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Guidance for technology audit of fibre optic connector kits and terminated connectors

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Guidance for technology audit of fibre optic connector kits and terminated connectors

This CENELEC Report has been prepared by the Technical Committee CENELEC TC 86BXA, Fibre optic connectors. It was approved by the Technical Committee on 1999-05-04 and endorsed by the CENELEC Technical Board on 1999-10-01.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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FOREWORD

This technical report has been prepared by the Technical Committee CENELEC TC 86BXA, Fibre optic connectors. It is based on a draft for fibre optic connectors made by UTE 86B.

The text of the draft was approved by TC 86BXA on 1999-05-04; it was approved for publication by the CENELEC Technical Board on 1999-10-01.

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INTRODUCTION

This document gives guidance for a technological audit for Fibre Optic connectors kits and terminated connectors. Its purpose is to give assurance to a customer that major critical aspects of the technology involved in such product are covered by an Audit carried out in compliance with this document.
This document has been prepared by the related expert community of the various European countries. It is in conjunction with the state of the art, at the period of time of the publication. It provides an harmonised approach of the Technical Audits. It is expected that this harmonisation will reduce the duplication of Audit preparation.

This document can also be used to develop the audit requirements for Technology Approval according to EN 100114 - 6.

1 General

1.1 Scope

This document provide the terms, definitions, symbols, quality system, test, assessment and verification methods and other requirements relevant to the design, manufacture, termination and supply of Fibre Optic Connectors.

1.2 Related documents

CECC 00 016	Basic Requirements for the use of Statistical Process Control (SPC) in the systems
CECC 00 401	Glossary of Abbreviations, terms and definitions of the CECC System
CECC 00 806	Guide to total quality management (TQM) for CECC approved organisations
EN 100114-6	Quality assessment procedures -- Part 6: Technology approval of electronic component manufacturers
CECC 210 000	Requirements for Technology Approval Schedules (TAS)
EN 45001	General criteria for the operation of testing laboratories
EN 175100	Sectional Specification: Two part and edge socket connectors for printed board application
EN 186000 -1	Generic Specification: Connector sets for optical fibres and cables -- Part 1: Requirements, test methods and qualification approval procedures
EN 61300 series	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures
EN 61753 series	Fibre optic interconnecting devices and passive components performance standard (in preparation)
EN 61754 series	Fibre optic connector interfaces
ISO 497	Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers
ISO 8402	Quality management and quality assurance -- Vocabulary

1.3 Units, symbols and terminology

Units, graphical symbols, letter symbols and terminology should, whenever possible, be taken from the following documents :

ISO 1000 :	SI units and recommendations for the use of their multiples and certain other units
IEC 60027 :	Letter symbols to be used in electrical technology
IEC 60050(581) :	International electromechanical vocabulary, chapter 581 : Electromechanical component for electronic equipment
IEC 60050(731)	International electromechanical vocabulary, chapter 731 : Optical Fibre communication
IEC 60617	Graphical symbols for diagrams

Where further units, symbols and terminology are required, these should be taken from the documents listed in subclause 1.2.

1.4 Standard and preferred values

Technology Audit allows values of ratings and characteristics to be selected to suit customers, and so preferred values are therefore not mandatory. However, when there are no over-riding customer needs, it is recommended that the established preferred values for fibre-optic, connectors are utilised. These may be found in the following publications : EN 61300 series and EN 61753 series.

1.5 Definitions

Definitions relevant to this technology, in addition to those given in EN 100114-6, CECC 00 401, IEC 60050 and the relevant Generic / Sectional specifications, are given below :

• Terminated connector	Connector piece parts and cable assembled and prepared in order to have final connector functionality
• Connector kits	Adapter or Connector plug piece parts not already assembled with the cable
• Connector technology	Principle on which the connector design, methods or processes used during the connector manufacture, assembly or termination are based.

• Examples to distinguish " Design tools " and " Design technology "
Example 1: CAD, Value analysis, numerical simulation are design tools, they are not technologies. On the other hand, Optical alignment by " Cylindrical ferrule and elastic sleeve ", or low loss field termination by " choice of ferrule according to the fibre diameters ", or low loss factory termination by " active alignment " are all technologies. The link between their technological parameters and the connector performance can be described using design tools

Example 2: Crimping is a technology. The link between the crimping parameters and the connector performance can be described

2 Definition of the component technology

2.1 Scope

This document covers three types of products : the connector kit, the termination procedure including tools, and the terminated connector (see figure 1). A manufacturer, being audited for Technology, may manufacture one or several of these products.

Both resellers and manufacturers have responsibility for final product, but the difference is that a manufacturer is considered to have control of each of the main technical processes related to his product. Some of these main technical processes could be under the control of said manufacturer even if that process is subcontracted. Of course, a manufacturer can only be considered as such if at least some of these processes are done internally

2.1.1 Main technical processes

The main manufacturing processes are :
(1) Design and development
- of the connector
- of the cable termination

(2) Piece part manufacture
(3) Piece part assembling
(4) Termination tools
(5) Connector / cable termination
(6) Test and final inspection
(7) Packing and shipping

2.1.2 Connector kit

To claim to be a " connector kit manufacturer ", said manufacturer must have all the manufacturing process (1), (2), (3), (5), (6), (7) under his control, regardless of whether these processes are in-house or external,

2.1.3 Termination procedures and tools

A manufacturer of connector kits or of terminated connectors may propose termination tooling associated with his procedures to other manufacturers or users.
It should be noted that a manufacturer who controls the manufacturing processes (1)-(2)-(4)-(5)-(6)-(7) keeps responsibility for the procedure regardless of whether the design or the manufacture is in-house or external.
The quality of the manufacturing processes associated with the production of the termination tools is not covered by this document (example : polishing machine, fibre cleaver, oven, etc...).
However, the specifications of these products, the control of their characteristics as well as the termination procedure are included in the connector technology.

2.1.4 Terminated connector (patchcord, pigtail)

A manufacturer who controls the manufacturing processes (5)-(6)-(7) keeps responsibility for the final quality of the terminated connector regardless of whether the design of the termination instructions and the tools are in-house or external.

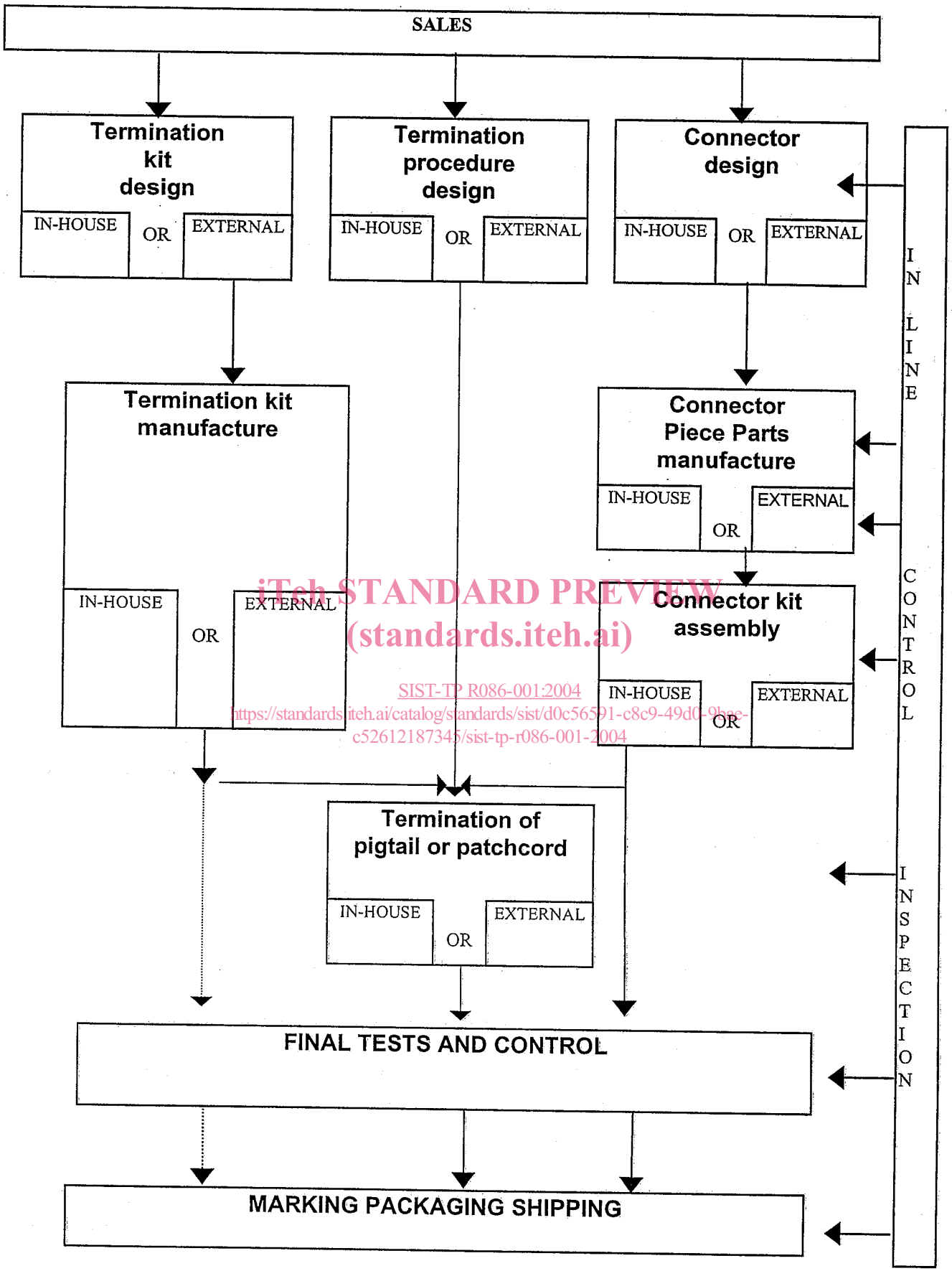

Figure 1 - Technologies for the three types of products

2.2 Description of activities and flowcharts

The manufacturer should identify all processes used in the technology application and include relevant flowcharts. Different processes and activities for different types of optical connectors covered by the same technology should be included.

Examples of processes:

. Design
. Piece part manufacturing
. Purchasing
. Subcontracting
. Piece part assembling
. Termination procedure
. Manufacturing of termination tools
. Connector termination
. Tests
. Packing and shipping

The flowchart in figure 1 shows an example where the manufacturer fully describes the processes, including the specific stages, with reference to the relevant internal documentation.

2.3 Technology abstract

A technology abstract should provide information about:

- the manufacturer
- the factory (ies)
- the families of products or components of the manufacturer
- technologies

The product should be described in the abstract in relation to each main technique i.e.

Main technique	Examples
optical alignment	cylinder/cylinder, cone/sphere, fibres in a V-groove, with lenses.
interface definition	fibre/fibre or fibre/lens, lens/lens, physical contact or not, refractive index adapter, polishing (plane, convex...) cleaved fibre, angle at the fibre end, antireflection coating
materials	ceramics (zirconia, alumina...) silicon, silica, metallic oxides for multi-layer deposits (antireflection)
dimensions of critical parts	precision ferrule (ID/OD...) V-groove angle, beam diameter (lenses)
mechanical coupling	screw-type, push-pull, bayonet-type
termination procedure	factory, field (time)
fibre preparation	polishing, cleaving, ferrule selection
fibre types	
cable types	
mounting	panel, PCB, backplane...
optical/mechanical/ environmental performances	