,5 dB is allowed in case the two-splitter is equipped with special ingress- or high voltage protection features

[21] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct.

9.3 Cable

9.3.1 Cable (equipment fly-lead)

Device description: coaxial cable with fixed connectors

item	description	remark	specification	tolerance	Measurement Protocol
9.3.1.1	Impedance	5 - 1218 MHz	75 Ω		vendor statement
9.3.1.2	Return loss	5 – 1218 MHz	≥ 20 dB[22]		IEC 60728-4 §5.3
9.3.1.3	Insertion Loss	Measurement freq. 862 MHz	Cable attenuation ≤0,5 dB/m, connector loss ≤ 0,4 dB per connector, max. flylead attenuation ≤ 5,8 dB		IEC 60728-4 §5.3
9.3.1.4	Tensile strength (t = 60 s)[23]		≥ 60 N		[24]
9.3.1.5	Connector in/out		F / IEC[25]		Appendix B , C
9.3.1.6	F male nut torque	Equipped with F-connectors	3,95 Nm		
9.3.1.7	Screening effectiveness[26]	5-15 MHz	≤ 5 mΩ/m (transfer impedance)		NEN-EN 50289-1-6, triaxial method
		15-30 MHz	≤ 2,5 mΩ/m (transfer impedance)		
		30 - 1000 MHz	≥ 95 dB		
		1000 - 1218 MHz	≥ 85 dB		
9.3.1.8	Bend radius without damaging the cable		75 mm		[27]

[22] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct.

[23] Pull force applied to the connectors

[24] After this test the unit still has to meet its insertion loss and return loss specifications

[25] Component may be equipped with either an IEC or F connector or a combination of both

[26] Inspired by NEN-EN 50117-2-5

[27] For testing: Bend and stretch cable four times in an angle of 90 degrees with a diameter of the bending radius. No physical damage may appear and the screening and impedance irregularity requirements still have to be met

9.3.2 Coax installation cable (indoor mounting cable)

Device description: Coaxial cable

item	description	remark	specification	tolerance	Measurement protocol
9.3.2.1	Impedance	5-1218 MHz	75 Ω		vendor statement
9.3.2.2	Insertion loss	@ 862 MHz	≤ 27 dB/100m		IEC 60728-4 §4.3
9.3.2.3	Material centre conductor		solid copper / copper cladded steel / silver cladded copper		Vendor statement
9.3.2.4	Material outer conductor		Aluminium/copper laminated foil which is bonded to the dielectric, a tinned, copper cladded or full copper braid or a combination		Vendor statement
9.3.2.5	Material dielectric		PE		vendor statement
9.3.2.6	Material jacket		PVC		vendor statement
9.3.2.7	Diameter Center conductor		0,7 - 1,15 mm		Micrometer method
9.3.2.8	Diameter dielectric		4,8 mm	± 0,2 mm	vendor statement
9.3.2.8.1	Diameter dielectric plus folie		<5,1 mm		Micrometer method
9.3.2.9	Diameter jacket		7,00 mm	+ 0,0 mm / -0,7 mm	vendor statement
9.3.2.10	Bend radius without damaging the cable		70 mm		[28]
9.3.2.11	Return loss	5-30 MHz	≥ 27 dB		IEC 60728-4 §4.6 NEN-EN 50117-2-4
		30-470 MHz	≥ 23 dB		
		470-1006 MHz	≥ 20 dB		
		1006 – 1218 MHz	≥ 18 dB		
9.3.2.12	Screening effectiveness[29]	5-15 MHz	≤ 5 mΩ/m (transfer impedance)		NEN-EN 50289-1-6, triaxial method
		15-30 MHz	≤ 2,5 mΩ/m (transfer impedance)		
		30 - 1006 MHz	≥ 95 dB		
		1000 - 1218 MHz	≥ 85 dB		

[28] For testing: Bend and stretch cable four times in an angle of 90 degrees with a diameter of the bending radius. No physical damage may appear and the screening and impedance irregularity requirements still have to be met

[29] Inspired by NEN-EN 50117-2-5

9.3.3 Coax 9 (indoor mounting cable)

Device description: Coaxial cable

item	description	remark	specification	tolerance	Protocol
9.3.3.1	Impedance	5-1218 MHz	75 Ω[30]		vendor statement
9.3.3.2	Insertion loss	@ 860 MHz	18 dB/100m	+0%/-10%	IEC 60728-4 §4.3
9.3.3.3	Material center conductor		solid copper / copper cladded steel / silver cladded copper		vendor statement
9.3.3.4	Material outer conductor		Aluminium/copper laminated foil which is bonded to the dielectric, a tinned, copper cladded or full copper braid or a combination		vendor statement
9.3.3.5	Material dielectric		Gas injected PE		vendor statement
9.3.3.6	Material jacket		UV stabile PVC		vendor statement
9.3.3.7	Diameter Center conductor		1,10 mm	± 0,05 mm	
9.3.3.8	Diameter dielectric		4,80 mm	± 0,15 mm	
9.3.3.9	Diameter dielectric plus folie		<5,1 mm		Micrometer method
9.3.3.10	Diameter jacket		7,10 mm	± 0,2 mm	
9.3.3.11	Bend radius without damaging the cable		70 mm		[31]
9.3.3.12	Return loss	5-30 MHz	≥ 27 dB		IEC 60728-4 §4.6
		30-470 MHz	≥ 23 dB		
		470-1006 MHz	≥ 20 dB		
		1006 – 1218 MHz	≥ 18 dB		
9.3.3.13	Screening effectiveness[32]	5-15 MHz	≤ 5 mΩ/m (transfer impedance)		NEN-EN 50289-1-6, triaxial method
		15-30 MHz	≤ 2,5 mΩ/m (transfer impedance)		
		30 - 1006 MHz	≥ 95 dB		

[30] All equipment should be designed for a 75 Ohm environment (vendor statement)

[31] For testing: Bend and stretch cable four times in an angle of 90 degrees with a diameter of the bending radius. No physical damage may appear and the screening and impedance irregularity requirements still have to be met

[32] Inspired by NEN-EN 50117-2-5

		1000 - 1218 MHz	≥ 85 dB		

9.4 Connectors and adaptors

9.4.1 IEC and F connectors and adaptors

Device description: An adaptor is a combination of two connectors. The specs are valid for adaptors and separate connectors

item	description	remark	specification	tolerance	Protocol
9.4.1.1	Impedance	5-1218 MHz	75 Ω		vendor statement
9.4.1.2	Return loss	5 – 1218 MHz	≥ 20 dB[33]		IEC 60728-4 §4.6
9.4.1.3	Screening effectiveness	5 – 30 MHz 30 – 300 MHz 300 - 470 MHz 470 - 950 MHz 950 - 1218 MHz	>95 dB >95 dB >90 dB >85 dB >70 dB		IEC 60728-2
9.4.1.4	Mechanical parameters				Appendix B, C
9.4.1.5	Pull force	Pull force after 10 insertions	≥ 20 N		Appendix E[34]
9.4.2.4.	Mounting principles F-connector	Twist-on type connectors not allowed			

9.5 Diplex filter

Device description: RTV duplex/data filter

item	Description	Remark	specification	tolerance	Protocol
9.5.1.1	Impedance	5-1006 MHz	75 Ω		vendor statement
9.5.1.2	Connector in/out		In IEC female TV IEC male R IEC female		Appendix C
9.5.1.3	Insertion loss in -> TV	5 – 70 MHz	≤ 1,0 dB		IEC 60728-4 §4.3
		120-140 MHz	≤ 1,0 dB		
		140-862 MHz	≤ 0,5 dB		
		862-1006	≤ 0,8 dB		
9.5.1.4	Insertion loss in -> R	5 – 70 MHz	≥ 25,0 dB		IEC 60728-4 §4.3
		87,5-108 MHz	≤ 2,0 dB		

[33] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct.

[34] Push on male F connectors will measured according to the procedure mentioned in appendix E

9.5.1.5	Return loss TV	5- 70 MHz 120 – 1006 MHz	≥14 dB ≥14 dB		IEC 60728-4 §4.6
9.5.1.6	Return loss R	87,5-108 MHz	≥10 dB		IEC 60728-4 §4.6
9.5.1.7.	Return loss In	5-70 MHz	≥14 dB		IEC 60728-4 §4.6
		87,5-108 MHz	≥10 dB		
		120-1006 MHz	≥14 dB		
9.5.1.8	Isolation TV-R	5 – 70 MHz	≥ 25 dB		IEC 60728-4 §4.2
		87,5-108 MHz	≥16 dB		
		120 – 1006 MHz	≥ 25 dB		
9.5.1.9	Screening effectiveness	5-30 MHz 30-300 MHz 300-470 MHz 470-950 MHz 950-1006 MHz	≥ 95 dB ≥ 95 dB ≥ 90 dB ≥ 85 dB ≥ 70 dB		NEN-EN 50083-2:2012

9.6 Port terminator

Device description: Termination resistor

Item	Description	Remark	Specification	Tolerance	Protocol
9.6.1.1	Impedance	5 - 1218 MHz	75 Ω		vendor statement
9.6.1.2	Frequency range	5 - 1218 MHz			
9.6.1.3	Return loss	5 – 1218 MHz	≥ 20 dB[35]		IEC 60728-4 §4.6
9.6.1.4	Torque (rotation) F (if applicable)		≥5 Nm		
9.6.1.5	Connector		F/IEC-connector		Appendix B, C
9.6.1.6	Screening effectiveness	5-30 MHz 30-300 MHz 300-470 MHz 470-950 MHz 950-1218 MHz	≥ 95 dB ≥ 95 dB ≥ 90 dB ≥ 85 dB ≥ 70 dB		NEN-EN 50083-2:2

[35] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct.

9.7 HDMI cable

Device description: HDMI (High-Definition Multimedia Interface) is a compact audio/video interface for transmitting uncompressed digital data. HDMI supports, on a single cable, any TV or PC video format, including standard, enhanced, and high-definition video, up to 8 channels of digital audio, and the Consumer Electronics Control signal.

item	description	Remark	specification	tolerance	Protocol
9.7.1	Construction		Fully shielded cable. Molded ends. Inner hood connected 360 degrees to the connector for complete end shielding.		HDMI Specification High Speed (category 2 or higher)
9.7.2	Interface		HDMI-A Interface[1]		HDMI Specification High Speed (category 2 or higher)
9.7.3	Ferrite	Both sides of the cable should contain a ferrite to prevent unwanted e-gress and ingress (shortcut shielding currents 0-1GHz).	Ferrite specification Impedance ≥200 Ohm @ 1 GHz		See Appendix F
9.7.4	Marking		"Kabel Keur certified" and HDMI label must be printed on the cable (label) or the connector[36]		
9.7.5	HDMI approved		The vendor must provide a certificate of HDMI ATC compliance and an ATC testing result		

[36] Label format corresponding to www.hdmi.org.

9.8 UTP patch cable

Device description: unshielded twisted pair patch cable

item	description	remark	specification	tolerance	Protocol
9.8.1	type		Category 5e		
9.8.2	Certificate of conformance		Intertek ETL or equivalent certificate for verification to ANSI/TIA-568-B.2 must be supplied		
9.8.3	Wire pairs and diameter		4 stranded pairs 24 AWG copper		
9.8.4	Testreports		A full test report for Verification to ANSI/TIA-568-B.2 the protocol must be supplied		
9.8.5	Connectors		RJ45 with 50 µm gold plated contacts		
9.8.6	Suitable for		10/100/1000 Base-T		
9.8.7	Max. length		30 m		

10 Active components

10.1 Amplifier

Device description: Amplifier (862 MHz) with one or multiple outputs, either wall mounted or push-on, (n-1) outputs must have a 75 ohm termination.

item	description		remark	specification	tolerance	Protocol
10.1.1	Gain forward path (port – port) range		85 - 862 MHz	1 – 9 dB[37]	± 1,5 dB[38]	IEC60728-3 §5.6
10.1.2	Cable compensating slope		85 - 862 MHz	≤ 1,5 dB see figure after this table		
10.1.3	Gain return path (port – port) range - Forward gain ≥7 dB - Forward gain <7 dB - Gain ripple/error		5 - 65 MHz	 0 - 5 dB 0 - 2 dB	 ± 1,0 dB	IEC60728-3 §5.6
10.1.4	Connectors in- out			F, IEC		Appendix B, C
10.1.5	Isolation	RF-IN to Outputs	5 - 65 MHz	≥ 26 dB		IEC 60728-4 §4.2
		Outputs to RF-IN	85 - 862 MHz	≥ 26 dB		
		Outputs to Outputs	5 – 15 MHz	≥ 20 dB		
		Outputs to Outputs	15 - 65 MHz	≥ 30 dB		
		Outputs to Outputs	85 - 862 MHz	≥ 26 dB		
10.1.6	Return loss input[39]		5 – 65 MHz	≥ 18 dB		IEC60728-3 &5.5
			85 – 862 MHz	≥ 18 dB		
10.1.7	Return loss output [40]		5 – 65 MHz	≥ 18 dB		
			85 – 862 MHz	≥ 18 dB		
10.1.8	Noise figure		5-65 MHz	≤ 18 dB		IEC 60728-3 §4.4
			85-120 MHz	≤ 9 dB		
			120-862 MHz	≤ 8 dB		
10.1.9	Nominal input level (PAL)[41]			≤ 77 dBuV		
10.1.10	Forward path distortion	CSO. @ (77+gain) dBuV output		< - 64 dBc[42]		IEC 60728-3 §4.2.3

[37] Unit may have either equal gain outputs or stepped gain outputs. Low gain amplifiers have preferable no adjustable gain.

[38] Gain forward path tolerance including temperature variation and gain ripple are indicated in the figures on page 31.

[39] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct with a minimum of 10 dB. Specification at f<40 MHz and -1,5/oct (f>40MHz)

[40] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct with a minimum of 10 dB. Specification at f<40 MHz and -1,5/oct (f>40MHz)

[41] Input channel load consists of 42 FM Channels, between 30-50 analogue (PAL) channels and 30-50 digital (QAM) signals

[42] Measured at output level (output level = input level + gain)

		CTB . @ (77+gain) dBuV output		< - 64 dBc		IEC 60728-3 §4.2.2
10.1.11	Reverse path distortion (in band)	Second order IMA (2-tone) @ 115 dBµV input		< - 50 dB		IEC 60728-4 §4.8[43]
		Third order intermodulation distortion @ 115 dBµV input		< - 50 dB		IEC 60728-4 §4.8[43]
10.1.12	Reverse path distortion into forward path	2^{nd} and 3^{rd} order intermodulation @ 115 dBµV reverse path input @ 58 dBµV forward path input level		< - 66 dBc		IEC 60728-4 §4.8 (Measured at forward output port) [43]
10.1.13	Spurious/oscillation		5-65 MHz 85-862 MHz	≤ -20 dBµV	To be measured on all In- and Output ports. All ports terminated.	Measuring method Spectrum analyzer, no additional signals connected
10.1.14	Group delay 5-10 MHz		Δ 2 MHz	≤ 30 ns		IEC 60728-3 §5.9
10.1.15	Group delay 10-65 MHz		Δ 2 MHz	≤ 10 ns		
10.1.16	Group delay 85-120 MHz		Δ 4.43 MHz	≤ 20 ns		
	Group delay 120-862 MHz		Δ 4.43 MHz	≤ 10 ns		
10.1.17	Surge protection		On input	1kV		IEC 60728-3 §5.9[44]
10.1.18	Galv. Isolation 2120 V DC		Inner conductor input >inner conductor output	≤ 0.7 mA		IEC 60728-11 §10
10.1.19	Galv. Isolation 230 V AC		Inner conductor input >inner conductor output	≤ 8.0 mA RMS		IEC 60728-11 §10
10.1.20	Screening effectiveness, class A		5-30 MHz 30-300 MHz 300-470 MHz 470-862 MHz	85 dB 85 dB 80 dB 75 dB		IEC 60728-2
10.1.21	Operating temperature range			$0 - +40^{0}$ C		
10.1.22	Power			< 7 W[45]		
10.1.23	Grounding			Connection for 2.5 mm cable[46]		

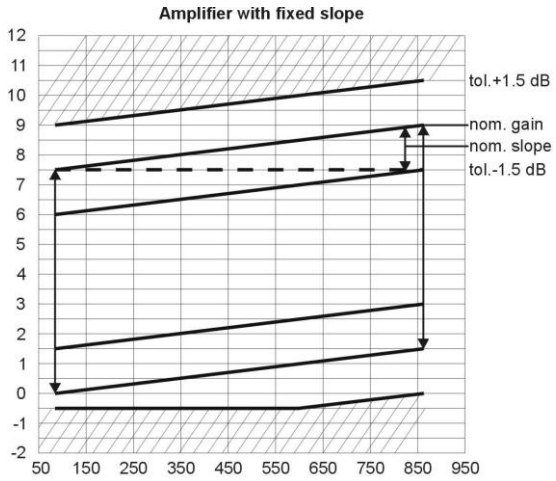
[43] IEC60728-4 §4.8 describes the 2-tone measurements for passives. In 60728 Part-3 § 4.7 for active components, the method of measurement has been changed to a CINR-test. Kabel Keur stics to the two-tone method as it is still in general use.

[44] 1 kV pulse (rise time 1.2 µsec/fall time 50 µsec

[45] Including power supply (when applicable)

[46] Not applicable for push-on amplifiers

10.1.24	Port termination	n-1 output must have a 75 ohm termination			



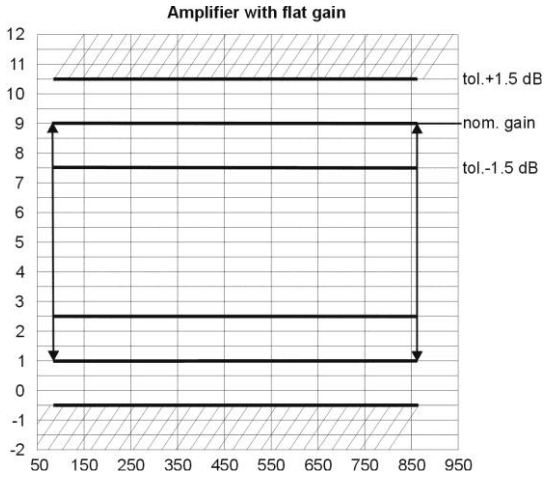


Figure 1

10.2 Amplifier

Device description: Amplifier (1006 MHz) with one or multiple (n) outputs, either wall mounted or push-on, (n-1) outputs must have a 75 ohm termination

item	description		remark	specification	tolerance	Protocol
10.2.1	Gain forward path (port – port) range		85 - 1006 MHz	1 – 11 dB[47]	± 1,5 dB[48]	IEC60728-3 §5.6
10.2.2	Cable compensating slope		85 – 1006 MHz	≤ 2,0 dB		
10.2.3	Gain return path (port – port) range - Forward gain ≥7 dB - Forward gain <7 dB - Gain ripple/error		5 - 65 MHz	 0 - 5 dB 0 - 2 dB	 ± 1,0 dB	IEC60728-3 §5.6
10.2.4	Connectors in- out			F, IEC		Appendix B, C
10.2.5	Isolation	RF-IN to Outputs	5 - 65 MHz	≥ 26 dB		IEC 60728-4 §4.2
		Outputs to RF-IN	85 - 1006 MHz	≥ 26 dB		
		Outputs to Outputs	5 – 15 MHz	≥ 20 dB		
		Outputs to Outputs	15 - 65 MHz	≥ 30 dB		
		Outputs to Outputs	85 - 1006 MHz	≥ 26 dB		

[47] Unit may have either equal gain outputs or stepped gain outputs. Low gain amplifiers have preferable no adjustable gain.

[48] Gain forward path tolerance including temperature variation and gain ripple are indicated in the figures on page 34.

10.2.6	Return loss input[49]	5 – 65 MHz	≥ 18 dB		IEC60728-3 &5.5
		85 – 1006 MHz	≥ 18 dB		
10.2.7	Return loss output[50]	5 – 65 MHz	≥ 18 dB		
		85 – 1006 MHz	≥ 18 dB		
10.2.8	Noise figure	5-65 MHz	≤ 18 dB		IEC 60728-3 §4.4
		85-120 MHz	≤ 9 dB		
		120-1006 MHz	≤ 8 dB		
10.2.9	Nominal input level (PAL)[51]		≤ 77 dBuV		
10.2.10	Forward path distortion	CSO @ (77+gain) dBuV output	< - 65 dBc[52]		IEC 60728-3 §4.2.3
		CTB @ (77+gain) dBuV output	< - 66 dBc		IEC 60728-3 §4.2.2
10.2.11	Reverse path distortion (in band)	Second order IMA (2-tone) @ 115 dBµV input	< - 50 dB		IEC 60728-4 §4.8[53]
		Third order intermodulation distortion @ 115 dBµV input	< - 50 dB		IEC 60728-4 §4.8[53]
10.2.12	Reverse path distortion into forward path	2nd and 3rd order intermodulation @ 115 dBµV reverse path input @ 58 dBµV forward path input level	< - 66 dBc		IEC 60728-4 §4.8[53] (measured at forward output port)
10.2.13	Spurious/oscillation	5-65 MHz 85-1006 MHz	≤ -20 dBµV	To be measured on all In- Output ports. All ports terminated.	Measuring method Spectrum analyzer, no additional signals connected
10.2.14	Group delay 5-10 MHz	Δ 2 MHz	≤ 30 ns		IEC 60728-3 §5.9
10.2.15	Group delay 10-65 MHz	Δ 2 MHz	≤ 10 ns		
10.2.16	Group delay 85-120 MHz	Δ 4.43 MHz	≤ 20 ns		
	Group delay 120-1006 MHz	Δ 4.43 MHz	≤ 10 ns		

[49] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct with a minimum of 10 dB. Specification at f<40 MHz and -1,5/oct (f>40MHz)

[50] Specification at f≤40 MHz and for f>40 MHz -1.5dB/oct with a minimum of 10 dB. Specification at f<40 MHz and -1,5/oct (f>40MHz)

[51] Input channel load consists of 42 FM Channels, between 30-50 analogue (PAL) channels and 30-50 digital (QAM) signals

[52] Measured at output level (output level = input level + gain)

[53] IEC60728-4 §4.8 describes the 2-tone measurements for passives. In 60728 Part-3 § 4.7 for active components, the method of measurement has been changed to a CINR-test. Kabel Keur sticks to the two-tone method as it is still in general use.

10.2.17	Surge protection	On input		1kV		IEC 60728-3 §5.9[54]
10.2.18	Galv. Isolation 2120 V DC	Inner conductor input >inner conductor output		≤ 0.7 mA		IEC 60728-11 §10
10.2.19	Galv. Isolation 230 V AC	Inner conductor input >inner conductor output		≤ 8.0 mA RMS		IEC 60728-11 §10
10.2.20	Screening effectiveness, class A		5-30 MHz 30-300 MHz 300-470 MHz 470-1006 MHz	85 dB 85 dB 80 dB 75 dB		IEC 60728-2
10.2.21	Operating temperature range			0 - +40^0 C		
10.2.22	Power			< 7 W[55]		
10.2.23	Grounding			Connection for 2.5 mm cable		
10.2.24	Port termination		n-1 output must have a 75 ohm termination			

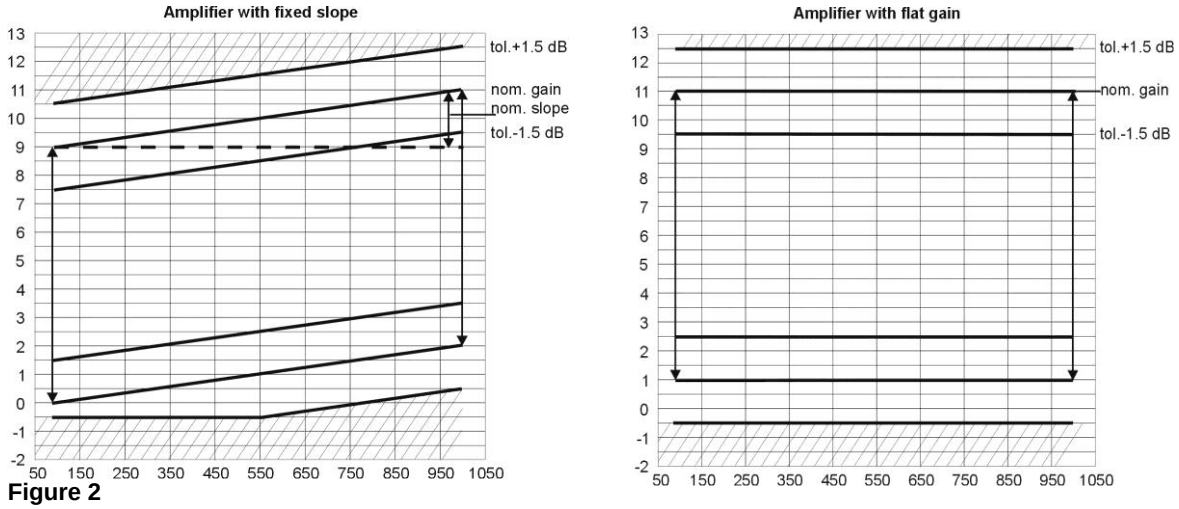


Figure 2

[54] 1 kV pulse (rise time 1.2 µsec/fall time 50 µsec

[55] Not applicable for push-on amplifiers

11 Special products

Vendor confidential

Procedure: see chapter 7

12 Appendix A: Logo's

Note: For product labeling see article 8.2

The Kabel Keur logo uses the following colors:

Blue: pms 2935 Green: pms 375

Logo Complete Full Color, the original Kabel Keur logo, has a minimum width of 10 mm.

Logo Complete Monochrome. This logo offers the possibility to display a grayscale picture in newspapers.

L**ogo Simplified** should only be used in cases where the original logo cannot be placed on the product due to minimal format requirements. The Logo Simplified is only allowed on products and not on packaging. The Logo Simplified has a minimum width of 5 mm .

The Kabel Keur logo can be used together with a theme. In this case the minimum dimension is 30 mm for the logo.

The theme should be minimum corps 8 (centered). The theme line must never be smaller than the width of the logo.

The Kabel Keur logo must always be placed on white background..

The Kabel Keur logo can also be placed deep. Mind: Strainer print for packaging materials on a dark or transparent background.

High resultion Logo files will at request be provided by NLkabel

Address:

Lange Voorhout 90 2514 EJ Den Haag Telefoon: 070 - 305 33 33

13 Appendix B: F-connectors

Description of F-connectors

This type of connector has screw locking with a 3/8-32UNEF-2”B” thread or a push-on F-male connector, this push-on connector does not have a screw/spinning lock nut as it has a spring mechanism. Normally, the plug will be a free connector, the socked a fixed connector. The design of the male connector may either such that the inner conductor of the cable serves as the male contact, or such that the centre (male) contact is independent of the cable inner conductor.

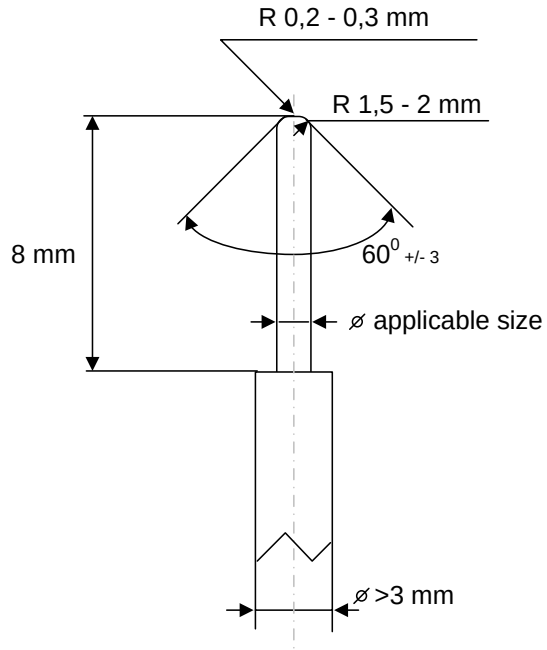
Physical dimensions

The physical characteristics of the F-connector must be able to be in accordance with the dimensions as stated in IEC 61169-24 2009.

Mechanical strength/withstand tightening torque

The F-ports shall be able to withstand the minimum specified tightening torque without damage. A male F-push-on connector should provide a minimum of 20 Nm pull strength (when disconnecting the F-male push-on from the female).

Test gauge acceptance F-female connector



The female contact of the F-connector for general products shall at least be able to accept male contacts/test gauges with a diameter range between 0.51-1.2 mm.

Clamp force/withdrawal test

To verify that the centre female contact of the socket does not suffer from deformation when mated with the range of inner conductors specified, a test has been advised which measures the force required to withdraw the selection of precision test gauges, out of the female connector under test.

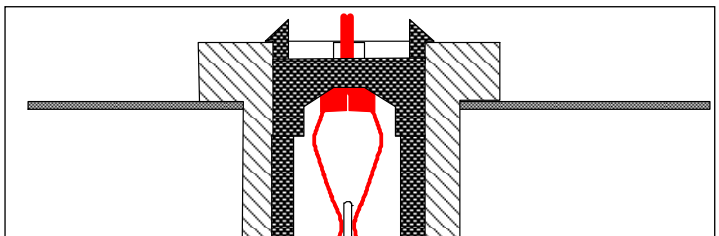


Figure: Example of Clamp force test set up

General Products					
Test sequence	1	2	3	4	5
Test gauge diameter (mm)	0.51	1.2	0.51	1.2	0.51
Clamping force min. (gram)			30		30
Clamping force tests must be performed with a duration of 10 seconds and at room temperature					
Test gauge tolerance: +/- 0.01 mm					

Insertion force test

To verify that the centre female contact of the socket does not suffer from deformation when mated with the range of inner conductors specified, a test has been advised which measures the force required to insert the selection of precision test gauges, into the female connector under test.

Depending on test gauge diameter a sliding scale of the insertion force is presented in the table below:

General Products			
Test sequence	1	2	3
Test gauge diameter (mm)	0.51	0.80	1.2
Insertion force (gram)	≤ 300	≤ 800	≤ 1700
Test must be performed at room temperature			
Test gauge tolerance: +/- 0.01 mm			

The insertion force applied at the applicable test gauge diameter, as mentioned in this table, shall not exceed mentioned insertion force values.

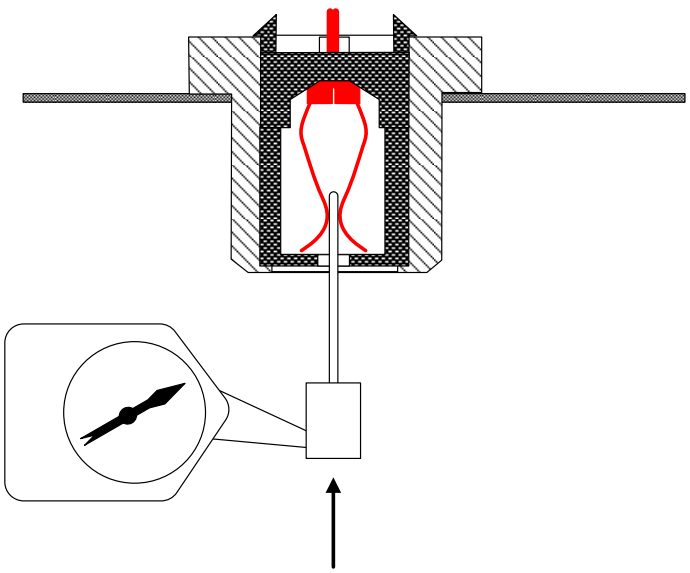


Figure: Example of Insertion force test set up

14 Appendix C: IEC-connectors

Description of IEC type connectors (type 9,52)

This type of connector has a push pull fitting without locking. Normally, the plug will be a free connector, the socked a fixed connector. The design of the plug may be such that the inner pin conductor serving as the male contact.

Physical dimensions

The physical characteristics of the IEC-connectors should be able to be in accordance with the dimensions as stated in IEC 61169-2, 2007.

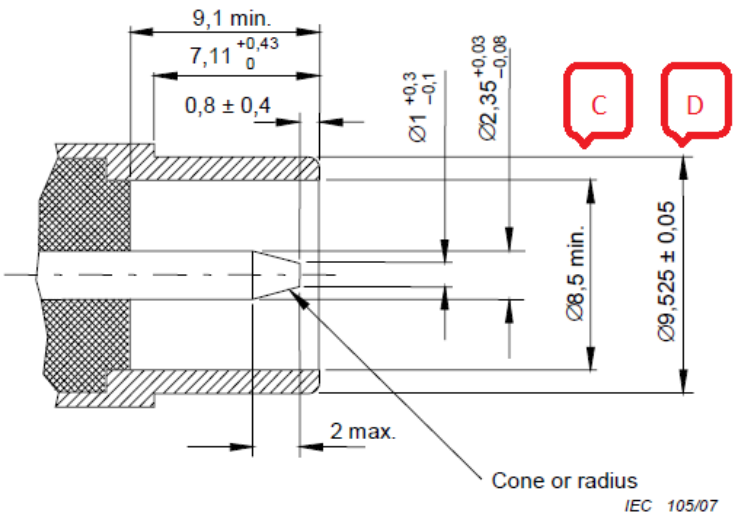
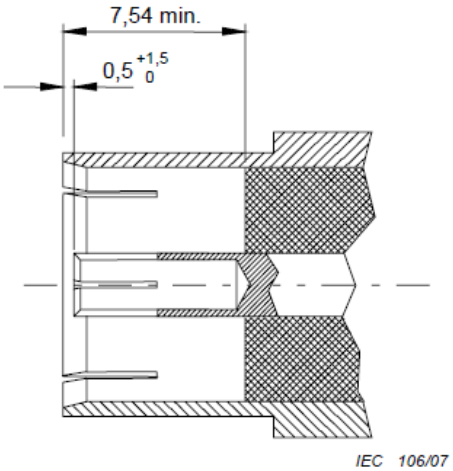


Figure 1a – Sliding male connector



For moulded IEC-connectors there are following relaxations to the dimensions as stated in IEC-61169-2:

- For size “C” there is a relaxation from 8.5 mm min. to **7.9 mm** min. due to tooling angle.
- For size “D” there is a relaxation from 9.525 ± 0.05 mm (9.520 to 9.530 mm) to 9.45 - 9.57 mm (no tolerance).

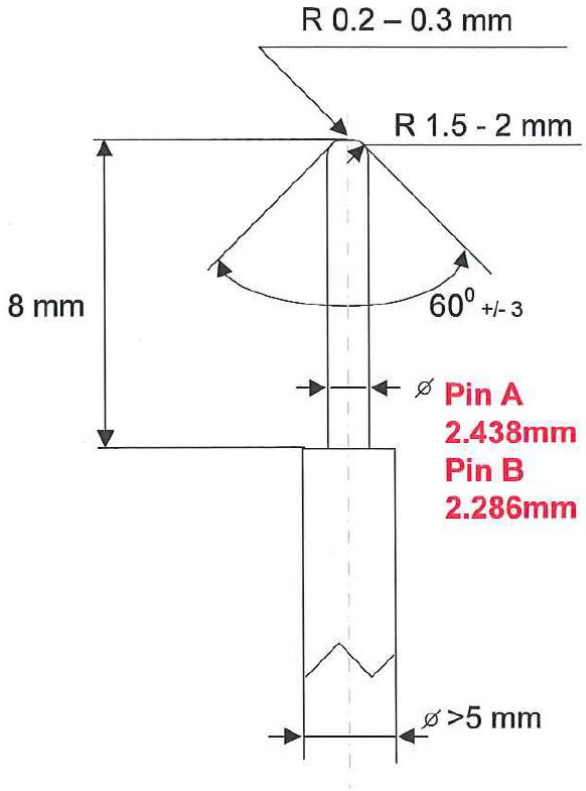
IEC acceptance tests

To verify the acceptable quality level the following test to ascertain the resilience of the conductor to insertion and withdrawal of a selection of precision test pins, into and out of the connector under test.

The tests are to determine:

A. Resilience of inner-pin
B. Resilience of outer-conductor
C. Torque resistance of inner-pin

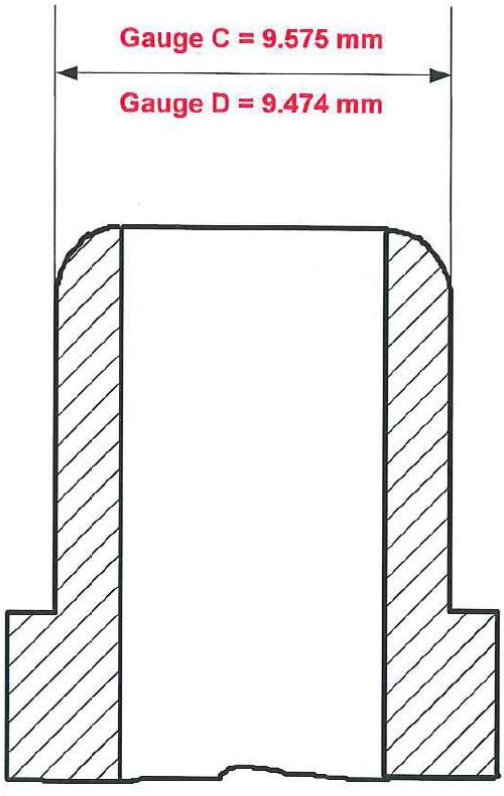
A. The test gauge dimensions for "**resilience of inner-pin**" are shown as follows:



	Dimensions (mm)	
		Tolerance
Test gauge A Ø	2.438	0, -0.01
Test gauge B Ø	2.286	+0.01, 0
Weight of test gauge B should be 30 gram		

In the first instance, use test gauge A with maximum diameter. This gauge must be inserted fully into the inner-pin of the IEC-female connector. Then insert fully the test gauge B with the minimum diameter. The test gauge B (minimum diameter) must not fall out after inserting the maximum diameter gauge A and sufficient clamping force should be left.

B. The test gauge dimensions for "**resilience of outer-conductor**" are shown as follows:



	Dimensions (mm)	
		Tolerance
Test gauge C Ø	9.575	0, -0.01
Test gauge D Ø	9.474	+0.01, 0
Weight of test gauge D should be 150 gram		

First insert the test gauge C with maximum diameter, this gauge must be inserted fully into the outer-conductor of the IEC-female connector.
Then insert the test gauge D with minimum diameter. Test gauge D (minimum diameter) must not fall out after inserting the maximum diameter gauge C and sufficient clamping force should be left.

Torque resistance of inner-pin

This test is to check rotation of the inner-pins of the IEC-male connector.
The inner-pin must withstand an applied force of 0.4 Nm without any signs of rotation or damage.
For fly lead connectors an applied force of 0.2 Nm without any signs of rotation or damage will apply.

Torque test example:

15 Appendix D: Cable clamp

Description of centre conductor construction

The type of the cable clamp and its centre conductor construction is depending on the manufacturer. The design of the centre conductor construction should be such that the inner conductor of the cable serves as the male contact.

Physical dimensions

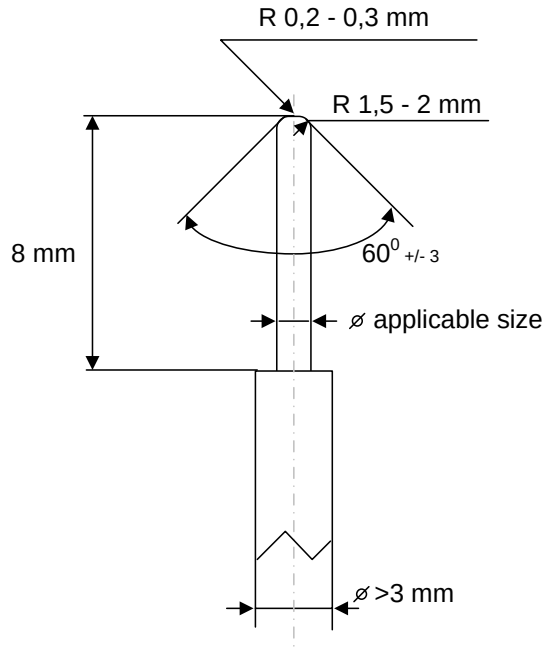
Depending on supplier construction.

Mechanical strength/withstand tightening torque

N.a..

Test gauge acceptance cable clamp centre conductor construction

The centre conductor construction of a cable clamp regarding Wall Outlets shall at least be able to accept male contacts/test gauges with a diameter range between 0.51-1.2 mm.



Clamp force/withdrawal test

To verify that the centre conductor construction of the cable clamp does not suffer from deformation when mated with the range of inner conductors specified, a test has been advised which measures the force required to withdraw the selection of precision test gauges, out of the centre conductor under test.

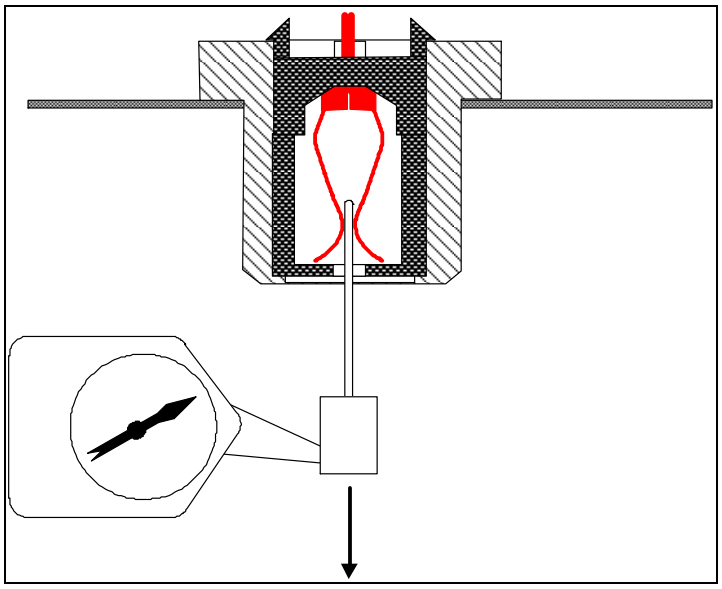


Figure: Example of Clamp force test set up on F-connector

Spring construction only:

Wall Outlet centre conductor construction					
Test sequence	1	2	3	4	5
Test gauge diameter (mm)	0.51	1.2	0.51	1.2	0.51
Clamping force min. (gram)			30		30
Clamping force tests must be performed with a duration of 10 seconds and at room temperature					
Test gauge tolerance: +/- 0.01 mm					

Spring construction in combination with fixing screw:

Wall Outlet centre conductor construction					
Test sequence	1	2			
Test gauge diameter (mm)	0.51	1.2			
Clamping force min. (gram)	30	30			
Clamping force tests must be performed with a duration of 10 seconds and at room temperature					
Test gauge tolerance: +/- 0.01 mm					

Insertion force test

To verify that the centre conductor construction of the cable clamp does not suffer from deformation when mated with the range of inner conductors specified, a test has been advised which measures the force required to insert the selection of precision test gauges, into the centre conductor construction.

Depending on test gauge diameter a sliding scale of the insertion force is presented in the table below:

Wall Outlet centre conductor construction			
Test sequence	1	2	3
Test gauge diameter (mm)	0.51	0.80	1.2
Insertion force (gram)	≤ 300	≤ 800	≤ 1700
Test must be performed at room temperature			
Test gauge tolerance: +/- 0.01 mm			

The insertion force applied at the applicable test gauge diameter, as mentioned in this table, shall not exceed mentioned insertion force values.

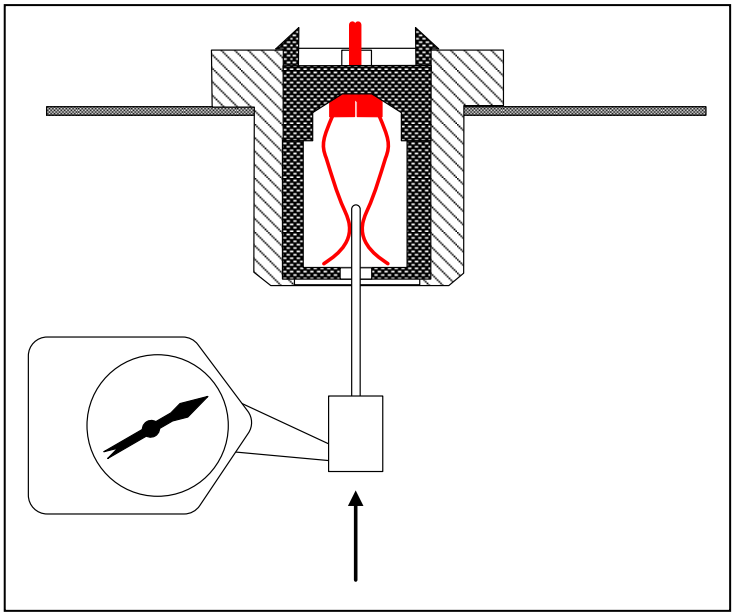


Figure: Example of Insertion force test set up on F-connector

16 Appendix E: Pull force IEC female connector

The pull force is the minimum force required to pull a IEC connector fully out without mechanical assistance.
Pull force is deemed to be of primary importance in the measurement of the IEC connector. If too much force is required to remove the IEC connector then there is a greater possibility of damage to the wall outlet. If there is too little force required to remove the IEC connector then there is the risk of the plug just falling out or moving enough within for the signal to become intermittent.

test procedure

The Connector Under Test shall be new and unused.
The extraction force testing should be undertaken after cycle testing. The ideal test uses a hardened steel mandrel conforming to the dimensions given in IEC 60169-2. No lubrication of the test mandrel is permitted for any of the tests listed.

- Insert/Extract the test mandrel fully, co-axially with the jack, ensuring there is no side force applied.
- Repeat for 10 insertion/extraction cycles.
- Physically inspect the terminals and body of the CUT for wear, and test for electrical continuity.
- If the CUT meets the pass/fail criteria, continue the test.

Using a standard mandrel the extraction force is to be tested for the CUT.

- Insert the test mandrel fully, co-axially with the jack, ensuring there is no side force applied.
- Measure and record the extraction force.

Pass/fail criteria:

- The extraction force shall be within limits shown in clause 9.4.1.5.
- Physically inspect the terminals and body of the CUT for wear, and test for electrical continuity.

17 Appendix F: Measurement protocol ferrite HDMI cable

Ferrite Specification and Test Method:

1 Ferrite Impedance

Both sides of the HDMI-cable should contain a ferrite to prevent unwanted e-gress and ingress (shortcut shielding currents 0-1GHz).
Specification:
Each ferrite on the cable must have an impedance of: ≥ 200 Ohm measured at 1000 MHz

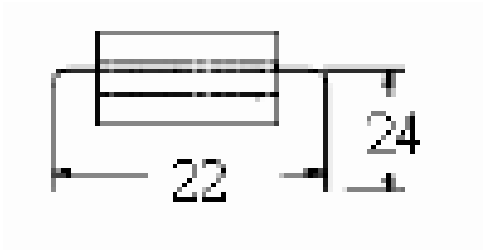
2 Test Method

Test equipment: a LCR meter with text fixture capable of measuring the ferrite impedance up to 1000 MHz.
e.g. Impedance Analyzer HP4991A
Test fixture HP16092A

Test wire dimensions: Ø0.5 mm x 70 mm (length)

Turns: 1

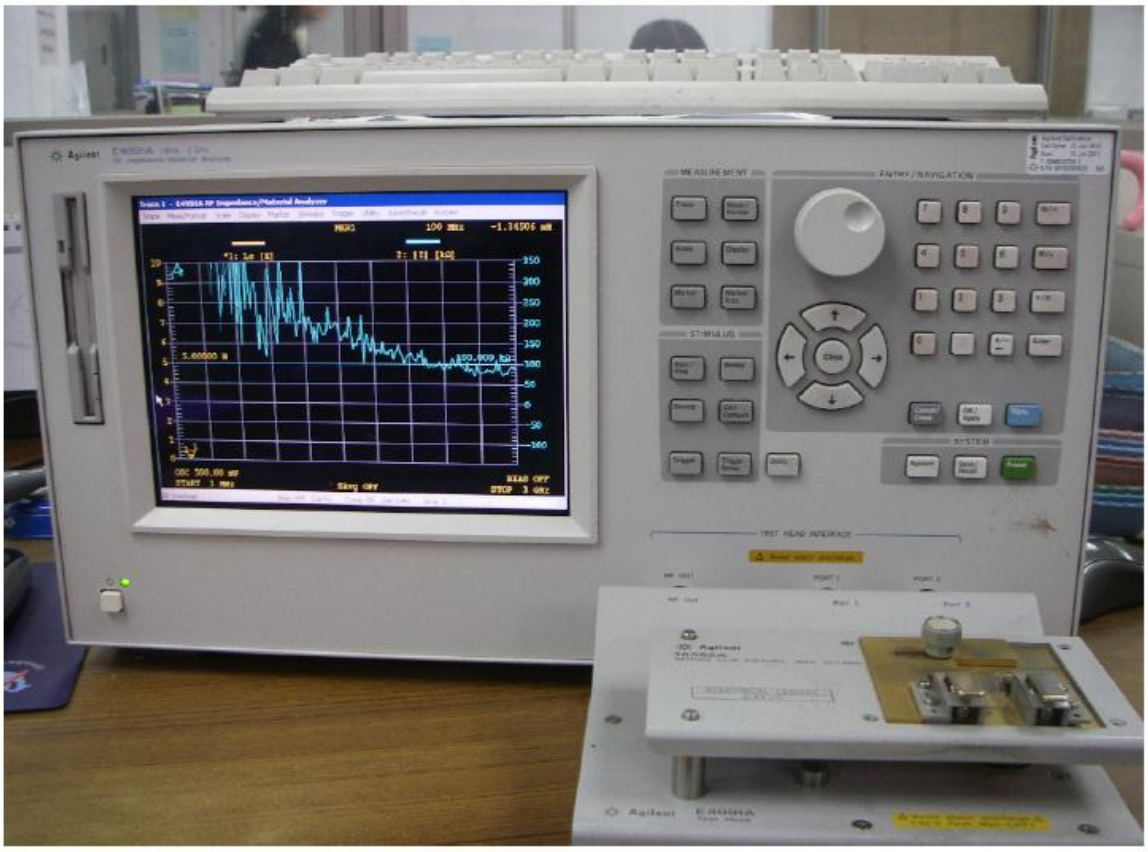
Remark: the test wire should be centered inside the ferrite



3 Interpretation result

Due to possible deviations a tolerance of -10% (≥ 180 Ohm) can be accepted.

IMPEDANCE ANALYZER:E4991A



Test Fixture

18 Appendix G

Example letter for requirements Kabel Keur products in a factory packing[56]
(English version)

Concerns: Kabel Keur Products:

Dear xxxxxxxxxxxxxxxxxxx

"Kabel Keur" is a quality certification mark for broadband in-home network products, initiated in 2008 by NLKabel (Dutch Association of Broadbandcable service providers). Today a variety of products have been tested and certified. Xxxxx xx is allowed to use the "Kabel Keur" logo on the products that have tested to fulfil the severe requirements of "Kabel Keur".
The Appendix gives an overview of these certified products

The products in the accompanying list however are (OEM) products in a factory packaging Your company also buys one or more of these (OEM) products. "Kabel Keur" requires these products will only be used for purposes of installation. It is not allowed to further distribute them ore sell them to consumers.

Products having "Kabel Keur" may only be sold to consumers taking into account the "Kabel Keur" requirements concerning packaging and accompanying instructions for use etc.

We ask you to support the guidelines edited by "Kabel Keur". We assume you will respect the requirements and follow the guidelines. In case you don't we will not be able to supply you the specific "Kabel Keur" parts/products anymore. We are sure we both would be sorry about that.

We expect with this letter we have informed you adequately.

With kind regards,

Company:
Name:

(Dutch version)

Betreft: Kabel Keur producten

Geachte / Beste xxxxxxxxxxx

"Kabel Keur", het kwaliteitskeurmerk voor producten voor binnenhuisinstallaties, is in 2008 door NLkabel (vereniging van Nederlandse Kabelbedrijven) geïnitieerd. Inmiddels hebben wij verschillende bestaande producten laten certificeren. Deze producten, waarvoor xxxxxxxx het "Kabel Keur" logo mag voeren, voldoen aan de strenge eisen van "Kabel Keur".
In de bijlage treft u een overzicht aan van de producten welke zijn gecertificeerd.

[56] Voorbeeld brief "Voorwaarden Kabelkeur producten in fabrieksverpakking"

De producten volgens bijgaande lijst zijn echter (OEM) producten in een fabrieksverpakking.
Ook uw bedrijf neemt een of meerdere van deze (OEM) producten af.
Volgens de voorwaarden die Kabel Keur stelt, mogen deze producten alleen gebruikt worden voor installatiedoeleinden en is het niet toegestaan deze producten verder te distribueren c.q. te verkopen aan consumenten en/of door te verkopen.

“Kabel Keur” producten die aan de consument worden geleverd, moeten voldoen aan de door NL Kabel in het kader van het “Kabel Keur” gestelde eisen met betrekking tot de verpakking, gebruiksaanwijzing e.d.

Wij verzoeken u mee te werken aan de richtlijnen zoals Kabel Keur die heeft opgesteld.

Wij gaan er van uit dat u de voorwaarde zult respecteren en overeenkomstig zult handelen.
Het niet opvolgen hiervan zou anders inhouden dat wij de betreffende Kabel Keur producten niet meer aan u mogen leveren. Voor alle partijen is dat uiteraard geen wenselijke situatie.

Wij vertrouwen erop u met deze brief op de juiste wijze op de hoogte te hebben gesteld.

Met vriendelijke groet,

xxxxxxxxxxxxxxxxx

Firma
Naam