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Information processing — Interchange practices and test methods for unrecorded instrumentation magnetic tape

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Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. 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.

The main task of a technical committee is to prepare International Standards but in exceptional circumstances, the publication of a technical report of one of the following types may be proposed:

— type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development requiring wider exposure;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC/TR 6371, which is a technical report of type 2, was prepared by ISO/IEC JTC 1, *Information technology.*

Introduction

Draft International Standard ISO/DIS 6371 was distributed to ISO member bodies in August 1982 and was approved for issue as an International Standard.

During the preparation of the final text, however, it was found necessary to replace the existing test for surface electrical resistance and, moreover, amendments to the text were necessitated to ensure alignment with related International Standards which at that time were in the course of preparation.

Bearing in mind the need for this document, but also the amount of time that has elapsed since it was approved and the extent to which the original text has been modified, it is considered preferable to make the document available at the present time in the form of a type 2 ISO/IEC Technical Report. It is expected that within two to three years, it will be further revised with a view to its issue as an International Standard.

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Information processing — Interchange practices and test methods for unrecorded instrumentation magnetic tape

1 Scope

1.1 General

This Technical Report specifies the interchange requirements for longitudinally-orientated, unrecorded magnetic tape wound on reels or hubs designed for use in instrumentation-recording applications. Tapes for interchange shall be recorded and played back on equipment conforming to ISO 6068 and to the applicable instructions furnished by the equipment manufacturer.

1.2 Archival tapes

It is recognized that archival interchange tapes, or those produced by systems in use prior to the publication of this Technical Report, may not meet the stringent requirements that follow. Users requiring exchange of standard tapes should verify that the planned interchange of data will be accomplished according to the following standards for tapes, reels, and recorder/reproducers: ISO 1858, ISO 1860, ISO 3802, ISO 6068, and this Technical Report.

2 Normative references

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

ISO 1184 : 1983, *Plastics — Determination of tensile properties of films.*

ISO 1858 : 1977, *Information processing — General purpose hubs and reels, with* 76 mm (3 in) *centrehole, for magnetic tape used in interchange instrumentation applications.*

ISO 1860 : 1986, *Information processing — Precision reels for magnetic tape used for interchange instrumentation applications.*

ISO 3802 : 1980, *Information processing — General purpose reels with* 8 mm (5/16 in) *centre hole for magnetic tape for interchange instrumentation applications.*

ISO 6068 : 1985, *Information processing — Recording characteristics of instrumentation magnetic tape (including telemetry systems) — Interchange requirements.*

In case of conflicts between reference documents and this Technical Report, the Technical Report should prevail.

3 Classification of tapes

3.1 Tape type designator

Tape types covered by this Technical Report may be designated in the following form:

TIT-E1-HT1-127(500)-760(2500)-G1

TIT	**E**	**1**
Basic indicator (see 3.2)	Magnetic coating characteristic indicator (see 3.3)	Performance class indicator (E magnetic coating only) (see 3.4)

HT 1	**127(500)**	**760(2500)**	**G1**
Base material and thickness indicator (see 3.5)	Width indicator (see 3.6)	Length indicator (see 3.7)	Reel indicator (see 3.8)

3.2 Basic indicator

The basic indicator defines the general application for a particular class of tape as specified herein. The basic indicator is "TIT" for tape, instrumentation type.

3.3 Magnetic coating characteristics indicator

The magnetic coating characteristics indicator defines a coating in terms of its short wavelength recording capabilities:

a) indicator "B" (intermediate resolution) denotes tape intended for use on low-band and intermediate-band recorder/reproducers [having a recorded wavelength not less than 6,1 µm (240 µin)];

b) indicator "E" (high resolution) denotes tape intended for use on wideband recorder/reproducers [having a recorded wavelength down to 1,5 µm (60 µin)].

See ISO 6068 for further information on the types of recorder/reproducers.

3.4 High resolution performance class indicator

High resolution tape (see 3.3) is subclassified as either E1 or E2 depending on its output level uniformity (see 8.5 and 8.6) and dropout performance (see 8.7).

3.5 Base material and thickness indicator

The base material and thickness indicator combines two letters and a number as an indicator. The number indicates whether the back side of the base material has been treated; untreated tape is defined by the number "1" and treated tape is defined by the number "2". The first letter identifies the type of base material, and the second letter indicates the nominal thickness of the base material. The base material is indicated by the letter "H" for polyethylene terephthalate (polyester). Base material of nominal thickness 38,1 µm (0,001 5 in) is defined by the letter "R" and base material of nominal thickness 25,4 µm (0,001 in) is defined by the letter "T".

3.6 Width indicator

The width indicator is the nominal width of the tape in tenths of a millimetre followed in parentheses by its equivalent in thousandths of an inch. For example, tape with a nominal width of 12,7 mm (0,5 in) has the width indicator 127 (500) (see 6.1).

3.7 Length indicator

The length indicator is the nominal length, in metres (feet), of a tape wound on a reel (see 6.3).

3.8 Reel indicator

This symbol identifies the type of reel on which the tape is wound, as follows

Table 1 — Reel indicator

Designator	Definition
G1	General purpose reels conforming to ISO 1858
G2	General purpose reels conforming to ISO 3802
P	Precision reels conforming to ISO 1860

4 Sampling

Sampling schemes and AQL (acceptable quality level) criteria for

a) dimensional requirements;

b) physical requirements;

c) performance requirements;

shall be separately agreed between interchange parties. Each sample tape shall be tested against the above requirements in order to determine compliance or non-compliance of the sampled batch.

5 General requirements

5.1 Materials

The tape shall consist of a layer of ferromagnetic material on a suitable continuous and splice-free, flexible base material and shall have the physical, magnetic and other characteristics as specified herein.

5.2 Toxic compounds

Tape or reel components which may cause bodily harm by contact, inhalation or ingestion shall not be used.

5.3 Flammable materials

Flammable materials which will ignite from a match flame, and when so ignited continue to burn in a still carbon dioxide atmosphere, shall not be part of the magnetic tape.

5.4 Tape reels

Tape reels shall conform to the requirements of ISO 1860 or ISO 1858 or ISO 3802.

5.5 Tape wind

The tape shall be wound with the magnetic coated surface facing the surface of the hub.

5.6 Packaging

It is recommended that each reel of magnetic tape should be enclosed, as a minimum, by an individually sealed polyethylene wrapper packaged in an appropriate container which provides support of the enclosed reel at the hub.

5.7 Environmental conditions

NOTE — Recent research results as reported in annex D suggest that certain points of the following specification may result in an undesirable operating condition. A future revision in this area may be issued.

5.7.1 Standard operating conditions

Temperature range: (see note 1)	10 °C to 40 °C (50 °F to 104 °F)
Relative humidity range: (see note 2)	40 % to 60 %
Barometric pressure:	50 kPa to 106 kPa

5.7.2 Extended operating conditions (see note 3)

Temperature range: (see note 1)	0 °C to 55 °C (32 °F to 131 °F)
Relative humidity range: (see notes 2 and 4)	25 % to 95 %
Barometric pressure:	5 kPa to 106 kPa

5.7.3 Severe operating conditions (see note 4)

Annex C provides guidelines for instrumentation tape use in severe conditions, for example, airborne recording.

5.7.4 Standard shipping and short-term storage

Temperature range:	10 °C to 40 °C (59 °F to 77 °F)
Relative humidity range: (see note 3)	10 % to 40 %
Barometric pressure:	5 kPa to 106 kPa

5.7.5 Extended shipping and short-term storage (see note 3)

Temperature range:	− 60 °C to + 60 °C (− 76 °F + 140 °F)
Relative humidity range: (see notes 2 and 4)	0 % to 95 %
Barometric pressure:	5 kPa to 106 kPa

5.7.6 Recommended long-term storage

Temperature range:	15 °C to 25 °C (59 °F to 77 °F)
Relative humidity range: (see note 2)	10 % to 20 %
Barometric pressure:	50 kPa to 106 kPa

NOTES

1 These temperatures apply to the air in the immediate vicinity of the tape within the tape transport.

2 Relative humidity values shall be maintained under non-condensing conditions.

3 Extended environments may require component qualification for tape and transport.

4 The deterioration of tape under adverse conditions is progressive (see annex D for further information). Tapes subjected to such conditions for long periods may need additional restrictions (see recommended long-term storage conditions in 5.7.6).

5.8 Test environment

5.8.1 Preliminary conditioning

Individual test clauses may require preliminary conditioning of each reel of tape prior to testing to relieve stresses and establish uniformity. Reels of tape shall be wound and rewound with a tensile force of 0,131 N/mm ± 0,033 N/mm (12 ozf/in ± 3 ozf/in) tape width. The tape shall then be conditioned at 23 °C ± 3 °C (73 °F ± 5 °F), 40 % RH to 60 % RH for a minimum of 24 h, and stored under the same environmental conditions until required for testing.

5.8.2 Standard test environment

During testing, unless otherwise specified, the testing environment shall be

Temperature:	23 °C ± 3 °C (73 °F ± 5 °F)
Relative humidity:	45 % to 55 %
Barometric pressure:	80 kPa to 106 kPa

6 Dimensional requirements

6.1 Tape widths

The standard tape widths shall be as listed in table 2.

Table 2 — Standard tape widths

Standard tape widths	
mm	in
$6{,}30\ ^{0}_{-0{,}06}$	$0{,}248\ ^{0}_{-0{,}002\,5}$
$12{,}70\ ^{0}_{-0{,}10}$	$0{,}500\ ^{0}_{-0{,}004}$
$25{,}40\ ^{0}_{-0{,}10}$	$1{,}000\ ^{0}_{-0{,}004}$
$50{,}80\ ^{0}_{-0{,}10}$	$2{,}000\ ^{0}_{-0{,}004}$

This Technical Report does not at present define performance requirements (see clause 8) for tape widths of 6,30 mm (0,248 in) or 50,80 mm (2,000 in).

6.2 Thickness

Maximum total thickness is a function of standard reel dimensions, length, coating thickness and E value (see 6.4.1).

Table 3a) — Tape length by reel diameters — For reels with 76 mm (3 in) centre hole

(Reels to ISO 1860 or ISO 1858)

Nominal base thickness		Tape perf. class	Reel diameters																	
			203 mm (8 in)			266 mm (10,5 in)			318 mm (12,5 in)			356 mm (14 in)			381 mm (15 in)			406 mm (16 in)		
			Nominal length*)	Minimum actual length**)		Nominal length*)	Minimum actual length**)		Nominal length*)	Minimum actual length**)		Nominal length*)	Minimum actual length**)		Nominal length*)	Minimum actual length**)		Nominal length*)	Minimum actual length**)	
mm	in		m	m	ft	m	m	ft	m	m	ft	m	m	ft	m	m	ft	m	m	ft
0,038	0,001 5	B	365	366	1 200	760	768	2 520	+)	+)	+)	1 520	1 531	5 025	—	—	—	—	—	—
0,025	0,001 0	B	525	527	1 730	1 100	1 105	3 625	+)	+)	+)	2 200	2 204	7 230	—	—	—	—	—	—
0,025	0,001 0	E1 or E2	670	673	2 210	1 400	1 410	4 625	2 190	2 204	7 230	2 800	2 815	9 235	3 290	3 303	10 795	3 800	3 792	12 440

*) These nominal lengths are metric conversions, rounded for convenience of description, of original values in feet.

**) These lengths apply for an E value as specified in 6.4.2.

+) B1/B2 tape not normally available on 318 mm reel.

Table 3b) — Tape length by reel diameters for reels with 8 mm (0,312 5 in) centre hole

(Reels to ISO 3802)

Nominal base thickness		Type perf. class	Reel diameters									
			102 mm (4 in)				127 mm (5 in)		146 mm (5,75 in)		178 mm (7 in)	
			Metal		Plastic							
			Tape lengths									
			min.		min.		min.		min.		min.	
mm	in		m	ft	m	ft	m	ft	m	ft	m	ft
0,038	0,001 5	B	100	330	112	365	180	590	242	795	371	1 220
0,025	0,001 0	B	146	480	161	530	256	840	347	1 140	535	1 755
0,025	0,001 0	E1 or E2	186	610	205	675	274	900	445	1 460	683	2 240

6.3 Length

Tape shall be supplied in the minimum lengths given in table 3.

6.4 *E* value

6.4.1 Definition

***E* value:** The radical distance by which the reel flanges extend beyond the outermost layer of tape wound on a reel.

6.4.2 Requirement

The minimum *E* value shall be 2,54 mm (0,100 in) for reels having a diameter up to and including 203 mm (8 in), and shall be 3,18 mm (0,125 in) for reels having a diameter greater than 203 mm (8 in).

6.4.3 Test condition

The tape pack shall be wound on a reel of a type listed in table 1 under a tensile force of 0,131 N/mm ± 0,033 N/mm (12 ozf/in ± 3 ozf/in) of tape width.

NOTE — It is current practice in some countries to use a standard tensile force of 0,175 N/mm (16 ozf/in) tape width. Interchange parties should exercise caution when defining tests involving this parameter.

7 Physical requirements

7.1 Yield strength

7.1.1 Requirement

The tensile force at break and/or the 1 % offset yield point (defined in ISO 1184) shall not be less than the value specified in table 4.

Table 4 — Physical requirements

Characteristics	Base material and thickness indicator (see 4.5)		Units
	HR	HT	
Yield strength or breaking force	3,08 (17,6)	2,10 (12,0)	N/mm (lbf/in) tape width
Elongation under stress	0,30	0,50	%

7.1.2 Test procedure

The sample tape shall undergo the preliminary conditioning specified in 5.8. A strip of tape, minimum length 200 mm (8 in), shall be clamped in the grips set for an initial separation of 100 mm (4 in). The test specimen shall be clamped in the testing machine taking care to align the long axis of the specimen with an imaginary line joining the points of attachment of the grips to the machine. The grips shall be tightened evenly and firmly to the degree necessary to prevent slipping of the specimen during the test. The rate of grip separation shall be 0,8 mm/s (2 in/min). Not less than five specimens of a particular type of tape shall be tested. A force-strain diagram shall be obtained. Means shall be provided for calibration of the strain axis. The force corresponding to 1 % offset yield shall equal or exceed the value listed in the table. For a more complete description of standard test procedures, see ISO 1184.

In the event that the breakage of a particular tape occurs prior to reaching the 1 % offset yield point, the load at break shall equal or exceed the value listed in table 4.

NOTE — ISO 1184 describes the determination of tensile properties of films and does not refer specifically to magnetic tape.

7.2 Elongation under stress

7.2.1 Definition

Elongation under stress is defined as the difference between an initially measured unstressed tape length and the final stressed tape length expressed as a percentage of the unstressed tape length.

7.2.2 Requirement

The elongation shall not exceed the value specified in table 4.

7.2.3 Test procedure

The sample tape shall undergo the preliminary conditioning specified in 5.8. Samples at least 600 mm (24 in) long shall be clamped so as to hang in the test area in a standard test environment, for at least 24 h under no externally applied stress before tests are begun. Before any weight is hung on the samples, a mark shall be made approximately 500 mm (20 in)

from the point of clamping to serve as a reference point for length measurement before and after stress. The distance between the mark and clamping point shall be measured accurately to the nearest 0,25 mm (0,01 in). A weight shall be attached which applies a tensile force of 0,5 N (2 ozf). The distance shall be taken as the base distance for calculation of residual elongation. When measurement of the base distance has been made, the test shall begin. A weight, which applies a tensile force of 1,75 N/mm (10 lbf/in) of tape width, shall be attached to the tape below the mark at zero time and allowed to hang undisturbed for 180 min ± 30 s, at which time the weight shall be removed from the tape. The tape shall be allowed to hang under its own weight for an additional 180 min ±30 s. The distance between the mark and the point of clamping shall then be measured to the nearest 0,25 mm (0,01 in) with an applied tensile force of 0,5 N (2 ozf). The difference between the base distance and the final distance shall be expressed as a percentage of the base distance to determine compliance with table 4.

7.3 Transverse curvature (cupping)

7.3.1 Definitions

7.3.1.1 transverse curvature (cupping): The angle formed by the conjunction of lines constructed perpendicular to the edges of the tape when viewed end on.

7.3.1.2 initial cupping: The transverse cupping measured prior to testing under humidifying or desiccating conditions.

7.3.1.3 differential cupping: The arithmetic difference between the transverse curvatures measured on the humidified tape and the desiccated tape.

7.3.2 Requirement

This test is not needed for standard interchange of polyester tapes. If needed by the user, the test procedure and recommanded performance levels appear in annex A.

7.4 Layer-to-layer adhesion and layer delamination

7.4.1 Definition

Layer-to-layer adhesion is defined as the tendency for one layer of tape to adhere to an adjacent layer of tape in the same pack.

7.4.2 Requirement

A sample of tape when conditioned according to the procedure described in 7.4.3, shall exhibit no sticking or layer-to-layer adhesion.

7.4.3 Test procedure

The sample tape shall undergo the preliminary conditioning specified in 5.8. Samples of 900 mm (36 in) in length shall be allowed to hang without bends or kinks in a standard test environment (see 5.8) for at least 24 h under no externally applied stress, before tests are begun.

The sample length shall be fastened at one end, magnetic side down, to a 12,7 mm (0,5 in) diameter hollow tube, approximately 100 mm (4 in) in length with a non-oozing adhesive material. The tube shall be made of a non-oxidizing metal such as brass or corrosion resisting steel and shall have a mass of not less than 15 g (0,5 oz) nor more than 30 g (1,0 oz). The tube shall be mounted in bearings so that it may be rotated freely around its central axis and easily removed from the bearings.

Weights shall be attached to the free end of the tape so as to apply a stress of 40 MPa (5 700 lbf/in^2). A small strip of double coated adhesive tape shall be affixed to the magnetic side of the tape about 25 mm (1 in) above the weight. The tube shall then be slowly and uniformly rotated so that the tape, held in tension by the weight, winds uniformly around the tube into a compact and even roll. The double-coated tape when wound into the test roll acts to secure the roll and prevent its unwinding when the weight is removed.

The tube supporting the rolled tape shall be removed from the winding set-up and subjected to a heat and humidity cycle of 16 h to 18 h at 55 °C ± 3 °C (130 °F ± 5 °F) and 80 % RH to 90 % RH, followed by 4 h at 55 °C ± 3 °C (130 °F ± 5 °F) dry heat (less than 5 % RH). During the humidification and dry heat phase, provision shall be made so that the air surrounding the tube is constantly circulated to assure uniformity of conditions throughout the test area. At the end of the dry heat cycle, the rod shall be removed from the conditioned area and allowed to come to equilibrium in a standard test environment (see 5.8).

To evaluate the tape for layer-to-layer adhesion, the end of the roll on the rod shall be carefully opened and the double-coated tape shall be removed. The rod shall then be held between the thumb and fingers and the untabbed tape shall be observed to note if the first two or three layers loosen up of their own accord; if this occurs, there is no adhesion and the tape has passed the test. If no loosening, or very little loosening of the outermost layer is observed, the free end of the tape shall be unwound slowly until 250 mm (10 in) has been unwound. The free end shall then be allowed to hang and the tape shall be observed to see if it will loosen by itself. If it will not unwind unaided, the tube with the tape hanging freely shall be slowly rotated in the direction of tape unwind. If the tape adheres to itself and refuses to begin to unwind after the rod has been rotated through one-fourth revolution or $\pi/2$ rad (90°), it shall be considered to have failed the test. After the rotation test has been made, the free end of the tape shall be held and the rod allowed to fall, thereby unwinding the tape. The unwound tape shall be checked for evidence of coating delamination and in this way the severity of adhesion is established. Any tape which will not self-unwind after rotating the rod through $\pi/2$ rad (90°) or which shows any delamination except in the 50 mm (2 in) nearest the rod shall be considered as having failed this test.

7.5 Longitudinal curvature

7.5.1 Definition

longitudinal curvature: The deviation of each tape edge from a straight line.

7.5.2 Requirement

The longitudinal curvature of a tape shall not exceed 3,8 mm when measured along a 1 m straight edge. (Alternatively, in inch dimensions, the curvature shall not exceed 0,125 in when measured along a 36 in straight edge.)

NOTE — The longitudinal curvature measurement has a resolution of about 0,4 mm (0,031 25 in).

Table 5 — Maximum moments of inertia for full reels

Nominal tape width	Nominal reel diameter											
	203 mm (8 in)		266 mm (10,5 in)		318 mm (12,5 in)		355 mm (14 in)		381 mm (15 in)		406 mm (16 in)	
	$g \cdot m^2$	$lb \cdot ft^2$	$g \cdot m^2$	$lb \cdot ft^2$	$g \cdot m^2$	$lb \cdot ft^2$	$g \cdot m^2$	$lb \cdot ft^2$	$g \cdot m^2$	$lb \cdot ft^2$	$g \cdot m^2$	$lb \cdot ft^2$
6,30 mm (0,25 in)	2,78	0,066	10,16	0,241	19,72	0,468	29,81	0,707	41,75	0,989	54,27	1,29
12,70 mm (0,50 in)	3,77	0,089	14,57	0,345	28,14	0,667	43,21	1,02	59,78	1,42	77,79	1,84
25,40 mm (1,00 in)	5,73	0,136	23,37	0,554	44,97	1,07	69,99	1,66	95,82	2,27	124,8	2,96
50,80 mm (2,00 in)	9,66	0,229	40,97	0,971	78,63	1,86	123,55	2,93	167,92	3,98	218,86	5,19

7.5.3 Test procedure

Longitudinal curvature shall be determined by constraining a sufficient length of tape to lie in a horizontal plane under a stress of about 0,3 MPa (40 lbf/in^2) and measuring the maximum deviation of either tape edge from a straight edge of the specified length. No special preparation of the tape sample is required.

7.6 Abrasivity

7.6.1 Definition

abrasivity: Tendency of the magnetic tape to abrade or wear a tape transport head.

7.6.2 Requirement

Under consideration.

7.6.3 Test procedure

Under consideration.

7.7 Moments of inertia of a full reel of tape

The maximum moments of inertia for full reels of tape are given in table 5.

8 Performance requirements

8.1 Definitions

8.1.1 reference tape: The reference tape is a special unrecorded length of tape used as a reference to establish operating bias current (see 8.1.3), standard record level (see 8.1.4), standard output level (see 8.1.5) and wavelength response (see 8.4) for the reference test recorder used in the tests described herein. The parameters of an operational system calibrated by means of the reference tape are: standard record level (see 8.1.4), standard output level (see 8.1.5), sensitivity (see 8.3), wavelength response (see 8.4), and harmonic distortion (see 8.8).

NOTE — To be established at and/or co-ordinated through a National Standards laboratory. As an interim measure, the reference tape may be one adopted by agreement between interchange parties. When absolute quantitative performance levels and an international source of standard reference types have been adopted, such agreements may be replaced by reference to standard reference tapes.

The reference tape required for tests on high resolution tapes may be different from that required for tests on intermediate resolution tapes. In the following sections, a reference tape shall be taken to mean the one appropriate to the type of tape being tested.

8.1.2 secondary reference tape: The secondary reference tape is an unrecorded length of tape, the magnetic characteristics of which have been calibrated against those of the reference tape.

8.1.3 Operating bias current

(1) For a high resolution tape (type E): Operating bias current is the amplitude of bias current through the recording head which causes a 2 dB fall-off (overbias peak) of the peak output from the reference tape when a 2,0 MHz signal is recorded at standard record level [see 8.1.4 (1)] at a tape speed of 3,048 m/s (120 in/s).

NOTE — This test is applicable to tapes used either in 1,5 or 2,0 MHz wideband DR equipment.

(2) For an intermediate-resolution tape (type B): Operating bias current is the amplitude of bias current through the recording head which causes a 3 dB fall-off (overbias peak) of the peak output from the reference tape when a 250 kHz signal is recorded at standard record level [see 8.1.4 (2)] at a tape speed of 1,524 m/s (60 in/s).

8.1.4 Standard record level

(1) For a high-resolution tape (type E): Standard record level is that input level of a 200 kHz signal recorded on the reference tape at 3,048 m/s (120 in/s) and with operating bias current [see 8.1.3 (1)] such that on playback the output signal has 1 % third-harmonic distortion as measured with a wave analyzer (see ISO 6068, annex A, table 23) with a 3 kHz bandpass and provision for automatic frequency control. The reproduce equalization shall be adjusted as recommended by the recorder manufacturer and correction shall be made for allowable equalization variation.

(2) For an intermediate resolution tape (type B): Standard record level is that input level of a 25 kHz signal recorded on the reference tape at 1,524 m/s (60 in/s) and with operating bias current [see 8.1.3 (2)] such that on playback the output signal has 1 % third-harmonic distortion as measured with a wave analyzer (see ISO 6068, annex A, table 23) with a 3 kHz bandpass and provision for automatic frequency control. The reproduce equalization shall be adjusted as recommended by the recorder manufacturer and correction shall be made for allowable equalization variation.

8.1.5 Standard output level

(1) For a high resolution tape (type E): The standard output level is the reproduce level of a 200 kHz signal recorded on the reference tape at 6 dB below standard record level and with operating bias current [see 8.1.3 (1) and 8.1.4 (1)].

(2) For an intermediate resolution tape (type B): The standard output level is the reproduce level of a 25 kHz signal recorded on the reference tape at 6 dB below standard record level and with operating bias current [see 8.1.3 (2) and 8.1.4 (2)].

8.2 Standard tests

8.2.1 Reference tape system

A reference tape system shall be used for standardized testing (see 8.1.1 and 8.1.2). A reference tape system includes a standard tape and head mounted on a suitable recorder/reproducer. Interchange tapes should perform within the tolerances of table 8 when recorded and played back on a reference system.

8.2.2 Reference test recorder for high resolution tape

The reference test recorder shall have wideband 2,0 MHz DR capability as defined in ISO 6068.

8.2.3 Reference test recorder for intermediate resolution tape

The reference test recorder shall have intermediate band DR capability as defined in ISO 6068.

8.2.4 Test set-up

Prior to tape testing, the reference tape system shall be set up as follows:

a) The recorder shall be thoroughly cleaned and demagnetized, and the heads shall be adjusted for correct azimuth. Cleanliness is particularly critical in drop-out tests (see 8.7) and it is highly desirable that facilities be provided to clean the tape during record/playback.

b) The tensile force applied to the tape shall be measured to determine that the recorder is in proper adjustment. Unless otherwise specified, the tensile force used in the following tests is the standard tensile force: 0,131 N/mm ± 0,033 N/mm (12 ozf/in ± 3 ozf/in) tape width (but see note following 6.4.3).

c) The record and reproduce head segments and head configuration shall conform to the dimensions specified in ISO 6068 (table 5 or table 8), i.e. using head segments giving a track width of 1,27 mm ± 0,13 mm (0,050 in ± 0,005 in). (Consideration is being given to test requirements for other track widths.)

d) Measurements of high resolution tape samples shall be performed at a tape speed of 3,048 m/s (120 in/s) unless otherwise specified in this Technical Report.

e) Measurements on intermediate resolution tape samples shall be performed at a tape speed of 1,524 m/s (60 in/s) unless otherwise specified in this Technical Report.

f) For all tests, the reference test recorder shall be terminated with its proper load impedance.

g) All test signals shall be sine wave signals.

8.3 Sensitivity

8.3.1 Definition

sensitivity: The output from a tape compared to the output from the reference tape at one specific frequency.

8.3.2 Requirement

The output from the tape under test at any point along its length shall not vary from the standard output level by more than the amount (expressed as a ratio in decibels) specified in table 8.

8.3.3 Test procedure

8.3.3.1 The standard output level applicable to the type of tape under test shall be determined to calibrate the test recorder for sensitivity measurement [see 8.1.5 (1) and 8.5.1 (2)]. The appropriate following procedure shall then be followed.

8.3.3.2 For a high resolution tape (type E): A 200 kHz signal shall be recorded on the tape to be tested at a record level 6 dB below standard record level and with operating bias current [see 8.1.3 (1) and 8.1.4 (1)]. The equalization and reproduce amplifier gain settings shall not be changed from those obtained when establishing the standard output level. This tape shall be reproduced and the output of the recorder measured to determine compliance with table 8.

8.3.3.3 For an intermediate resolution tape (type B): A 25 kHz signal shall be recorded on the tape to be tested at a record level 6 dB below standard record level and with operating bias current [see 8.1.3 (2) and 8.1.4 (2)]. The equalization and reproduce amplifier gain settings shall not be changed from those obtained when establishing the standard output level. This tape shall be reproduced and the output of the recorder measured to determine compliance with table 8.