INTERNATIONAL STANDARD

15307

First edition 1997-12-01

Information technology — Data interchange on 12,7 mm 128-track magnetic tape cartridges — DLT 4 format

Technologies de l'information — Échange de données sur cartouches de bande magnétique de 12,7 mm, 128 pistes — Format DLT 4 (Standards.iten.ai)



Contents

	Page
Section 1 - General	1
1 Scope	1
2 Conformance	1
2.1 Magnetic tape cartridges2.2 Generating systems2.3 Receiving systems	1 1 1
3 Normative references	1
4 Definitions	1
4.1 Average Signal Amplitude 4.2 azimuth 4.3 back surface 4.4 Beginning-Of-Tape marker (BOT) 4.5 byte 4.6 cartridge 4.7 Cyclic Redundancy Check (CRC) character 4.8 Early Warning (EW) 4.9 Error-Detecting Code (EDC) 4.10 End-Of-Tape marker (EOT) 4.11 Entity 4.12 Error-Correcting Code (ECC) 4.13 flux transition position 4.14 flux transition spacing 4.15 Logical Block 4.16 logical track 4.17 magnetic tape 4.18 Master Standard Reference Tape 4.19 object 4.20 page 4.21 physical block 4.22 physical recording density 4.23 physical track 4.24 Record	1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
4.25 Reference Edge	3
4.26 Reference Field4.27 Secondary Standard Reference Tape	3
4.27 Secondary Standard Reference Tape 4.28 Standard Reference Amplitude (SRA)	3
4.29 Standard Reference Current	3
4.30 Test Recording Current	3
4.31 Typical Field	3

©ISO/IEC 1997

All rights reserved. Unless otherwise specified no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher ISO/IEC Copyright Office · Case Postale 56 · CH-1211 Genève 20 · Switzerland Printed in Switzerland

5 Conventions and notations	3
5.1 Representation of numbers	3
5.2 Dimensions 5.3 Names	3
5.4 Acronyms	3
6 Environment and safety	4
6.1 Cartridge and tape testing environment	4
6.2 Cartridge operating environment	4
6.3 Cartridge storage environment6.4 Safety	4
6.4.1 Safeness	4
6.4.2 Flammability	4
6.5 Transportation	5
Section 2 - Requirements for the unrecorded tape	5
7 Mechanical and electrical requirements	5
7.1 Material	5
7.2 Tape length 7.3 Width	5 5
7.4 Total thickness	5
7.5 Discontinuity iTeh STANDARD PREVIEW	5 5
7.6 Longitudinal curvature 7.6 Longitudinal curvature (standards.iteh.ai)	
7.6.1 Requirement 7.6.2 Procedure	5 5
ISO/IEC 15307:1997	5
7.7 Out-of-Plane distortions https://standards.iteh.ai/catalog/standards/sist/33ccf726-6bde-4041-9448-7.8 Cupping 55292111928b/iso-jec-15307-1997	5
7.8 Cupping 55292111928b/iso-iec-15307-1997 7.9 Roughness of the coating surfaces	5
7.9.1 Roughness of the back coating surface	5
7.9.2 Roughness of the magnetic coating surface	6
7.10 Coating adhesion	6
7.11 Layer-to-layer adhesion	6
7.11.1 Requirements 7.11.2 Procedure	6
7.12 Modulus of elasticity	7
7.12.1 Requirement	7
7.12.2 Procedure	7
7.13 Flexural rigidity	7
7.13.1 Requirement	7
7.13.2 Procedure	8
7.14 Tensile yield force	8
7.14.1 Procedure	8
7.15 Electrical resistance	8
7.15.1 Requirement 7.15.2 Procedure	8 8
7.16 Inhibitor tape7.17 Abrasivity	9 9

7.17.1 Requirement 7.17.2 Procedure	
7.18 Light transmittance of the7.19 Coefficient of dynamic fri	
	rement of the friction between the magnetic surface and the back surface are ment of the friction between the magnetic surface or the back surface and calcium
8 Magnetic recording character	istics
8.1 Typical Field8.2 Signal amplitude8.3 Resolution8.4 Overwrite	
8.4.1 Requirement	
8.5 Peak shift	
8.5.1 Requirement 8.5.2 Procedure	
9 Tape quality	
9.1 Missing pulses	iTeh STANDARD PREVIEW
9.1.1 Requirement	(standards.iteh.ai)
9.2 Missing pulse zone	(Standards.iten.ar)
9.2.1 Requirement	<u>ISO/IEC 15307:1997</u>
9.3 Tape durability	https://standards.iteh.ai/catalog/standards/sist/33ccf726-6bde-4041-9448- 55292111928b/iso-iec-15307-1997
Section 3 - Mechanical specifi 10 General	
10.1 Bottom side and right side	
10.2 Back side and left side	
10.3 Tape reel10.4 Tape leader	
10.5 Front side	
10.6 Operation of the cartridge	
10.7 Tape winding10.8 Moment of inertia	
10.9 Material	
Section 4 - Requirements for a	an interchanged tape
11 Method of recording	
11.1 Physical recording density11.2 Channel bit cell length	
11.2.1 Average Channel bit cell 11.2.2 Long-term average Chan 11.2.3 Short-term average Chan	nel bit cell length
11.3 Flux transition spacing 11.4 Read signal amplitude 11.5 Azimuth 11.6 Channel skew	
12 Tape format	

12.1 Reference Edge 12.2 Direction of recording 12.3 Tape layout 12.4 Calibration and Directory Area	28 28 28 28
12.4.1 Scratch Area 12.4.2 Guard Area G1 12.4.3 Calibration Tracks Area 12.4.4 Guard Area G2 12.4.5 Directory Area 12.4.6 Guard Area G3	29 29 29 30 30 30
12.5 Data Area 12.5.1 Physical tracks 12.5.2 Width of the physical tracks 12.5.3 Logical tracks 12.5.4 Locations of the physical tracks 12.5.5 Layout of tracks in the Data Area 13 Data format	30 31 31 31 31 32 32
13.1 Data Bytes 13.2 Logical Blocks 13.3 Data Blocks 13.4 Types of Logical Blocks iTeh STANDARD PREVIEW 13.5 Entities 13.6 Logical Block format (standards.iteh.ai)	33 33 33 33 33
13.6.1 Preamble 13.6.2 Sync 13.6.2 Sync 13.6.3 Data Field https://standards.iteh.ai/catalog/standards/sist/33ccf726-6bde-4041-9448- 13.6.4 EDC 55292111928b/iso-iec-15307-1997 13.6.5 Control Field 1 (CF1) 13.6.6 Control Field 2 (CF2) 13.6.7 CRC 13.6.8 Postamble 14 Use of Logical Blocks 14.1 Data Blocks 14.2 Filler Blocks 14.3 End of Track Blocks (EOTR) 14.4 End of Data Blocks (EOD) 14.5 ECC Blocks	344 344 364 366 377 388 388 388 389 399 399
15 Format of Entities	39
16 Error handling	39
Annexes A - Measurement of light transmittance	40
B - Generation of the Data Block CRCs	43
C - ECC generation	44
D - Generation of page CRCs	47
E - Format of MAP entries	48
F - Format of Control Field 1	49
G - Format of Control Field 2	50
H - Recommendations for transportation	51

ISO/IEC 15307:1997(E) ©ISO/IEC

J - Inhibitor tape	52
K - Recommendations on tape durability	53
L - Handling guidelines	54

iTeh STANDARD PREVIEW (standards.iteh.ai)

©ISO/IEC 15307:1997(E)

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

International Standard ISO/IEC 15307 was prepared by ECMA (as ECMA-231) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC. **TECHNOLOGY**

Annexes A to G form an integral part of this International Standard, Annexes H to L are for information only. (Standards.iten.al)

Introduction

This International Standard constitutes a further development of the family of DLT-formatted magnetic tape cartridges. It allows for a capacity of 20 Gbytes of uncompressed data, or, typically, of 40 Gbytes of compressed user data.

iTeh STANDARD PREVIEW (standards.iteh.ai)

Information technology — Data interchange on 12,7 mm 128-track magnetic tape cartridges — DLT 4 format

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of a 12,7 mm wide, 128-track magnetic tape cartridge, to enable interchangeability of such cartridges. It also specifies the quality of the recorded signals, a format - called Digital Linear Tape 4 (DLT 4) - and a recording method. Together with a labelling standard, for instance ISO 1001 for Magnetic Tape Labelling, it allows full data interchange by means of such magnetic tape cartridges.

2 Conformance

2.1 Magnetic tape cartridges

A magnetic tape cartridge shall be in conformance with this International Standard if it satisfies all mandatory requirements of this International Standard. The tape requirements shall be satisfied throughout the extent of the tape.

2.2 Generating systems

A system generating a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if all the recordings that it makes on a tape according to 2.1 meet the mandatory requirements of this International Standard.

2.3 **Receiving systems**

A system receiving a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if it is able to handle any recording made on a tape according to 2.1.

3 Normative references

ISO/IEC 15307:1997

The following standards contain provisions which through reference in this text (constitute provisions of this International Standard. At the time of publication, the editions indicated were valid Albstandards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1001:1986, Information processing — File structure and labelling of magnetic tapes for information interchange.

ISO 1302:1992, Technical drawings — Method of indicating surface texture.

4 **Definitions**

For the purposes of this International Standard, the following definitions apply.

Average Signal Amplitude

The average peak-to-peak value of the output signal from the read head at the physical recording density of 2 142 fromm measured over a minimum length of track of 25,4 mm, exclusive of missing pulses.

The angular deviation, in minutes of arc, of the mean flux transition line of the recording made on a track from the line normal to the Reference Edge.

4.3 back surface

The surface of the tape opposite the magnetic coating which is used to record data.

4.4 **Beginning-Of-Tape marker (BOT)**

A hole punched on the centreline of the tape towards the end nearest to the leader.

4.5 byte

An ordered set of bits acted upon as a unit.

Note - In this International Standard, all bytes are 8-bit bytes.

ISO/IEC 15307:1997 (E) ©ISO/IEC

4.6 cartridge

A case containing a single supply reel of 12,7 mm wide magnetic tape with a leader attached at the outer end.

4.7 Cyclic Redundancy Check (CRC) character

A 64-bit character, generated by a mathematical computation, used for error detection.

4.8 Early Warning (EW)

A signal generated by the drive indicating the approaching end of the recording area.

4.9 Error-Detecting Code (EDC)

A mathematical computation yielding check bytes used for error detection.

4.10 End-Of-Tape marker (EOT)

A hole punched on the centreline of the tape towards the end farthest from the leader.

4.11 Entity

A group of ten Logical Blocks treated as a logical unit and recorded on a logical track.

4.12 Error-Correcting Code (ECC)

A mathematical computation yielding check bytes used for the correction of errors detected by the CRC and the EDC.

4.13 flux transition position

The point which exhibits the maximum free-space flux density normal to the tape surface.

4.14 flux transition spacing iTeh STANDARD PREVIEW

The distance on the magnetic tape between successive flux transitions. iteh.ai)

4.15 Logical Block

The two physical blocks simultaneously written on, or read from, the two physical tracks of a logical track.

https://standards.iteh.ai/catalog/standards/sist/33ccf726-6bde-4041-9448

4.16 logical track

55292111928b/iso-iec-15307-1997

A pair of physical tracks that are written or read simultaneously.

4.17 magnetic tape

A tape that accepts and retains magnetic signals intended for input, output, and storage purposes on computers and associated equipment.

4.18 Master Standard Reference Tape

A tape selected as the standard for reference field, signal amplitude, resolution, peakshift, and overwrite characteristics.

Note - The Master Standard Reference Tape has been established by the Quantum Corporation.

4.19 object

A Record or a Tape Mark Block.

4.20 page

A logical division of a physical block.

4.21 physical block

A set of contiguous bytes recorded on a physical track and considered as a unit.

4.22 physical recording density

The number of recorded flux transitions per unit length of track, expressed in flux transitions per millimetre (ftpmm).

4.23 physical track

A longitudinal area on the tape along which a series of magnetic signals can be recorded.

4.24 Record

A collection of User Bytes, the number of which is determined by the host.

4.25 Reference Edge

The bottom edge of the tape when viewing the magnetic coating of the tape with the BOT to the left and the EOT to the right of the observer.

4.26 Reference Field

The Typical Field of the Master Standard Reference Tape.

4.27 Secondary Standard Reference Tape

A tape the characteristics of which are known and stated in relation to those of the Master Standard Reference Tape.

Note - Secondary Standard Reference Tapes can be ordered under Reference "SSRT/DLT4" until the year 2005 from Quantum Corporation, 333 South Street, Shrewsbury, Mass. 01545-4195, USA.

It is intended that these be used for calibrating tertiary reference tapes for routine calibration.

4.28 Standard Reference Amplitude (SRA)

The Average Signal Amplitude from the Master Standard Reference Tape when it is recorded with the Test Recording Current at 2 142 ftpmm.

4.29 Standard Reference Current

The current that produces the Reference Field.

4.30 Test Recording Current

The current that is 1,1 times the Standard Reference Current.

4.31 Typical Field

iTeh STANDARD PREVIEW

In the plot of the Average Signal Amplitude against the recording field at the physical recording density of 2 142 ftpmm, the minimum field that causes an Average Signal Amplitude equal to 95 % of the maximum Average Signal Amplitude.

ISO/IEC 15307:1997

5 Conventions and notations iteh.ai/catalog/standards/sist/33ccf726-6bde-4041-9448-

5.1 Representation of numbers 55292111928b/iso-iec-15307-1997

The following conventions and notations apply in this Standard, unless otherwise stated.

- A measured value is rounded off to the least significant digit of the corresponding specified value. It implies that a specified value of 1,26 with a positive tolerance +0,01, and a negative tolerance -0,02 allows a range of measured values from 1,235 to 1,275.
- In each block and in each field the bytes shall be arranged with Byte 1, the least significant, first. Within each byte the bits shall be arranged with Bit 1, the least significant, first and Bit 8, the most significant bit, last. This order applies to the data, and to the input and output of the error-detecting and error-correcting codes, and to the cyclic redundancy characters.
- Letters and digits in parentheses represent numbers in hexadecimal notation.
- The setting of bits is denoted by ZERO or ONE.
- Numbers in binary notation and bit patterns are represented by strings of 0 and 1 shown with the most significant bit to the left.

5.2 Dimensions

Unless otherwise stated, all dimensions in the format figures are in millimetres with a tolerance of \pm 50 mm.

5.3 Names

The names of basic elements, e.g. specific fields, are written with a capital initial letter.

5.4 Acronyms

BOT	Beginning of Tape	
CF1	Control Field 1	
CF2	Control Field 2	
CRC	Cyclic Redundancy Check (c	

CRC Cyclic Redundancy Check (character)

ECC Error-Correcting Code

EDC Error-Detecting Code

EOD End of Data
EOT End of Tape
EOTR End of Track
EW Early Warning

FCT1 Forward Calibration Track 1
FCT2 Forward Calibration Track 2
RCT1 Reverse Calibration Track 1
RCT2 Reverse Calibration Track 2
2,7 RLL Run Length Limited (method)
SRA Standard Reference Amplitude

6 Environment and safety

Unless otherwise stated, the conditions specified below refer to the ambient conditions in the test or computer room and not to those within the tape drive.

6.1 Cartridge and tape testing environment.

Unless otherwise stated, tests and measurements made on the cartridge and tape to check the requirements of this International Standard shall be carried out under the following conditions:

- temperature: $23 \text{ °C} \pm 2 \text{ °C}$ - relative humidity: 40 % to 60 %

- conditioning before testing: 24 h STANDARD PREVIEW

6.2 Cartridge operating environment

Cartridges used for data interchange shall be capable of operating under the following conditions:

- temperature: 10 °C to 40 °C ISO/IEC 15307:1997

- relative humidity: 20 % to 80 % https://standards.iten.ai/catalog/standards/sist/33ccf726-6bde-4041-9448-

Note - Localized tape temperatures in excess of 49 °C may cause tape damage icc-15307-1997

If during storage and/or transportation a cartridge has been exposed to conditions outside the above values, it shall be conditioned before use by exposure to the operating environment for a time equal to, or greater than, the time away from the operating environment up to a maximum of 2 h. There shall be no deposit of moisture on or in the cartridge.

6.3 Cartridge storage environment

Cartridges shall be stored under the following conditions:

temperature: 16 °C to 32 °C
relative humidity: 20 % to 80 %
wet bulb temperature: 26 °C max.

Tapes intended for archiving data for one year or more shall be stored under the following conditions:

temperature: 18 °C to 26 °C
relative humidity: 20 % to 60 %

The stray magnetic field at any point on the tape shall not exceed 4000 A/m. There shall be no deposit of moisture on or in the cartridge.

6.4 Safety

6.4.1 Safeness

The cartridge and its components shall not constitute any safety or health hazard when used in the intended manner, or through any foreseeable misuse in an information processing system.

6.4.2 Flammability

The cartridge and its components shall be made from materials which, if ignited from a match flame, and when so ignited do not continue to burn in a still carbon dioxide atmosphere.

6.5 **Transportation**

This International Standard does not specify parameters for the environment in which cartridges should be transported. Annex H gives some recommendations for transportation.

Section 2 - Requirements for the unrecorded tape

Mechanical and electrical requirements 7

7.1 Material

The tape shall consist of a base material (oriented polyethylene terephthalate film or its equivalent) coated on one surface with a strong yet flexible layer of ferromagnetic material dispersed in a suitable binder. The other surface of the tape shall be coated with a non-ferromagnetic conductive coating.

7.2 Tape length

The length of the tape from the leadersplice to the hub shall be 557 m \pm 5 m.

7.3 Width

The width of the tape shall be $12,649 \text{ mm} \pm 0,010 \text{ mm}$.

The width shall be measured across the tape from edge to edge when the tape is under a tension of less than 0,28 N.

7.4 Total thickness

The total thickness of the tape at any point shall be between 8,3 µm and 9,3 µm.

Discontinuity

7.5 Discontinuity iTeh STANDARD PREVIEW

There shall be no discontinuities in the tape between the BOT and EOT such as those produced by tape splicing or (standards.iteh.ai) perforations.

7.6 Longitudinal curvature

The longitudinal curvature is measured as the departure of the Reference Edge of the tape from a straight line along the longitudinal dimension of the tape in the plane of the tape surface.

Any deviation of the Reference Edge from a straight line shall be continuous and shall not exceed 0,076 mm within any 229 mm length of tape.

7.6.2 **Procedure**

Measure at a tension of 1.39 N \pm 0.28 N in a test fixture equipped with two guides spaced at 229 mm. The two guides shall be spring-loaded to position the Reference Edge of the tape against two edge control surfaces. Measure the maximum deviation of the Reference Edge of the tape from the line drawn between the two control surfaces.

7.7 **Out-of-Plane distortions**

All visual evidence of out-of-plane distortion shall be removed when the tape is subjected to a uniform tension of 0,6 N. Outof-plane distortions are local deformations which cause portions of the tape to deviate from the plane of the surface of the tape. Out-of-plane distortions are most readily observed when the tape is lying on a flat surface under no tension.

7.8 Cupping

The departure across the width of the tape from a flat surface shall not exceed 2,54 mm.

Cut a 1,0 m ± 0,1 m length of tape. Condition it for a minimum of 3 hours in the test environment by hanging it so that both surfaces are freely exposed to the test environment. From the centre portion of the conditioned tape cut a test piece of approximately 25 mm length. Stand the test piece on its end in a cylinder which is at least 25 mm high with an inside diameter of 13,0 mm ± 0,2 mm. With the cylinder standing on an optical comparator measure the cupping by aligning the edges of the test piece to the reticle and determining the distance from the aligned edges to the corresponding surface of the test piece at its centre.

7.9 Roughness of the coating surfaces

Roughness of the back coating surface

The back coating surface shall have an arithmetic average roughness R_a between 0,003 μm and 0,018 μm (ISO 1302:N 2). This measurement shall be made using a contacting stylus of radius 12,5 µm with a 20 mg load, and a 254 µm cut-off range.

ISO/IEC 15307:1997 (E) ©ISO/IEC

7.9.2 Roughness of the magnetic coating surface

The magnetic coating surface shall have an arithmetic average roughness R_a between 0,003 μ m and 0,008 μ m (ISO 1302: N 3). For this measurement, the contacting stylus radius shall be 12,5 μ m with a 20 mg load, and a 254 μ m cut-off range.

7.10 Coating adhesion

The force required to peel any part of the coating from the tape base material shall not be less than 0,4 N.

Procedure

- i. Take a test piece of the tape approximately 380 mm long and scribe a line through the recording coating across the width of the tape 125 mm from one end.
- ii. Using a double-sided pressure sensitive tape, attach the full width of the test piece to a smooth metal plate, with the magnetic coating (recording surface) facing the plate, as shown in figure 1.
- iii. Fold the test piece over 180°, attach the metal plate and the free end of the test piece to the jaws of a universal testing machine and set the speed of the jaw separation to 254 mm per min.
- iv. Note the force at which any part of the coating first separates from the base material. If this is less than 0,2 N, the tape has failed the test. If the test piece peels away from the double-sided pressure sensitive tape before the force exceeds 0,2 N, an alternative type of double-sided pressure sensitive tape shall be used.
- v. Repeat i) to iv) for the back coating.

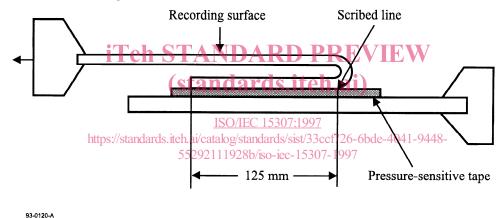


Figure 1 - Measurement of the coating adhesion

7.11 Layer-to-layer adhesion

Layer-to-layer adhesion refers to the tendency of a layer, when held in close proximity to the adjacent layer, to bond itself to an adjacent layer so that free and smooth separation of the layers is difficult.

7.11.1 Requirements

There shall be no evidence of delamination or other damage to the coatings.

7.11.2 Procedure

- i. Fasten one end of a 914 mm length of tape, magnetic coating inwards, to a horizontally mounted stainless steel cylinder with a low cold-flow adhesive material.
- ii. The dimensions of the cylinder shall be:
 - diameter: 12,7 mm - length: 102 mm
- iii. Attach a mass of 1 000 g to the opposite end of the tape.
- iv. Attach, 25,4 mm above the mass, a narrow strip of double-sided adhesive tape to the magnetic coating.
- v. Slowly rotate the cylinder, so that the tape winds uniformly around it into a compact and even roll. The double-sided tape secures the end and prevents unwinding when the mass is removed.
- vi. The cylinder with the tape shall then be exposed to the following temperature and humidity cycle:

Time	Temperature	RH
16 h to 18 h	54 °C	85 %
4 h	54 °C	10 % or less
1 h to 2 h	21 °C	45 %

vii. Open the end of the roll and remove the double-sided adhesive tape.

viii.Release the free end of the tape.

- ix. The outer one or two wraps shall spring loose without adhesion.
- x. Hold the free end of the tape and allow the cylinder to fall, thereby unwinding the tape.
- xi. The tape shall show no coating delamination, except for the 51 mm of tape nearest to the cylinder.

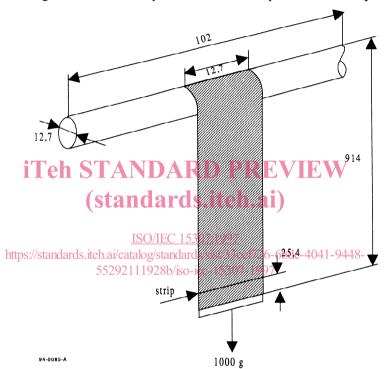


Figure 2 - Measurement of layer-to-layer adhesion

7.12 Modulus of elasticity

The modulus of elasticity (Young's modulus) is the ratio of stress to strain in the longitudinal direction.

7.12.1 Requirement

The modulus of elasticity shall be between 4 900 N/mm² and 11 700 N/mm².

7.12.2 Procedure

Clamp a test piece of tape at least 178 mm in length with an initial 102 mm separation between the jaws of a universal testing machine with a nominal crosshead speed of 5 mm per minute. Calculate the modulus using the chord of the curve between the force at 0 % and 1 % elongation.

7.13 Flexural rigidity

Flexural rigidity is the ability of the tape to resist bending in the longitudinal direction.

7.13.1 Requirement

The flexural rigidity of the tape in the longitudinal direction shall be between $2 \times 10^{-7} \, \text{N} \cdot \text{mm}$ and $8 \times 10^{-17} \, \text{N} \cdot \text{mm}$.