Studio Mastering Tape

AMPEX

456

Grand Master

- **End-to-End Qualification**
  Every 2″ reel of Grand Master 456 Studio Mastering Tape is end-to-end tested. A test chart showing the centre track results of this testing is included with every reel of 2″ tape. This unique Ampex feature graphically shows the high level of signal uniformity on that specific roll of tape.

- **Available in All Configurations**
  1/4″, 1/2″, 1″, and 2″ widths from 1200′ to 5000′ lengths.

- **Reel-to-Reel Consistency**
  Led by our commitment to consistency of performance, the manufacture of Ampex 456 Studio Mastering Tape is carefully controlled to maintain tight tolerances at 118 steps in the manufacturing process. Our "continuous flow" production system eliminates batch variations.

- **Elimination of Transient Errors**
  All slitting creates debris from the shearing of cutting blades against the tape. Only Ampex' proprietary "Total Surface Cleaning" process wipes and then vacuums every square inch of tape, thereby cleaning away all debris. This eliminates dropouts.

- **Extra Protection**
  Ampex 2″ Studio Mastering Tape has a solid back flange and a front flange with only two windage holes. This combination of flanges provides maximum tape protection, ensuring that the tape will not be damaged during shipping or handling. An Ampex-designed heavy-duty plastic reel band is included on all 2″ configurations, providing both protection from environmental contamination and from tape edge damage due to flange deflection.

456 Studio Mastering Tape

Grand Master®

Test Conditions		Units	Data	Notes
Record head gap length		µm	7	2
Replay head gap length		µm	3	2
Record head track width		mm	6.3	2
Replay head track width		mm	2.6	2
Replay equalisation		µs	IEC 1	3
Reference level at 1kHz		nWb/m	320	4
IEC Reference tape			MT82472	5
Reference bias of reference tape		dB	0	6

Electroacoustic properties			Tape Speed			
			19.05 cm/s (7.5 in/s)	38.1 cm/s (15 in/s)	76.2 cm/s (30 in/s)	
Sensitivity reduction at 10kHz for conventional test bias		dB	10.0	4.5	2.0	7
Bias ratio		dB	+1.0	+1.0	+1.0	8
Maximum output level for 3% THD at 1kHz	MOL 1kHz	dB	+12.0	+12.0	+12.0	9
Maximum output level for saturation at 10kHz	MOL 10kHz	dB	+1.0	8.5	+15.5	10
Relative sensitivity 1kHz	S 1kHz	dB	+1.0	+1.5	+1.5	11
10kHz	S 10kHz	dB	+1.5	+2.0	+2.0	11
12.5kHz	S 12.5kHz	dB	+1.0	N/A	+1.5	11
16kHz	S 16kHz	dB	N/A	+2.5	+1.5	11
Percentage third harmonic distortion at 320 nWb/m at 1kHz	% THD	%	0.1	0.05	0.05	12
Reference level to bias noise ratio, weighted		dB	66.0	66.0	63.0	13
Signal to bias noise ratio, weighted		dB	78.0	78.0	75.0	14
Reference level to DC noise ratio, filtered	RL/DC	dB	60.5	61.0	57.5	15
Reference level to print ratio		dB	53.5	50.5	51.0	16
Reference level to erase ratio		dB	≧70.0	≧70.0	≧70.0	17

Magnetic Properties				
Coercivity		kA/m (Oe)	24.7 (310)	18
Retentivity		mT/(G)	92 (920)	19
Remanent Saturation Flux		nWb/m (mM/mm)	1150 (115)	20

Mechanical Properties				
Tape thickness base		µm (in × 10^{-3})	34.1 (1.34)	21
	coating	µm (in × 10^{-3})	12.5 (0.49)	
	back coating	µm (in × 10^{-3})	0.9 (0.04)	
	total	µm (in × 10^{-3})	47.5 (1.87)	
Width			see table on page 4	22
Width tolerance		mm	+0/−0.06	
Breaking strength: width 6.3 mm (0.25 in)		N (lb f)	43.1 (9.7)	23
Yield force (F3): width 6.3 mm (0.25 in)		N (lb f)	23.2 (5.2)	24
Residual elongation		%	<0.1	25
Electrical resistance of back coating		MΩ	<0.05	26

456 Studio Mastering Tape

Grand Master®

Notes and Explanations of Test Methods

1. Test Conditions
The test conditions used to prepare these technical data sheets are in accordance with IEC Publication 94, Part 4 "Mechanical Magnetic Tape Properties" and Part 5 "Electrical Magnetic Tape Properties".

2. Record and Replay Heads
The record and replay heads used to determine the electrical properties are the standard IEC measuring heads types AB 22–7 and WC 30a–3 respectively.

3. IEC Calibration Tape
The calibration tapes used to produce this data are in accordance with IEC Publication 94, Part 2 "Calibration Tapes". The calibration tapes have flux response characteristics ($t_1 = 35\mu s$, $t_2 = \infty$ at 38.1 cm/s and 76.2 cm/s; $t_1 = 70\mu s$, $t_2 = \infty$ at 19.05 cm/s) in accordance with the IEC 1 designation in IEC Publication 94, Part 1.

4. Reference Level
The reference level is 320nWb/m at 1000Hz and is contained on the IEC calibration tape.

5. IEC Reference Tape
The IEC Reference tape is an unrecorded tape with specified characteristics used primarily for determining the bias ratio and for relative sensitivity measurements.

6. Reference Bias
The Reference bias is obtained from the Reference tape. It is determined by finding the value of bias current which is necessary to produce minimum third harmonic distortion at a frequency of 1kHz, when recording at the reference level, contained on the IEC calibration tape.

An alternative method for obtaining the Reference bias, when using the standard IEC measuring heads, is to determine the higher of the two bias currents at which the output on the 10 kHz curve is a known amount below the obtainable maximum.

7. Sensitivity Reduction at 10kHz for Conventional Test Bias
The sensitivity reduction at 10kHz for conventional test bias is the difference in sensitivity at 10kHz between the obtainable maximum output and the output using conventional test bias (see note 8). It is expressed in dB.

8. Bias Ratio
The bias ratio is expressed in dB as the ratio of the conventional test bias current required for the product to the Reference bias current required for the Reference tape. The conventional test bias for this product is that which will produce minimum third harmonic distortion at a frequency of 1kHz, when recording at the reference level.

9. Maximum Output Level at 1 kHz (MOL 1kHz)
The maximum output level at 1kHz is expressed in dB relative to the reference level and is the recording level at which 3% third harmonic distortion is generated by the tape, when using conventional test bias.

10. Maximum Output Level at 10kHz (MOL 10kHz)
The maximum output level at 10kHz is expressed in dB relative to the reference level and is the value of recorded level at which the magnetic tape has attained saturation, when using conventional test bias.

11. Relative Sensitivity (S 1 kHz, S 10 kHz, S 12.5kHz, S 16kHz)
Relative sensitivity is the difference expressed in dB, between two levels of the same signal, one recorded on this product at the conventional test bias and the other on the Reference tape at the Reference bias.

Measurements at all specified frequencies are made using the same value of audio current, which produces an output level at 1kHz of – 20dB relative to the reference level when recording the Reference tape using Reference bias.

12. Percentage Third Harmonic Distortion (THD)
The figure published represents the percentage third harmonic distortion of the 1kHz signal recorded at a level of 320nWb/m, when using conventional test bias.

13. Reference Level to Bias Noise Ratio, Weighted
Reference level to bias noise ratio is the ratio expressed in dB, of the reference level from the calibration tape to the level of weighted bias noise. Bias noise is the remaining level of tape noise, after the tape has been subjected to a high frequency erase and bias magnetic field from the erase and record heads.

The bias noise is measured at conventional test bias using a RMS meter and a weighting network with the characteristics specified for the "A" curve in IEC Publication 651.

14. Signal to Bias Noise Ratio, Weighted
Signal to bias noise ratio is the ratio expressed in dB, of the MOL at 1 kHz to the level of weighted bias noise (see note 13).

15. Reference Level to DC Noise Ratio (RL/DC)
Reference level to DC noise ratio is the ratio, expressed in dB, of the reference level from the calibration tape to the level of filtered DC noise. DC noise is the level of tape noise measured at the output of a replay chain after the tape has been recorded with a specified value of direct current and conventional test bias.

16. Reference Level to Print Ratio
Reference level to print ratio is the ratio expressed in dB, of the reference level from the calibration tape to the highest value of print-through signal at 1kHz from this product. The print-through signal is measured after an incubation period of 24 hours at a nominal temperature of 20°C.

17. Reference Level to Erase Ratio
Reference level to erase ratio is the ratio expressed in dB, of the replay voltage of a 1kHz signal, recorded at reference level using conventional test bias, to the residual signal after erasure.

18. Coercivity
Coercivity is the magnetic field strength required to reduce the remanent magnetisation of saturated tape to zero. It is expressed in Amperes per metre and in Oersteds, where 1 Oersted is equal to 79.577 A/m.

19. Retentivity
Retentivity is the flux density remaining in the tape after exposure to a saturating field which has been reduced to zero. It is expressed in Teslas and in Gauss, where 1 Tesla is equal to 10,000 Gauss.

20. Remanent Saturation Flux
Remanent saturation flux is the total flux remaining in a tape after saturation. It is expressed in nanoWebers per metre width and in milliMaxwells per millimetre width where 1 Weber is equal to 10^8 Maxwells.

21. Mechanical Properties
Mechanical properties are measured in accordance with IEC Publication 94, Part 4 "Mechanical Magnetic Tape Properties". The rate of elongation for all tensile tests is 100 mm/min.

22. Width Tolerance
The width tolerances stated are in accordance with those specified in IEC Publication 94, Part 1 "General Conditions and Requirements".

23. Breaking Strength
The breaking strength is the minimum force, expressed in newtons, that is required to break the tape sample. The original length of the tape samples was 500 mm.

24. Yield Force (F3)
The yield force is the applied force, expressed in newtons, that is required to produce a 3% increase in the original tape length. The original length of the tape samples was 500 mm.

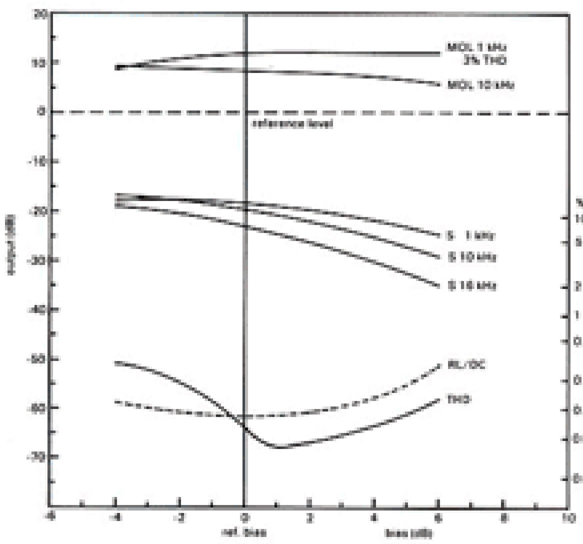
25. Residual Elongation
The residual elongation is the percentage increase in length of a tape sample, after it has been subjected to a force of 30N/mm² (total cross-section of base film only) for a period of 3 min. The length of the tape sample is then measured with negligible force (<0.25N) 3 min after the applied force has been removed.
The original length of the tape samples was 500 mm.

26. Electrical Resistance to Back Coating
The electrical resistance of a coating is the resistance of a tape specimen, the length of which is equal to its width. It is expressed in megohms.

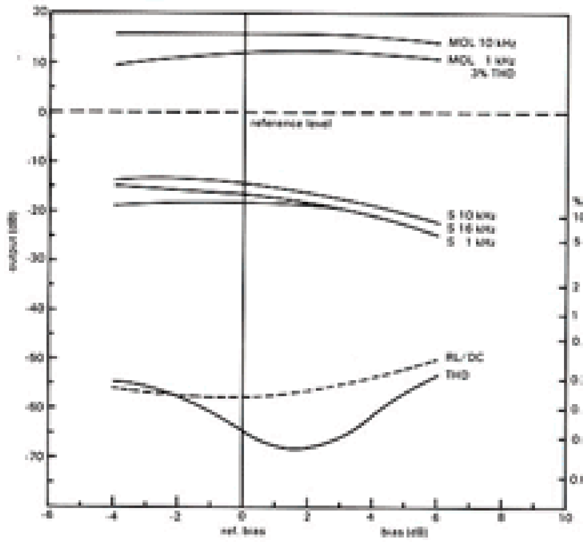
456 Studio Mastering Tape

Grand Master®

AMPEX 456 PROFESSIONAL 38.1 cm/s (15 in/s)



AMPEX 456 PROFESSIONAL 76.2 cm/s (30 in/s)



Recommended Maximum Operating Levels

Ampex Grand Master® Gold 499	520 nWb/m (+4dB)
Ampex Grand Master® 456	370 nWb/m (+1.3 dB)
Ampex 478	320 nWb/m (0 dB)
Ampex 406/407 Mastering	250 nWb/m (−2 dB)

RECOMMENDED BIAS SETTINGS

OVERBIAS at 10 kHz

SPEED	AMPEX 456 GRAND MASTER®
7.5 IPS	5.0 dB
15 IPS	3.0
30 IPS	1.2

STANDARD WIDTHS AND TOLERANCES (Note 22)

millimetres		inches	
6.274 ± 0.0254		0.247 ± 0.001	
12.598	all	0.496	all
25.324	+0.058	0.997	+0.002
50.698	-0.000	1.996	-0.000

Product Configuration

Catalog Number	Description	Reel Size in	Reel Size cm	Tape Length ft	Tape Length m	Carton Weight lb	Carton Weight kg	Carton Quantity
456-131111	1.5 mil — Plastic Reel	¼" × 5"	13 cm	600'	183 m	15	6.8 kg	40
456-151111	1.5 mil — Plastic Reel	¼" × 7"	18 cm	1200'	366 m	35	15.9 kg	40
456-17311J	1.5 mil — NAB Reel	¼" × 10½"	27 cm	2500'	762 m	25	11.4 kg	10
456-17611C	1.5 mil — Plastic Hub (boxed)	¼" Hub		2500'	762 m	17	7.7 kg	10
456-17611T	1.5 mil — Plastic Hub (bulk)	¼" Hub		2500'	762 m	12	5.5 kg	10
456-272111	1.5 mil — Plastic Hub (boxed)	½" Hub		2500'	762 m	21	9.5 kg	7
456-273111	1.5 mil — NAB Reel	½" × 10½"	27 cm	2500'	762 m	25	11.4 kg	7
456-572111	1.5 mil — Plastic Hub (boxed)	1" Hub		2500'	762 m	19	8.6 kg	5
456-573111	1.5 mil — NAB Reel	1" × 10½"	27 cm	2500'	762 m	28	12.7 kg	5
456-593111	1.5 mil — NAB Reel	1" × 14"	36 cm	5000'	1524 m	36	16.3 kg	5
456-97G111	1.5 mil — Precision Reel	2" × 10½"	27 cm	2500'	762 m	22	10.0 kg	2
456-99G111	1.5 mil — Precision Reel	2" × 14"	36 cm	5000'	1524 m	40	18.2 kg	2
456-99G11F*	1.5 mil — Precision Reel	2" × 14"	36 cm	5000'	1524 m	41	18.6 kg	2

*Plastic Shipper

AMPEX

Ampex Media Europa, Marketing,
Unit 3, Commerce Park, Theale, ENGLAND

European Sales Offices

- England: Unit 3, Commerce Park, Brunel Road,, Theale, Berkshire RG7 4AB ENGLAND Tel: +44 734 302 208 Fax: +44 734 302 383 *(Great Britain, Ireland, Greece, Middle East, Africa)*
- France: Immeuble "L'OCTROI", 3 et 5 Rue du 8 Mai 1945, 92110 Clichy, FRANCE Tel: +33 1 4731 7171 Fax: +33 1 4731 7476 *(France, North Africa)*
- Germany: Otto-Volger Strasse 7c, 65842 Sulzbach im Taunus, GERMANY Tel: +49 6 1967 6555 Fax: +49 6 1967 4511 *(Germany, Austria)*
- Italy: Via Ildebrando Vivanti 157, 00144 Rome, ITALY Tel: +39 6 529 3330 Fax: +39 6 529 3430 *(Italy, Malta, Spain, Portugal)* Via Boito 3,20026 Novate, Milan, ITALY Tel: +39 2 3324 0086 Fax: +39 2 3324 0432 *(Northern Italy)*
- Netherlands: Binderskampweg 31, 6545 CA Nijmegen, NETHERLANDS Tel: +31 80 730484 Fax: +31 80 783898 *(Benelux) also European Finance, Administration, Warehousing and Distribution*
- Sweden: Skopgrand 2, 194 51 Upplands-Vasby, SWEDEN Tel: +46 8 5907 5100 Fax: +46 8 5907 5900 *(Nordic Countries)*

Printed in England by Grange Press Ltd 6/94 5M EO456