harman consumer group

Engineering Design Specification	Date	Rev #	Document Number
	10/19/2012	B	9990037

10 inch woofer, Special Paper Pulp with SBR Foamed Rubber Surround

Model Number:	100FE-12
Part Number:	320-0048-001
Division:	Harman Lifestyle
Where Used:	JBL S3900
Approved Supplier(s)	GGEC
Design Engineer:	Jmoro

Assembled View:

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Section View

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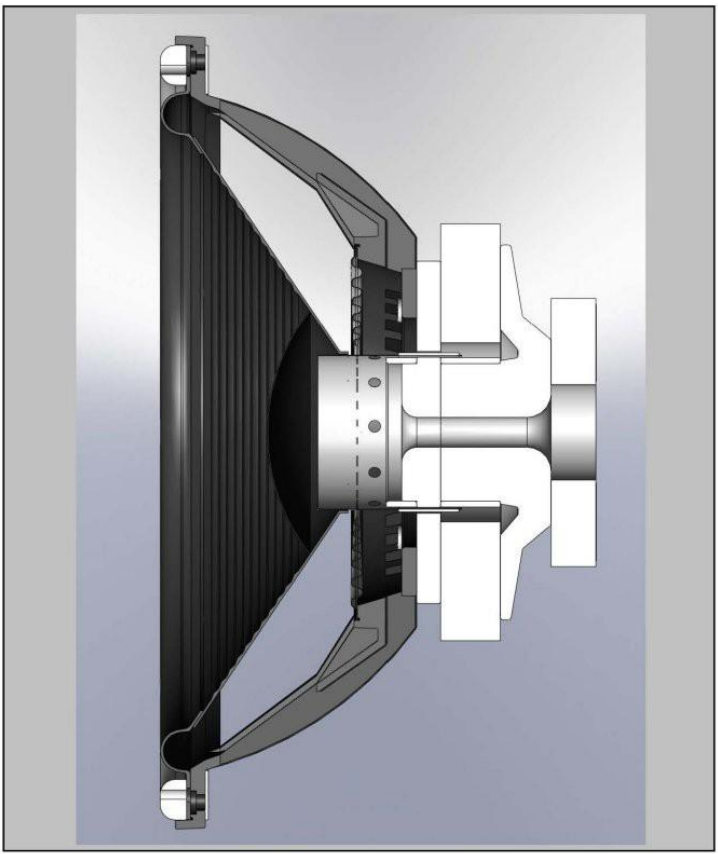

Document Revision History

Rev #	Date	Description of Change	ECO#	Approval	
				M.E.	T.E.
X1	6/21/2012			n/a	JM
X2	10/18/2012	Update specs		N/A	JM
A	10/18/2012	Release to production	5846	N/A	JM

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Transducer Mechanical Characteristics

Model #	100FE-12	Part #	320-0048-001

Assembly

Overall Height:	146mm	Mounting Depth:	130.6mm

Frame

Type:	Cast Aluminum	Material:	380 Aluminum
Color:	Black	Finish:	Textured Powder Coat
O.D.:	266.2mm	Mounting Diameter:	227.5mm
Flange Thickness:	10.5mm	Screw Holes & Size:	8 recessed holes for #10 Philister head
Other:	Mounting holes: 8x 5.43mm Thru with 7.92mm C.Bore on 248.4mm B.C.		

Diaphragm

Material:	Special Mogami formulation "B-45-SB"	Shape:	Straight body cone with ribs
Color:	Black	Finish:	Natural pulp - Semi Pressed
O.D.:	198.2mm Trim O.D.	Overall Height:	52.82mm
Thickness:	******	I.D.:	52.5mm
Other:	15 gram cone body mass and 37 gram Assy. Mass		

Dust Dome

Material:	Special Mogami formulation "B-45-SB"	Shape:	Convex Dome
Color:	Black	Finish:	Smooth
O.D.:	81.28mm	Overall Height:	14.37mm
Other:	Spherical Radius is 66.04mm		

Surround

Material:	Low Density SBR Foamed Rubber	Shape:	Half Roll
Color:	Black	Thickness:	Approx. 0.90mm
Width/Roll Diameter:	14.56mm / 228.37mm Roll O.D.	Overall Height:	9.78mm
Other:	Front attached to Cone Body, Surround Supplier (Chi Yih MFG)		

Spider

Material:	Conex - 100%	Shape:	Progressive 6 roll Sine wave
Roll Diameter/Width:	n/a	Overall Height:	3.23mm - Outer Roll Ht.
Other:	Flat spider with outer glue flange on roll geometry center line (not a cupped spider)		

Front Gasket

Material:	NBR Rubber - 70 Shore A	Color:	Black

Rear Gasket

Material:	0.76mm thick Volara type or Equivalent	Color:	Black

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Transducer Mechanical Characteristics (Motor)

Model #	100FE-12	Part #	320-0048-001

Voice Coil

I.D.:	51.5mm	Max O.D.:	53.0mm
Wire Type:	PESV-CCAR	Wire Size:	0.6 x 0.100mm Ribbon (Edge Wound)
Wire Turns:	158 +/-2	Wire D.C.R.:	12.5 Ohm
Winding Width:	20.0mm	Winding Layers:	1
Former:	Fiberglass (Til) 0.125mm thick	Wrapper:	High Temp NEC or Equivalent
Other:			

Top Plate

Material:	1008, 1010, 1215, or Equivalent	Thickness:	8 mm
O.D.:	115 mm	I.D.:	54.2 mm
Plating Type.:	Clear Zinc Plating per current standard	Color / Finish:	Natural Zinc
Other:			

Magnet

Material:	Ceramic 5 (Y30) or Equivalent	Thickness:	20 mm
O.D.:	140	I.D.:	60 mm
Other:			

Pole Piece

Material:	1008, 1010, 1215, or Equivalent	O.D.:	50.3 mm
Vent:	10 mm diameter vent with large radius ends (flares to reduce noise)		
Overhang:	Extended step for upper shorting ring	Copper Cap:	N/A
Plating Type.:	Clear Zinc Plating per current standard	Color / Finish:	Natural Zinc
Other:			

Back Plate

Material:	1008, 1010, 1215, or Equivalent	Thickness:	Varies - Thick center to thin at OD
O.D.:	126mm	Features:	N/A
Vent:	10 mm diameter vent with large radius ends (flares to reduce noise)		
Plating Type.:	Clear Zinc Plating per current standard	Color / Finish:	Natural Zinc
Other:			

Bucking Magnet

Material:	Ceramic 5 (Y30) or Equivalent	Thickness:	15 mm
O.D.:	90 mm	I.D.:	32 mm
Other:			

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Transducer Mechanical Characteristics (Misc. & Notes)

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Shielding Can

Material:	N/A	Thickness:	N/A
Plating Type.:	N/A	Color / Finish:	N/A
Other:			

Misc

SFG Configuration:	Yes. Pole Plate has center feature for above gap Aluminum ring.		
Tinsel Lead Type:	ATA5x3YKA42W or Equivalent		
Flux Stabilizing Ring:	20 mm tall ring below gap and 10 mm tall ring above gap		
Tinsel Lead Attach.:	Leads hidden under dome. Loop leads from cone to terminal. Use silicon strain relief at ends		
Lug Size:	.250 inch (Pos) and .205 inch(Neg)	Polarity:	EIA
Other:			

Notes:

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Transducer Electro-Mechanical Parameters

Fundamental Resonant Frequency (Hz):	Fs	33	+/-	10%
Transducer Direct Current Resistance (Ohms):	DCR	12.5	+/-	3%
Total Driver Q at Fs, Considering all driver Resistance:	Qts	0.39	+/-	5%
Moving Mass (g):	Mms	38	+/-	5%
Motor Strength (T*m):	Bl	16	+/-	5%
Voltage Sensitivity(2.83V@1 meter)	SPL	87.5dB *	+/-	1dB
Radiation Area	Sd	337.0 sq.cm.		

Method

Software:	Smith & Larson Audio Woofer Tester
Mass Loading:	50 grams
Misc.:	* SPL shown is averaged at 200, 300, 400Hz

Magnetic Flux Information (For Engineering Reference Only)

Total flux lines intercepted by coil windings [Maxwell Turns]:	204,902
Conversion to flux density [Tesla]:	0.617
Flux lines throughout gap thickness [Maxwell Turns]:	136,400
Conversion to flux density [Tesla]:	1.036

Notes

Parameters provided are nominal values which are closest to the Engineering Referance Standard

Voltage Sensitivity takes precedence over possible T/S combinations that would produce SPL

Magnetic Flux data measured with a 2.030 inch diameter, One-turn Search coil

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Transducer Test Specifications

production testing quantities per HCG QA AQL

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Polarity Test

Polarity: EIA = Positive to large Lug, Cone moves out

Dynamic Test

Sine Sweep Voltage:	17.0 vrms (throughout sweep range)
Frequency Range:	20 - 500Hz
Sweep Duration:	4 sec minimum

Power Test

Signal	Filtered Pink Noise, 50-500Hz, 6dB Crest, 47.0vrms
Duration:	8 + 92 hours (2 hours for Production Audit)**

Impedance

DC Resistance: 12.5 Ohms

Min. Impedance @ Frequency 14.0ohms @ 250Hz

Frequency Response

Freq. Response:

Window	***Averaging***	***Slope***
57 - 202 Hz, +1.5dB / -1.5dB	1/3 Octave	36 dB / Octave
226 - 640 Hz, +1.0dB / -1.0dB	1/3 Octave	36 dB / Octave
718 - 2000 Hz, +2.0dB / -2.0dB	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave
	1/3 Octave	36 dB / Octave

Notes:

Power Test voltage shown indicates 100 hour continuous operation without issue after testing.

**Production Audit power test (6 pcs each run) to same specification but only 2 hour duration.

Engineering Standard Measured Parameters	Date	Rev #	Document Number
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Model # 100FE-12 Part # 320-0048-001

100FE-12 DV(BMA)#15.log

```
100FE-12 DV(BMA)#15                                          Ver 5.00
Completed: Fri Apr 27 07:45:00 2012
Drive level  40.000 % [  1.404 mA]
Sine,LoZP(LV/LA)->Vas,22 pts
;-------------------------------------------------------------------
Re          =   12.6431 ohms
Fs          =   33.6039 Hz
Zmax        =  355.8092 ohms
Qes         =    0.3957
Qms         =   10.7404
Qts         =    0.3816
Le          =    0.8244 mH  (at 1 kHz)
Diam        =  207.1429 mm  (  8.1552 in  )
Sd          =33700.0079 mm^2( 52.2351 in^2)
Vas         =   95.4403 L   (  3.3704 ft^3)
BL          =   15.9938 N/A
Mms         =   37.9187 g
Cms         =  591.5717 uM/N
Kms         = 1690.4121 N/M
Rms         =    0.7454 R mechanical
Efficiency  =    0.8600 %
Sensitivity=   91.3628 dB @1W/1m
Sensitivity=   89.3752 dB @2.83Vrms/1m
Krm         =  11.191E-03 ohms     Freq dependent resistance
Erm         = 663.789E-03          Rem=Krm*(2*pi*f)^Erm
Kxm         =  17.843E-03 Henries  Freq dependent reactance
Exm         = 689.324E-03          Xem=Kxm*(2*pi*f)^Exm
;-------------------------------------------------------------------
Ftest                       =    22.069 Hz
Ftest/Fms                   =    0.6567
Test Mass used              =   50.0000 g (Equal to 10.0 nickels)
Test Mass (Ft=Fms*0.90) =     8.895 g (Add -41.105g for Ft=30.244)
Test Mass (Ft=Fms*0.75) =    29.492 g (Add -20.508g for Ft=25.203)
```

Engineering Standard Frequency Response	Date 10/18/2012	Rev # A	Document Number 9990037

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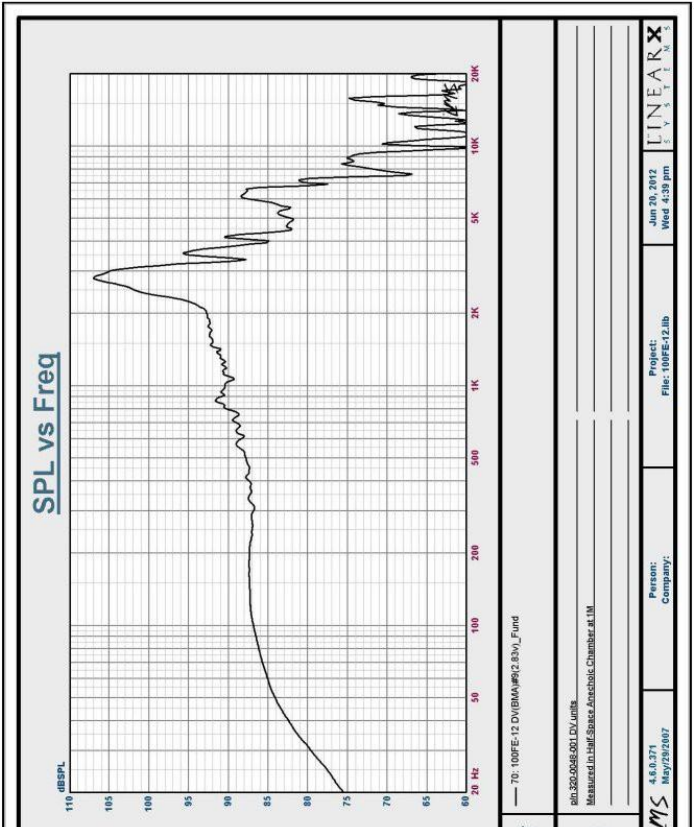

Engineering Standard Distortion (Low Level)	Date 10/18/2012	Rev # A	Document Number 9990037

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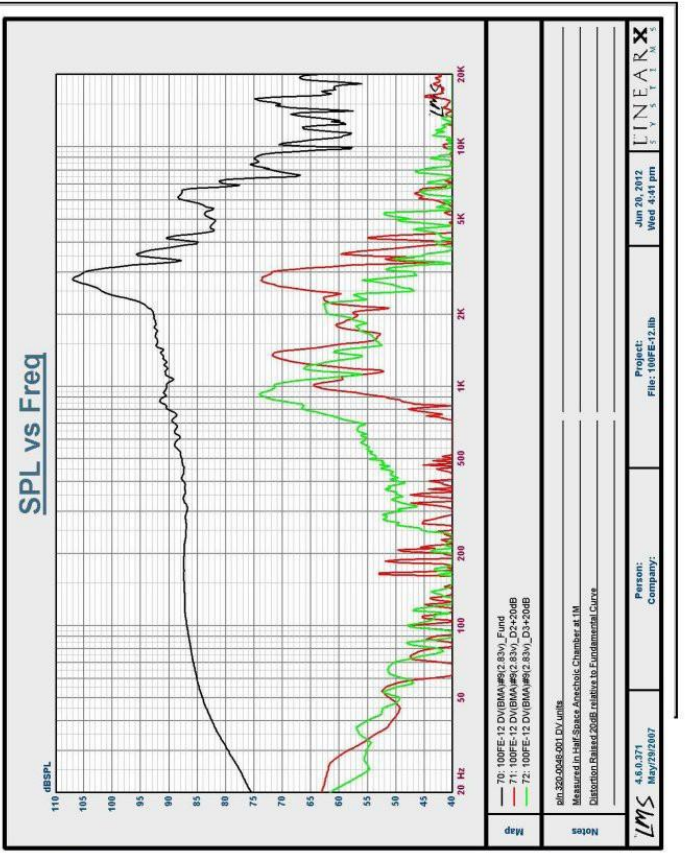

Engineering Standard Distortion (High Level)	Date 10/18/2012	Rev # A	Document Number 9990037

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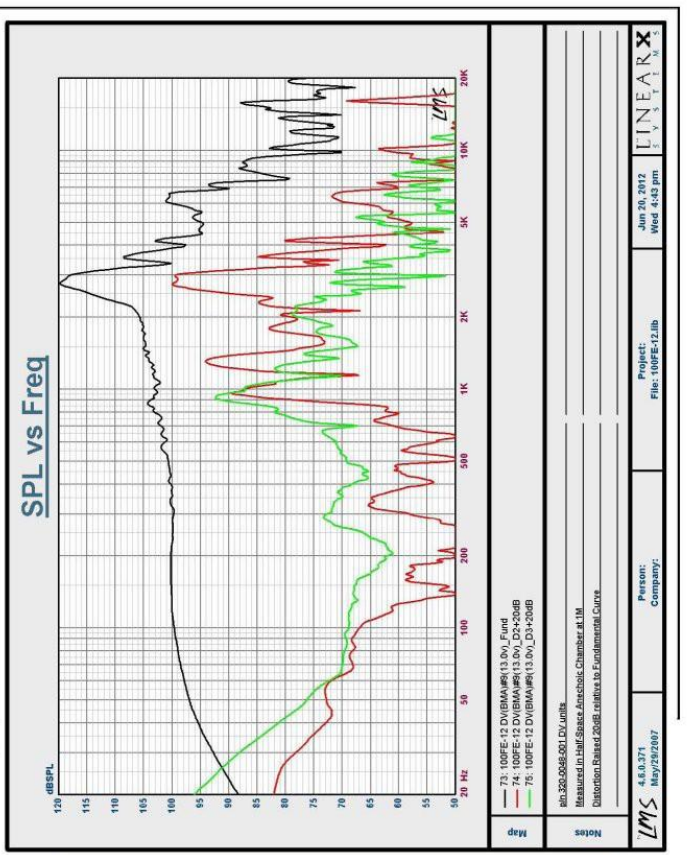

Engineering Standard Impedance	Date 10/18/2012	Rev # A	Document Number 9990037

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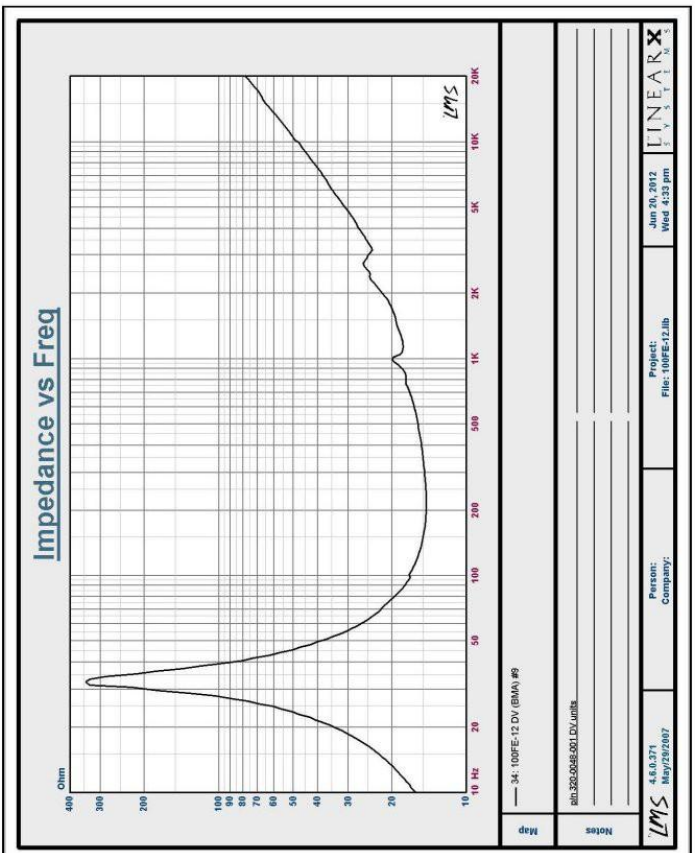

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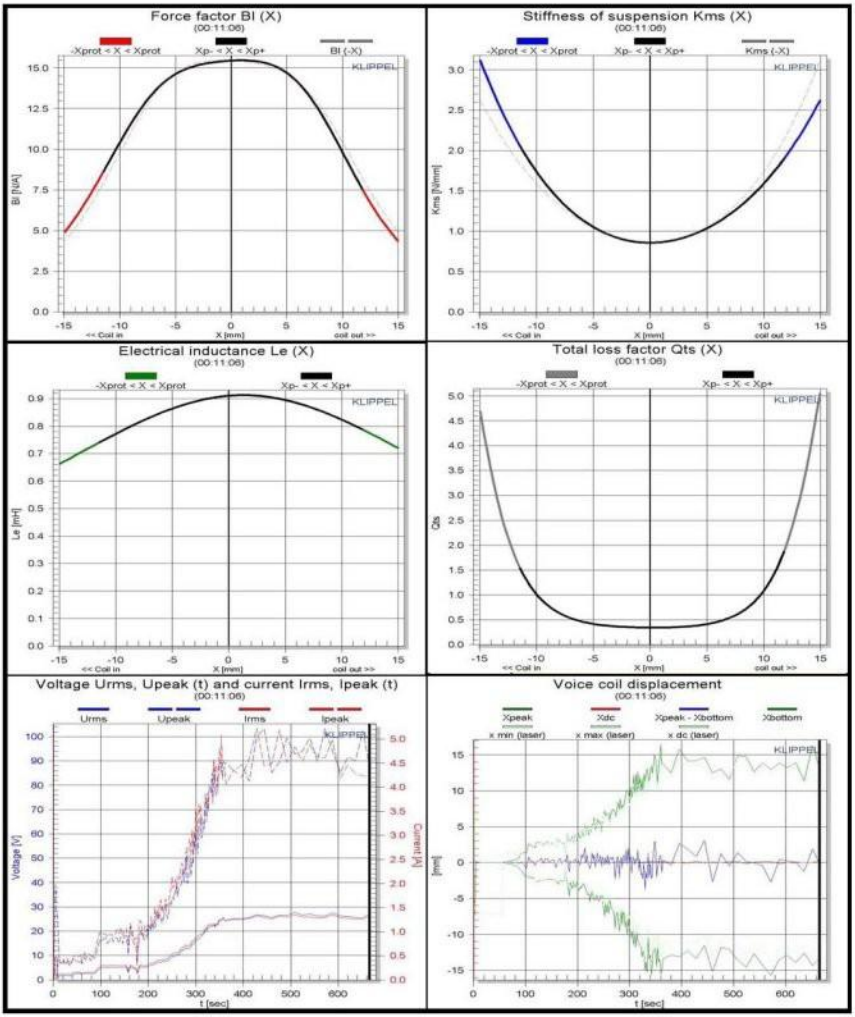

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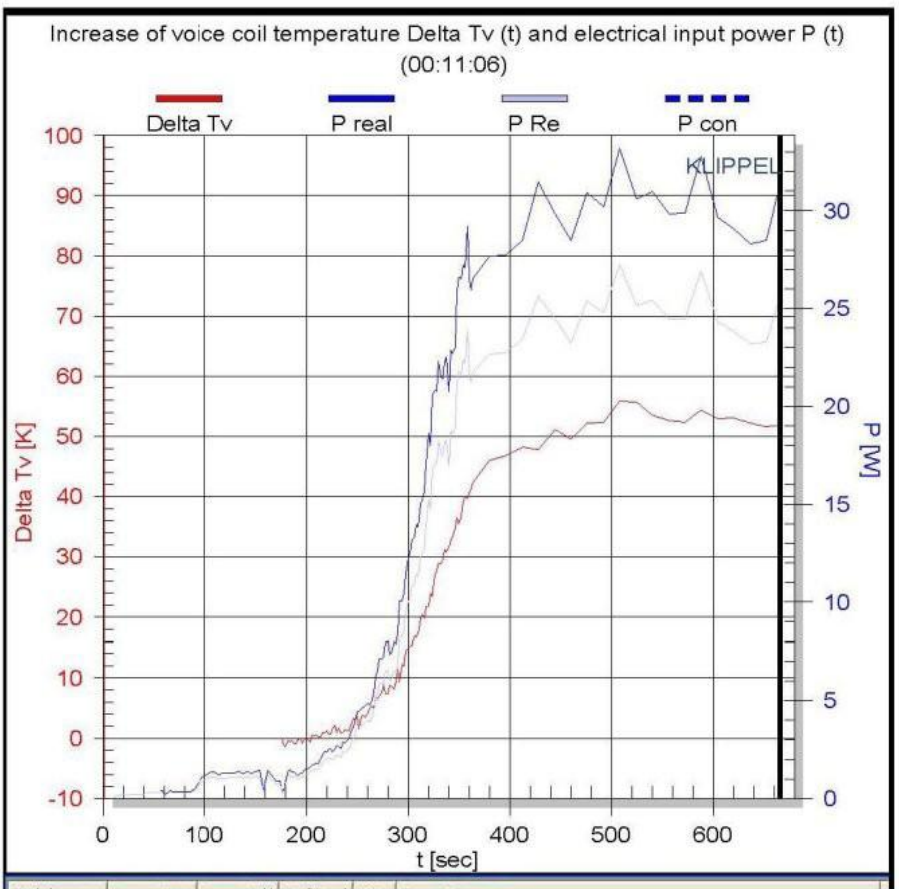

Symbol	Large + Warm	Large + Cold	Small Signal	Unit	Comment
Delta Tv = Tv-Ta	52	0	-0	K	increase of voice coil temperature during the measurement
Xprot	15.0	15.0	2.7	mm	maximal voice coil excursion (limited by protection system)
Re (Tv)	14.69	12.22	12.22	Ohm	(imported) voice coil resistance considering increase of voice coil temperature Tv
Le (X=0)	0.91	0.91	0.87	mH	voice coil inductance at the rest position of the voice coil
L2 (X=0)	0.63	0.63	0.60	mH	para-inductance at the rest position due to the effect of eddy current
R2 (X=0)	4.14	4.14	3.94	Ohm	resistance at the rest position due to eddy currents
Cmes (X=0)	246	246	204	µF	electrical capacitance representing moving mass
Lces (X=0)	182.21	182.21	158.81	mH	electrical inductance at the rest position representing driver compliance
Res (X=0)	226.44	226.44	210.13	Ohm	resistance at the rest position due to mechanical losses
Qms (X=0, Tv)	8.32	8.32	7.53		mechanical Q-factor considering Rms only
Qes (Tv)	0.35	0.29	0.35		electrical Q-Factor considering Re (Tv) only
Qts (X=0, Tv)	0.34	0.28	0.33		total Q-factor considering Re (Tv) and Rms only
fs	23.8	23.8	28.0	Hz	driver resonance frequency
Mms	38.440	38.440	38.440	g	(imported) mechanical mass of driver diaphragm assembly including voice-coil and air load
Rms (X=0)	0.689	0.689	0.898	kg/s	mechanical resistance of total-driver losses
Cms (X=0)	1.17	1.17	0.84	mm/N	mechanical compliance of driver suspension at the rest position
Bl (X=0)	15.45	15.45	15.45	N/A	(imported) force factor at the rest position (Bl product)
Vas	186.8939	186.8939	134.8179	l	equivalent air volume of suspension
N0	0.680	0.818	0.818	%	reference efficiency (2Pi-sr radiation using Re)
Lm	90.5	91.3	91.3	dB	characteristic sound pressure level
Sd	337.00	337.00	337.00	cm²	diaphragm area

Symbol	Value	Unit	Comment
Mode	Nonlinear Mode 5(7)		
Record	179/179		
Laser	signal reliable		
t	00:11:06	h:min:s	measurement time
Warning	high amplifier error		
Ei (t)	6.0	%	error current measurement
Ex (t)	2.7	%	error laser measurement
Eu (t)	51.1	%	error amplifier check
Delta Tv (Delta Tlm)	51.9 (80.0)	K	increase of voice coil temperature (limit)
Blmin (Blim)	30.4 (25.0)	%	minimal force factor ratio (limit)
Cmin (Clim)	28.9 (20.0)	%	minimal compliance ratio (limit)
P (Plim)	31.46 (30.00)	W	real electrical input power (limit)
Lmin	73.8	%	minimal inductance ratio
Pn	52.20	W	nominal electrical input power
P Re	25.73	W	Power heating voice coil
P con		W	deducted power due to convection cooling
Glarge (Gmax)	17.2 (26.0)	dB	gain of the excitation amplitude increased in the large signal domain (maximum)
Mech. system		abs.	import used to identify mechanical system in absolute quantities
Xdc	0.3	mm	dc component of voice coil excursion measured in the last update intervall
Xpeak	13.2	mm	positive peak value of voice coil excursion measured in the last update intervall
Xbottom	-13.3	mm	negative peak value (bottom) of voice coil excursion measured in the last update intervall
Xp+	11.8	mm	upper limit of displacement range (99% probability)
Xp-	-11.4	mm	lower limit of displacement range (99% probability)
Xprot	15.0	mm	maximal voice coil excursion allowed by protection system
v rms	0.73	m/s	voice coil velocity
Irms	1.323	A	rms value of the electrical input current
Urms	27.035	V	rms value of the electrical voltage at the transducer terminals
Ipeak	4.223	A	peak value of the electrical input current
Upeak	87.309	V	peak value of the electrical voltage at the transducer terminals
PC	1.60	dB	thermal power compression factor
Db	36.8	%	distortion factors representing contribution of nonlinear force factor
Dl	1.8	%	distortion factor representing contribution of nonlinear inductance
Dc	31.4	%	distortion factor representing contribution of nonlinear compliance
R tc (v)		K/W	
R th total	2.02	K/W	Delta Tv / P Re