

# DYNAUDIO®

TECHNOLOGY UNLIMITED

D-21

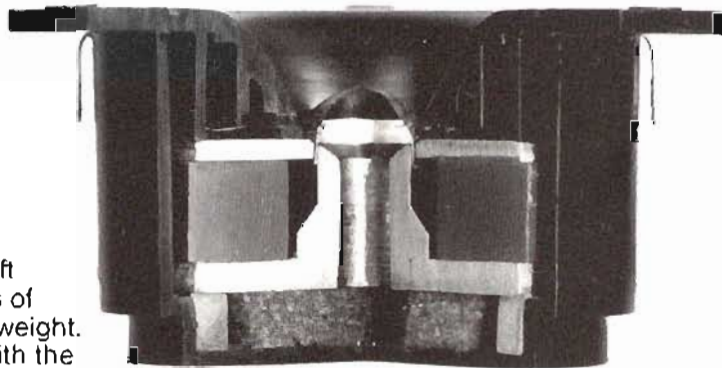
## APPLICATIONS

dome tweeter for 3 way or  
super tweeter for 4- or  
5-way constructions

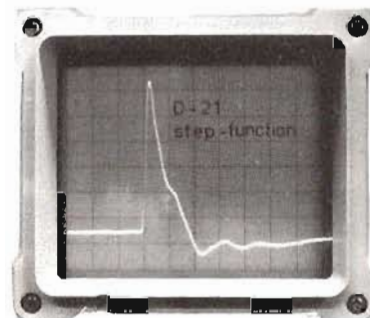
## FEATURES

very low rise time  
high power handling  
rigid hexacoil technique  
liquid cooling of vc  
flexible wire connectors  
soft dome material  
no ringings  
aperiodic damped double  
chamber enclosure  
very flat impedance curve  
correct time aligned when  
used with other DYNAUDIO  
drivers

The moving system of this 5/6" (21 mm) soft dome tweeter is of extremely light weight. This together with the high flux density of the magnet system and the magnetic fluid result in an extremely low rise time and the response exceeds 35 kHz. The aperiodic damping and the high power handling give a natural and open sound with very good resolution. Transient peaks of more than 1000 watts are reproduced with full dynamic without compression. Ears used to normal speakers in the beginning will miss the usual ringings and overshoots. In 3-way system to be crossed at around 5000 Hz. As a super tweeter starting from 10 .. 15 kHz, 6 dB.

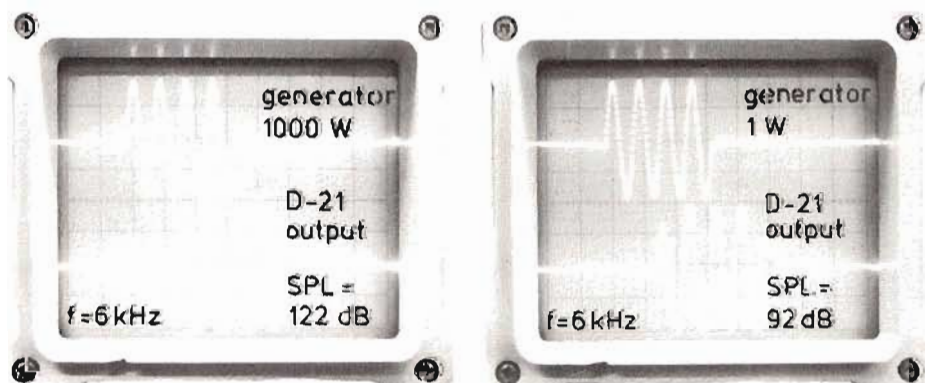


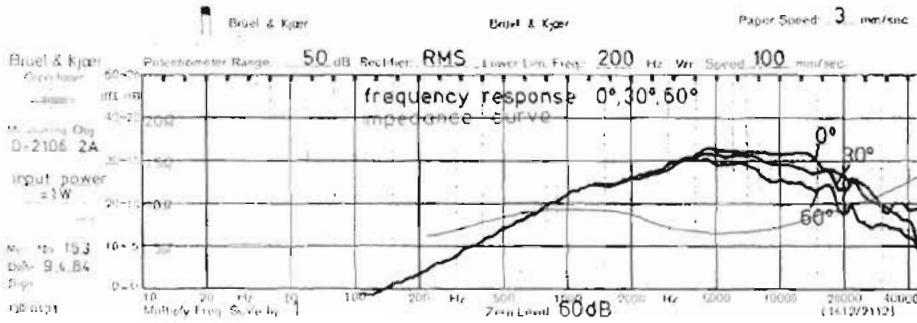
This STEPFUNCTION discloses clearly the quality standard of the unit. The slope drops without re-rising which stands for all frequencies. Very few speaker manufacturers are using this method of testing, perhaps because of the results?



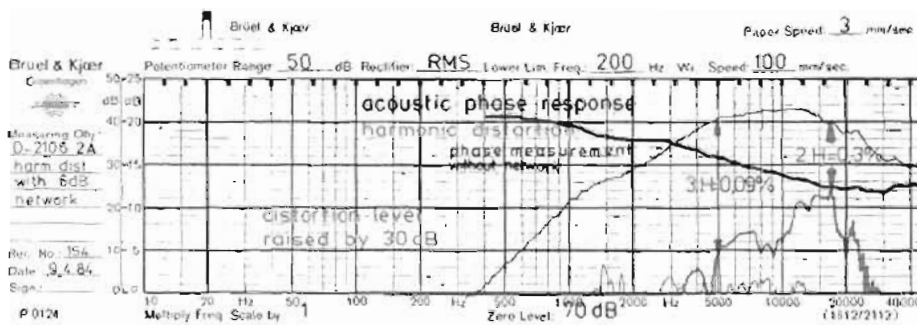
Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30 dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.

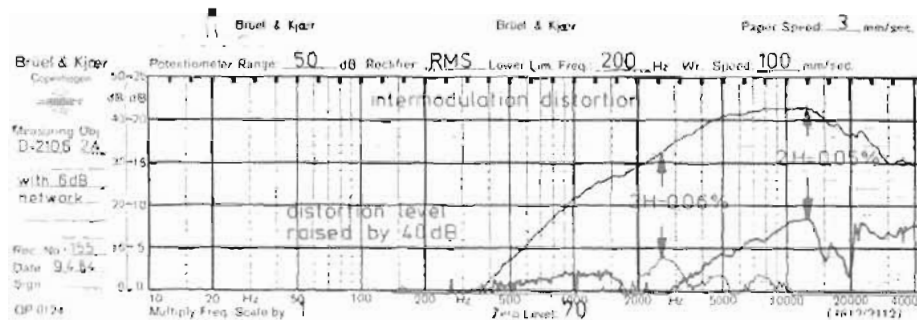




The 30° and 60° curves indicate wide dispersion with correct phase. The impedance curve is flat because of aperiodic damping and magnaflux.



Low harmonic distortions. No phase shift to be noted. 6 dB filter used.



The intermodulation distortion diagram demonstrates: the D-21 converts the input signal into clean sound pressure.

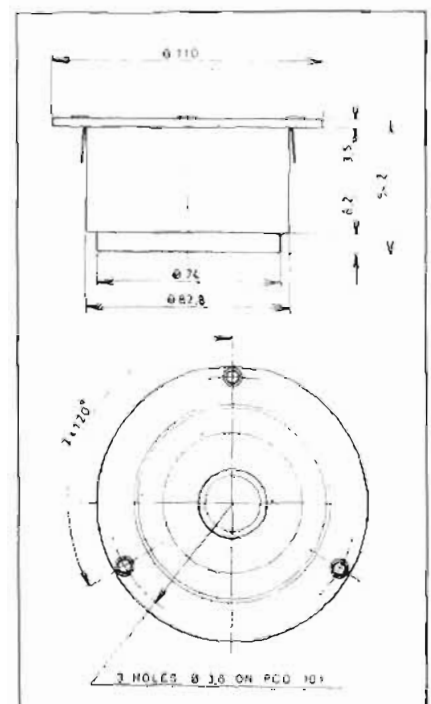


The front of the D-21 has a typical design evoked by having moved the acoustic center inwards for correct phase array. The mouth very often is mistaken as a short horn arrangement. The frequency diagram to the left indicates clearly that no horn effect at all is there, no directional radiation, to the contrary a wide and ideal dispersion is measured.

<b>Compliance:</b>		<b>Overall dimensions:</b>	
suspension	Cms	Ø 110 x 55 mm	
acoustic	Cas	<b>Power handling:</b>	
equivalent volume	Vas	* nominal	DIN 600 W
<b>Cone:</b>		* music	DIN 1200 W
eff. cone area	SD	transient	10 ms 1000 W
moving mass	Mms	<b>Q-factor:</b>	
lin. vol. displacement	Vd	mechanical	Qms 0,62
mech. resistance	Rms	electrical	Qes 1,21
lin. excursion P-P	Xmax	total	Qts 0,41
max. excursion P-P		<b>Resonance frequency free air: Is</b> 1300 Hz	
<b>* Frequency response:</b> 2000 / 35000 Hz		<b>Sensitivity:</b> 1 W / 1 m 92 dB	
<b>Harmonic distortion:</b> 0,3 %		<b>Voice coil:</b>	
<b>Intermodulation distortion:</b> 0,06 %		diameter	d 21 mm
<b>Magnetsystem:</b>		length	h 3,2 mm
total gap flux	280 µWb	layers	n 2
flux density	1,75 Tesla	inductance (1 kHz)	Le 0,08 mH
gap energy	125 mWs	nom. impedance	Zvc 8 Ω
force factor	B x L 4,01 Tm	min. impedance	Zmin 6,4 Ω
air gap volume	Vg 0,11 cm³	DC resistance	Re 5,3 Ω
air gap height	2,5 mm	<b>Data given are as after 30 hours of running</b>	
air gap width	0,65 mm		
<b>Net weight:</b>	0,65 kg		

\* Thiele/Small parameters are measured not statically but dynamically.

All specifications subject to change without notice





# DYNAUDIO®

TECHNOLOGY UNLIMITED

## D-21 AF

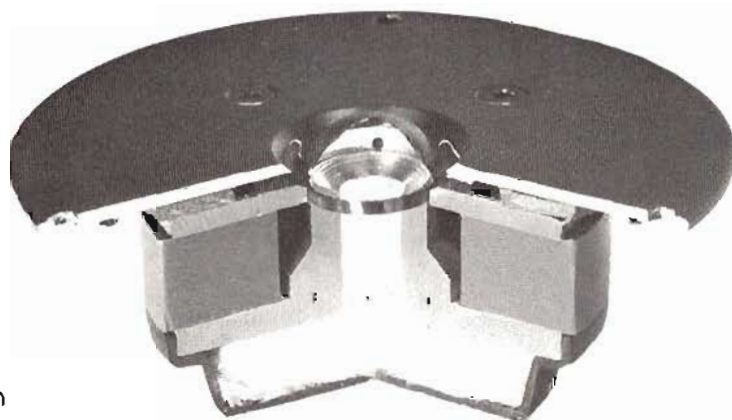
### APPLICATIONS

3/4" (21 mm) extended soft dome tweeter for 3-way systems or super tweeter in 4- or 5-way systems mobile sound For OEM use wide variety of faceplates

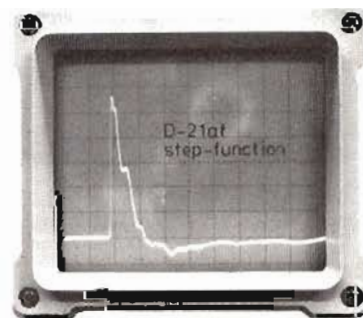
### FEATURES

very low distortion  
no phase shifts  
aperiodic damped double chamber construction  
rigid hexacoil technique  
soft roll off suspension  
liquid cooling  
wide dynamic range  
no compression of SPL

The D-21 AF is basically the famous DYNAUDIO D-21 but the extended dome version. The moving system is extremely light. The diaphragm is a doped fabric suspended in the only correct manner of a soft roll-off avoiding antiphase of the outer ring. The Magnaflex magnetic fluid optimizes the internal damping and dissipation of heat. The rigid Hexacoil withstands transients of far more than 1000 watts of clean music signals. The response gives a transparent, crisp and clear sound with a good resolution. The off-axis curves at 30° and 60° show the good dispersion, on-axis the curve runs linear up to 40 kHz.

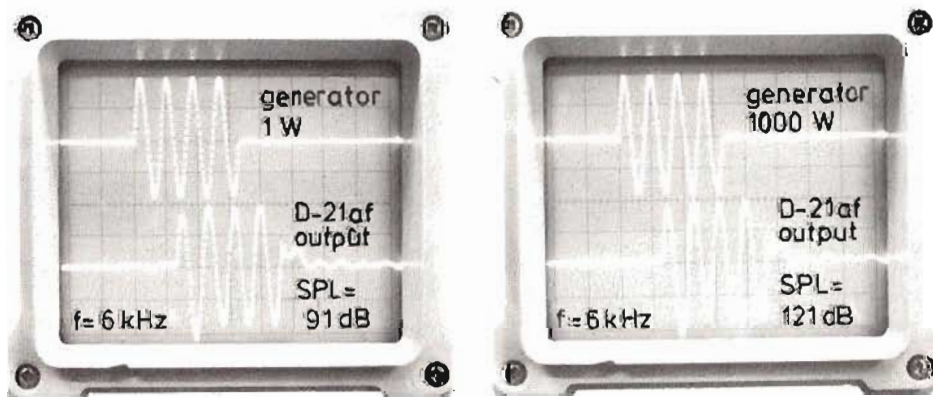


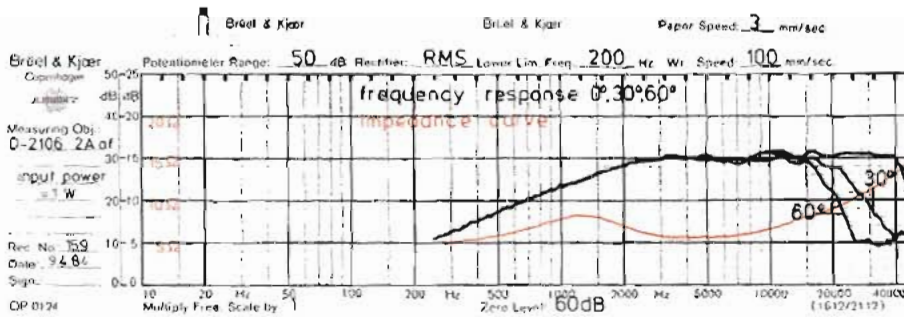
No overshoot, no ringing: result of the excellent damping and correct construction of shape of dome as well as the right material engineering.



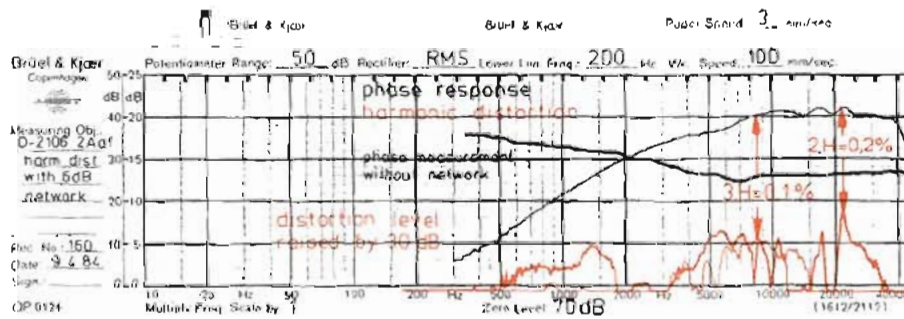
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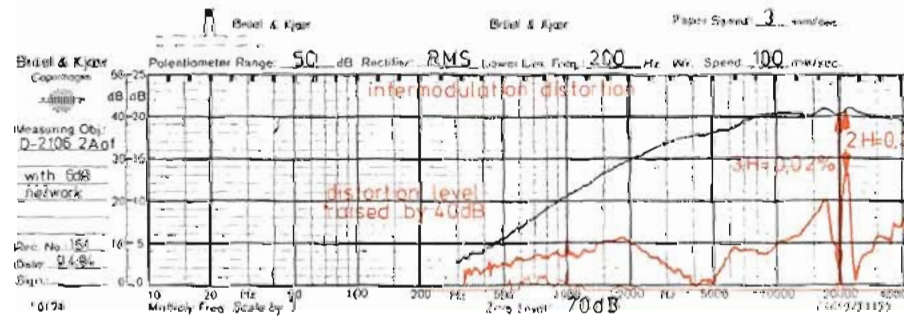




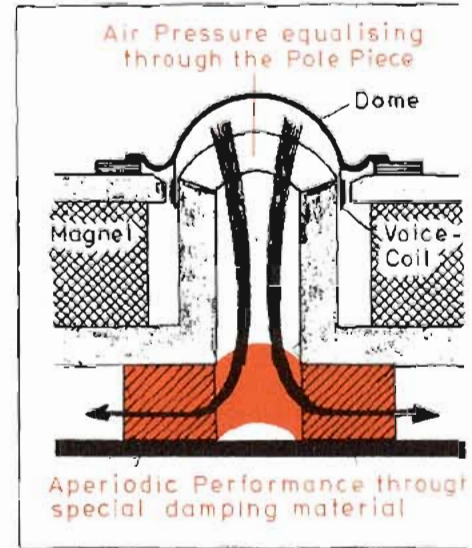
Frequency response from 3.000 up to 40.000 Hz  $\pm 1$  dB!! The impedance curve shows the resonance well damped.



The acoustically measured phase indicates no jumps. The harmonic distortions are very low figures.



Level had to be raised by 40 dB (!)

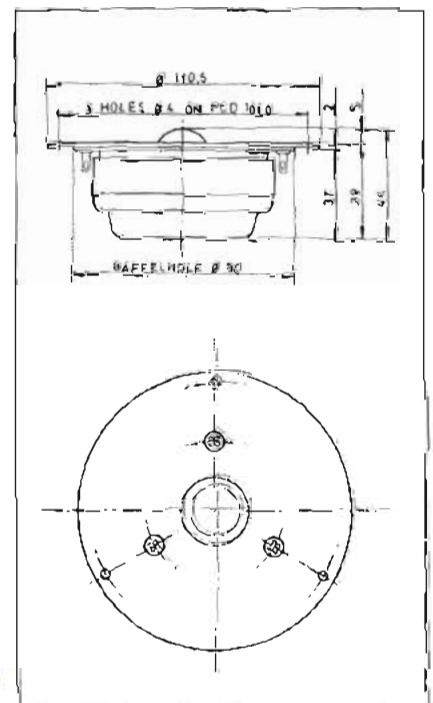


The advantages of the aperiodic damping are consequently applied to all DYNAUDIO dome constructions and may be achieved to all cabinet enclosures by using the VARIOVENT. Aperiodic damping may be compared with a shock absorber in a motor car. Physically the aperiodic damping acts like a DC-resistance in the oscillating circuit.

Compliance:			Overall dimensions:	Ø 110 x 42 mm	
suspension	Cms	-	Power handling:		
acoustic	Cas	-	nominal	DIN 600	W
equivalent volume	Vas	-	music	DIN 1200	W
Cone:			transient	10 ms	1000 W
eff. cone area	S <sub>D</sub>	4,9 cm <sup>2</sup>	Q-factor:		
moving mass	M <sub>ms</sub>	0,24 g	mechanical	Q <sub>ms</sub>	0,62
lin. volume displacement	V <sub>d</sub>	3,4 cm <sup>3</sup>	electrical	Q <sub>es</sub>	1,21
mech. resistance	R <sub>ms</sub>	-	total	Q <sub>ts</sub>	0,41
lin. excursion	P-P X <sub>max</sub>	0,7 mm	Resonance frequency free air f <sub>s</sub>	1300	Hz
max. excursion	P-P	2 mm	Sensitivity:		
Frequency response		1500-45000 Hz	1W/1m	91	dB
Harmonic distortion		< 0,2 %	Voice coil:		
Intermodulation distortion		< 0,2 %	diameter	d	21 mm
Magnetsystem:			length	h	3,2 mm
total gap flux		280 mWb	layers	n	2
flux density		1,75 Tesla	inductance (f kHz)	L <sub>e</sub>	0,08 mH
gap energy		125 mJ/m <sup>2</sup>	nom. impedance	Z <sub>WZ</sub>	8 Ω
force factor	B x L	4,01 Tm	min. impedance	Z <sub>min</sub>	6,4 Ω
air gap volume	V <sub>g</sub>	0,19 cm <sup>3</sup>	DC resistance	R <sub>e</sub>	5,3 Ω
air gap height		2,5 mm			
air gap width		0,085 mm			
Net weight		0,55 kg			

\* These small parameters are measured not statically but dynamically.

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93.05.27.

PARAMETERS: D-21/2

Measured in free air and with imp.corr. (6R8/0.68uF)

P R E L I M I N A R Y S H E E T

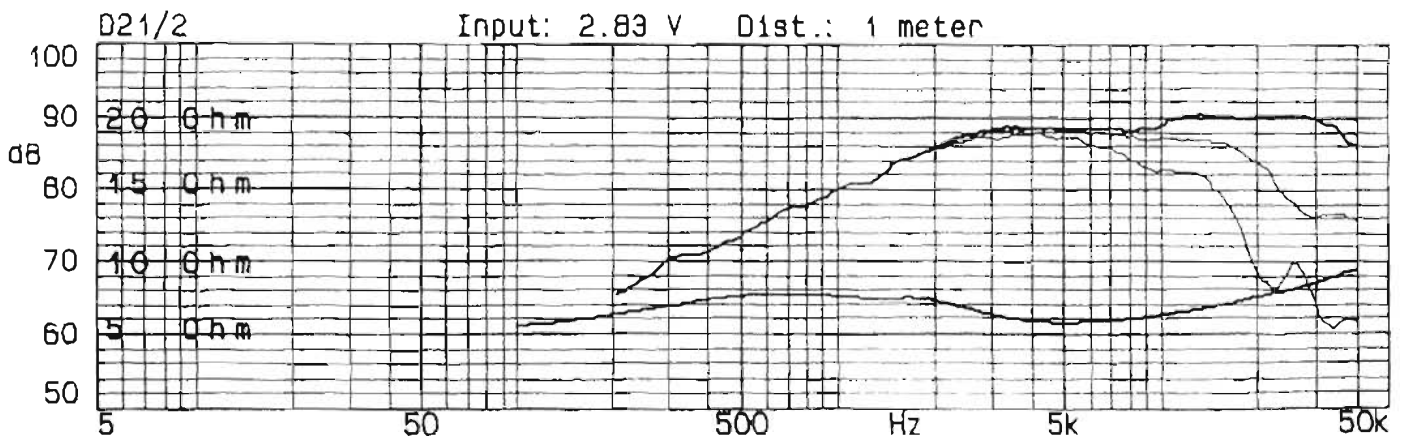
Q, mechanical	Qm	0.7
Q, electrical	Qe	1.1
Q, total	Qt	0.4
Resonance frequency	Fs	1300 Hz
Maximum impedance	Zmax	
Moving mass	Mms	0.35 g
Force factor	BL	3.7 Tm
Equiv. volume	Vas	
Effective cone area	Sd	4.9 cm <sup>2</sup>
Lin. excursion (p-p)	Xmax	0.3 mm
Max. excursion (p-p)		2.0 mm

VOICE COIL:

Diameter	d	21 mm
Length	h	2.9 mm
Layers	n	2
Inductance (10kHz)	Le	0.05 mH
Nom. impedance	Zvc	8 Ohms
DC resistance	Re	5.2 Ohms
Sensitivity	2.83V	see curve

POWER HANDLING:

Nominal (long term)	IEC	130 W
Transient	10ms	1000 W
Net weight		570 g
Overall dimensions		Ø111 x 46 mm



# DYNAUDIO®

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D-28

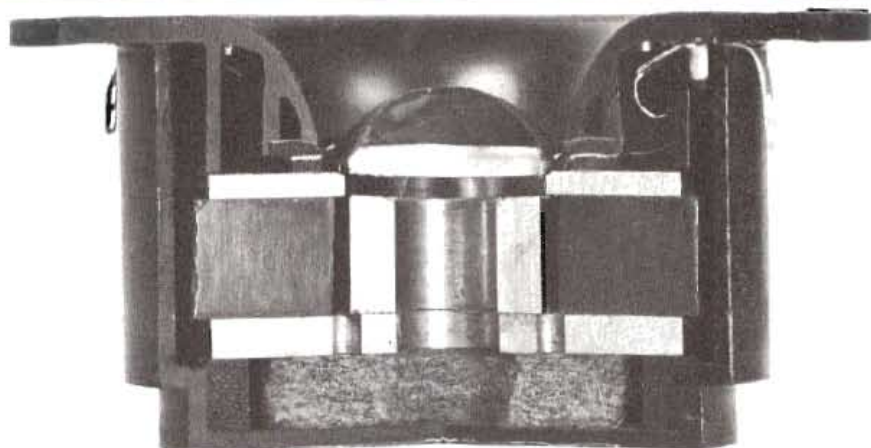
## APPLICATIONS

1.1 inch (28 mm) soft dome tweeter for 2- and 3-way systems with supertweeter also in 4- and 5-way systems mobile hifi commercial and PA

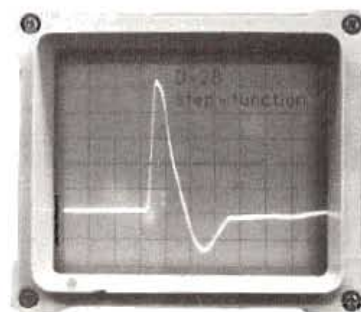
## FEATURES

soft roll-off suspension  
vented magnet motor  
aperiodically damped  
Hexacoil technique  
Magnaflex cooling / damping  
flexible connector wires  
high power handling  
dynamic range more than 127 dB - no compression  
very high efficiency  
very low THD

The D - 28 has the most advanced tweeter technology. Regularly improvements have secured this position for many years. Professional users value the enormous dynamic range of more than 127 dB SPL without compression which is important with to-days high class high power electronic. The exceptional shape eases the time alignment and improves the efficiency without any horn characteristic.



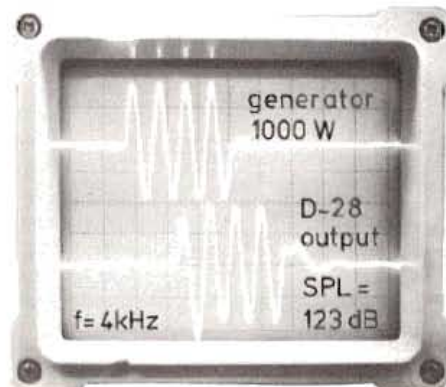
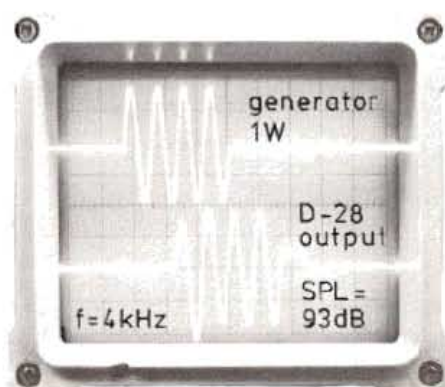
The rise time of a speaker is measured by means of a STEP-FUNCTION. The total is set to be 100 %, then 10 % and 90 % are marked. The first 10 % is the phase of acceleration, the last 10 % is the deceleration phase of the diaphragm. The 80 % between both marks are defined as the movement of the diaphragm. The time needed for this phase is called the rise time. The step function of the D-28 often is used as a scientific example because of its linearity.



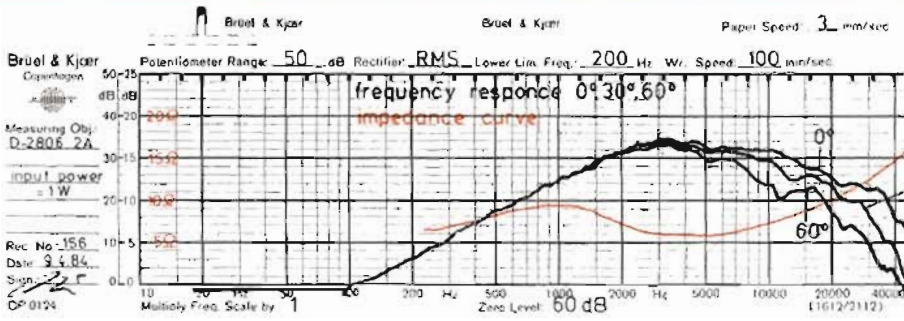
## TONE BURSTS

Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30 dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

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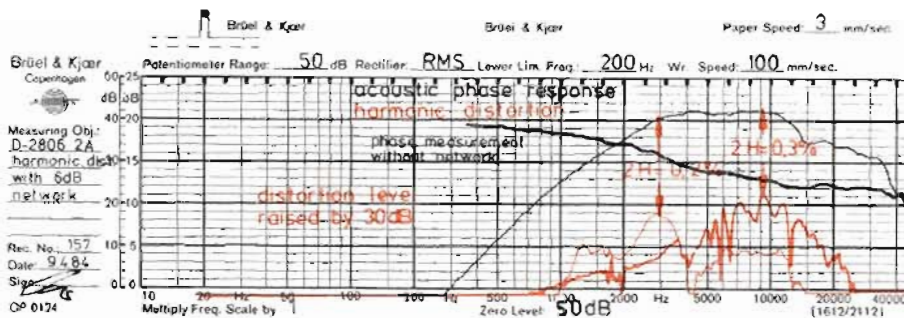




The 30° and 60° off-axis curves prove clearly that the special house construction has no directional/horn effect at all.

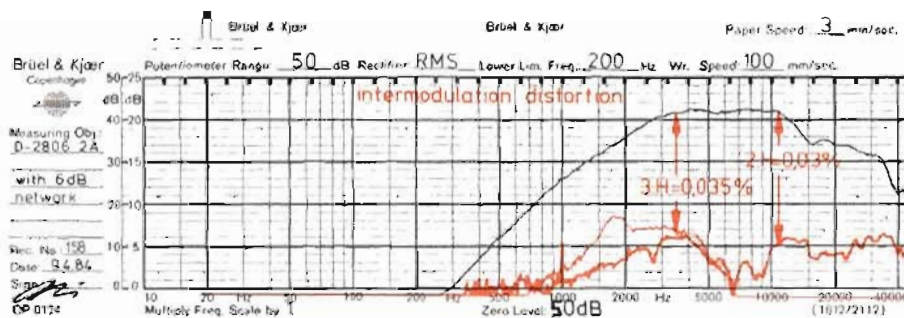


DYNAUDIO tweeter and midrange domes are always made of special soft cloth. This is important for the resolution and the precision of the response of the high end.



The acoustic phase runs linear up to 50 kHz.

A certain bending pattern is unavoidable to the dome material while forcing it back and forwards. With soft material this effect is not audible. The harder the diaphragm material is (i.e. plastic, aluminium, titanium, beryllium etc.) the more this bending effect is heard and measured as the distortion potential.

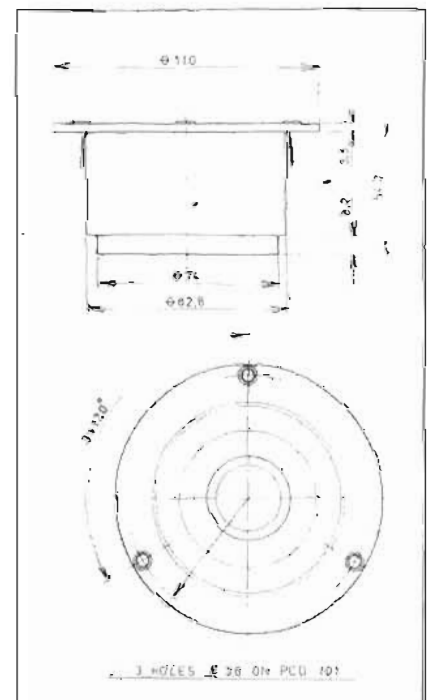


What other system has datas like these?  
Intermodulation distortion level had to be raised by 40 dB.

<b>Compliance:</b>		<b>Overall dimensions:</b>		Ø 110x55 mm	
suspension	Cms	-	<b>Power handling:</b>	DIN	300 W
acoustic	Cas	-	* nominal	DIN	1200 W
equivalent volume	Vas	-	* music		10 ms 1000 W
<b>Cone:</b>		<b>Q-factor:</b>			
eff. cone area	SD	8,5	mechanical	Qms	0,61
moving mass	Mms	0,51	electrical	Qes	1,11
lin. vol. displacement	Vd	6,0	total	Qts	0,39
mech. resistance	Rms	-	<b>Resonance frequency free air:</b>	fs	700 Hz
lin. excursion P-P	Xmax	0,7	<b>Sensitivity:</b>	1 W / 1 m	93 dB
max excursion P-P		3,2	<b>Voice coil:</b>		
<b>* Frequency response</b>		1200 / 25000 Hz	diameter	d	28 mm
<b>Harmonic distortion:</b>		0,3 %	length	h	3,2 mm
<b>Intermodulation distortion:</b>		0,035 %	layers	n	2
<b>Magnetsystem:</b>			inductance (1 kHz)	Le	0,09 mH
total gap flux		340 µWb	nom. impedance	Zvc	8 Ω
flux density		1,52 Tesla	min impedance	Zmin	6,4 Ω
gap energy		156 mWs	DC resistance	Re	5,3 Ω
force factor	B x L	4,2 Tm			
air gap volume	Vg	0,16 cm³			
air gap height		2,5 mm			
air gap width		0,75 mm			
<b>Net weight:</b>		0,6 kg			

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# DYNAUDIO®

TECHNOLOGY UNLIMITED

D-28 AF

## APPLICATIONS

1 7/16" (28 mm)  
soft dome tweeter  
ideal for 2-way  
systems  
also for 3-, 4- and  
5-way-combinations  
car fidelity.

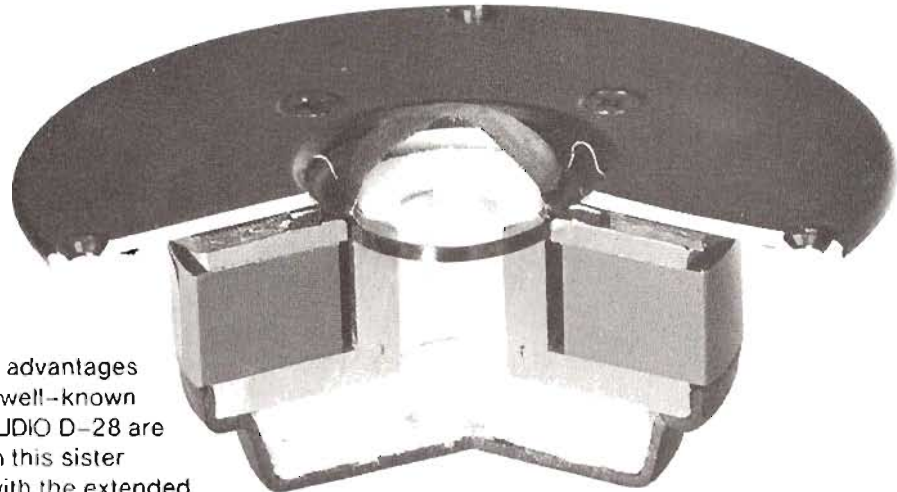
## FEATURES

soft roll off  
suspension  
aperiodic damped  
double chamber con-  
struction  
hexacoil technique  
very low distortions  
high power handling  
no phase shifts  
magnaflex liquid  
cooling  
wide dynamic range  
no compression of SPL.

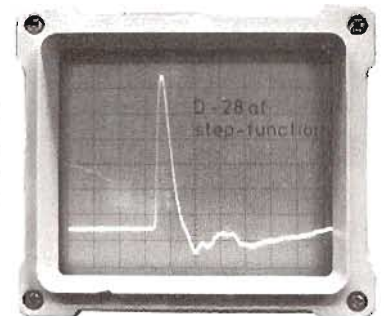
All the advantages  
of the well-known  
DYNAUDIO D-28 are  
built in this sister  
type with the extended  
dome even the aperiodic  
damped double chamber.

The result is slightly  
less efficient, but the  
same good resolution,  
same wide dispersion and  
good imaging

Years of research and practice  
have lead to the conviction that  
measurements and considerations should be made on dynamic and not  
static basis. This is the key to further development of the principles of the  
most successful system, the dynamic speaker.

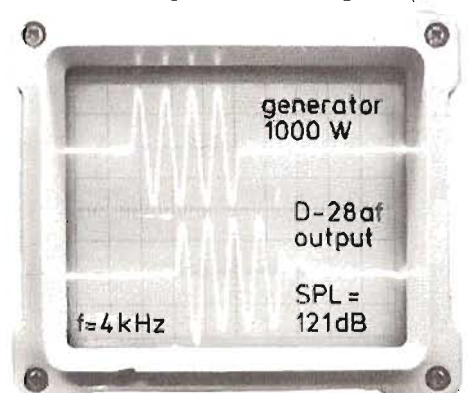
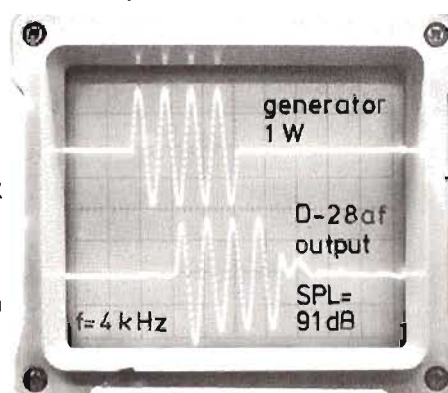


The STEP-FUNCTION of this tweeter shows the advantages of the extrem light weight of the moving system. The rise time is calculated here branding the D-28 AF to be one of the fastest tweeter of its size. Besides this no ringing or overshoot can be seen, thanks to the excellent damping by magnetic strength, aperiodic construction and MAGNAFLEX magnetic fluid.

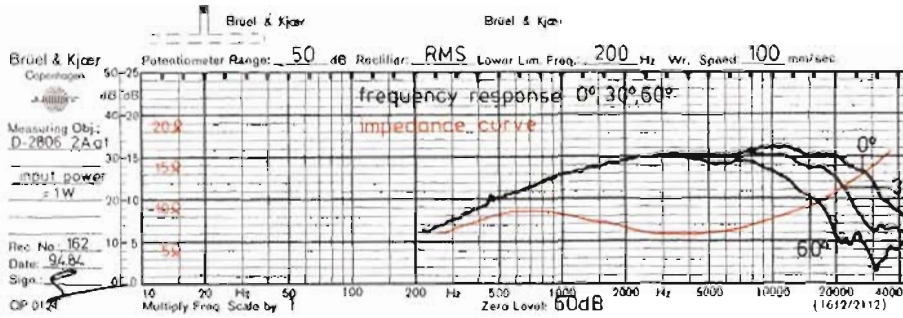


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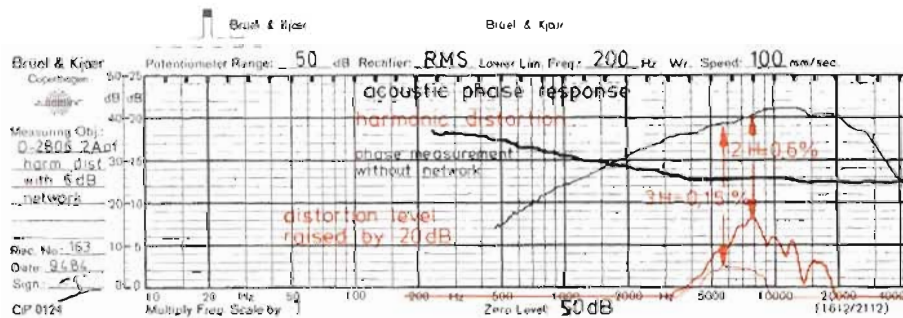
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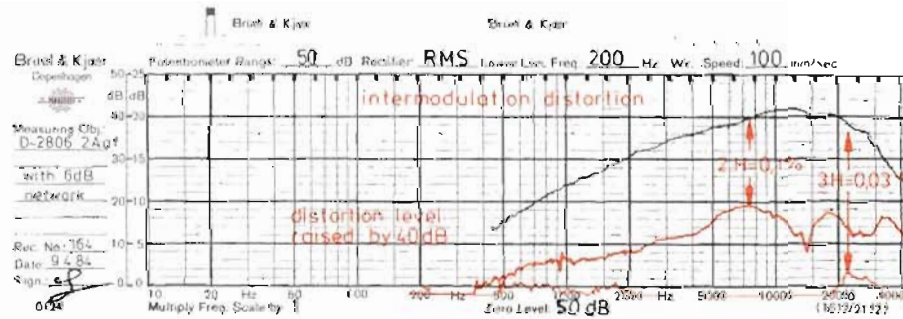




The impedance maximum at resonance does not exceed 8 Ohms! Balanced frequency response from 1,500 up to 22,000 Hz



Exceptional linear phase response up to 40 kHz. The h.d. is measured at 110 dB SPL!



The i. d. measurement is made at 90 dB SPL as well. Unusual low i. d. even at this high power level.

	filter slopes		
	18 dB/oct	12 dB/oct	6 dB/oct
measurement	linear	nonlinear	linear
amplitude	linear	nonlinear	linear
phase	nonlinear	nonlinear	linear
impuls	very bad	bad	good

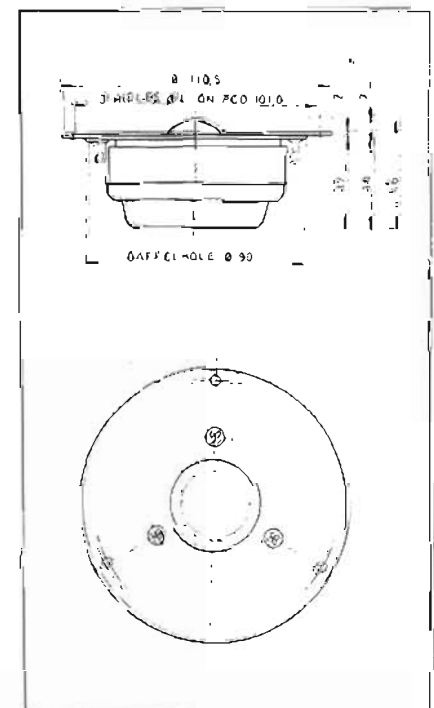
The more components a filter network has the more distortion of one or the other kind is produced. High quality components do less than average in this respect but they still do. 6 dB filters do need the lowest number of components and have ideal phase characteristic. Only if the speaker unit has a well damped resonance and soft roll-off in both ends 6 dB filters can be used

ALL DYNAUDIO drive units have soft roll-offs in both ends and a well damped resonance. They are for use of 6 dB filters for lowest distortion and excellent results.

Compliance:		Overall dimensions:		∅ 110 x 46	mm
suspension	C <sub>ms</sub>	-	Power handling:		
acoustic	C <sub>as</sub>	-	nominal	DIN 300	W
equivalent volume	V <sub>as</sub>	-	music	DIN 1.200	W
Cone:		transient		10 ms	1.000 W
eff. cone area	S <sub>D</sub>	8,5	Q-factor:		
moving mass	M <sub>ms</sub>	0,51	mechanical	Q <sub>ms</sub> 0,61	
lin. volume displacement	V <sub>d</sub>	6,0	electrical	Q <sub>es</sub> 1,11	
mech. resistance	R <sub>ms</sub>		total	Q <sub>ts</sub> 0,39	
lin. excursion	P-P X <sub>max</sub>	0,7	Resonance frequency free air f <sub>s</sub>	700	Hz
max. excursion	P-P	3,2	Sensitivity:	1W/1m 91	dB
* Frequency response:	f.000 - 30.000	Hz	Voice coil:		
Harmonic distortion:	0,6	%	diameter	d 28	mm
Intermodulation distortion:	0,1	%	length	l 3,2	mm
Magnetsystem:		layers		n 2	
total gap flux		340	inductance (1kHz)	L <sub>e</sub> 0,09	mH
flux density		1,53	nom. impedance	Z <sub>nc</sub> 8	Ω
gap energy		156	min. impedance	Z <sub>min</sub> 6,4	Ω
force factor	BxL	4,2	DC resistance	R <sub>e</sub> 5,3	Ω
air gap volume	V <sub>g</sub>	0,16			
air gap height		2,5			
air gap width		0,75			
Net weight:		0,55			kg

Data given are as after 30 hours of running

\* Depends on cabinet construction



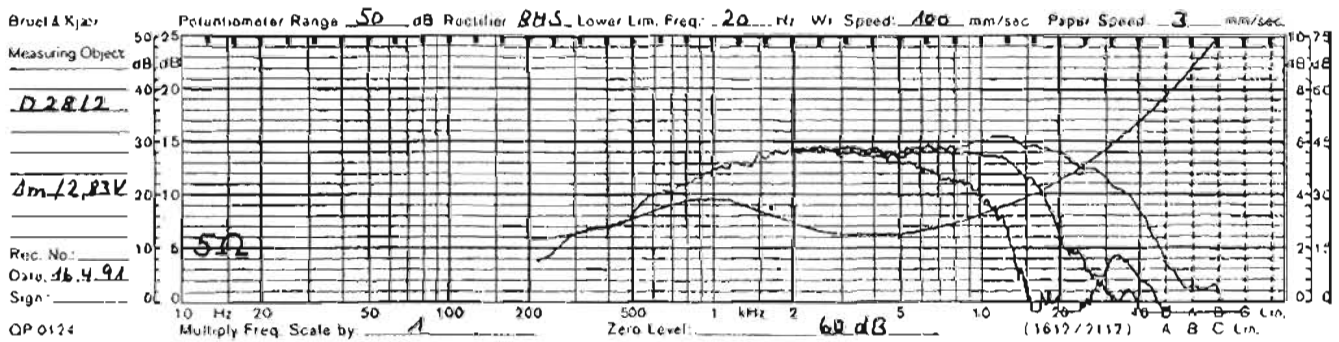
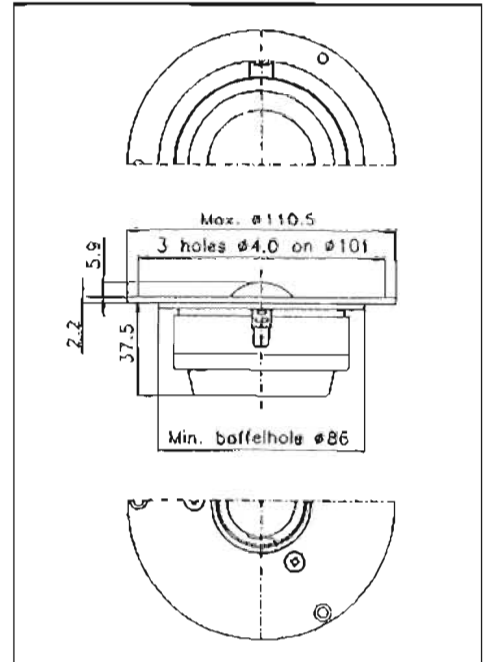
\* These small parameters are measured not statically but dynamically.

All specifications subject to change without notice

## Soft Dome Tweeter D-28/2

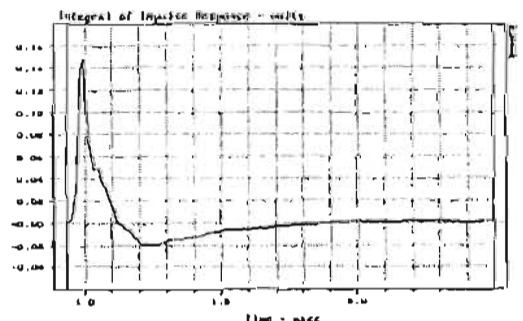
Produced for more than 14 years, the D-28 has now been revised in many details. The improvements relate to the acoustic-musical side as well as to the inside mechanics. In terms of technical datas and measurements the D-28/2 is fully compatible with its predecessor. The application of this soft dome tweeter in 2-way systems from app. 2,000 Hz is found in many prestigious brands and often with 6 dB crossover designs.

The D-28/2 is a perfect match for 3-way constructions as well. As proven by the measurements shown here, the dynamic response of this tweeter is simply outstanding. It fully documents the advantage of this professional designed soft-dome set against any other product.



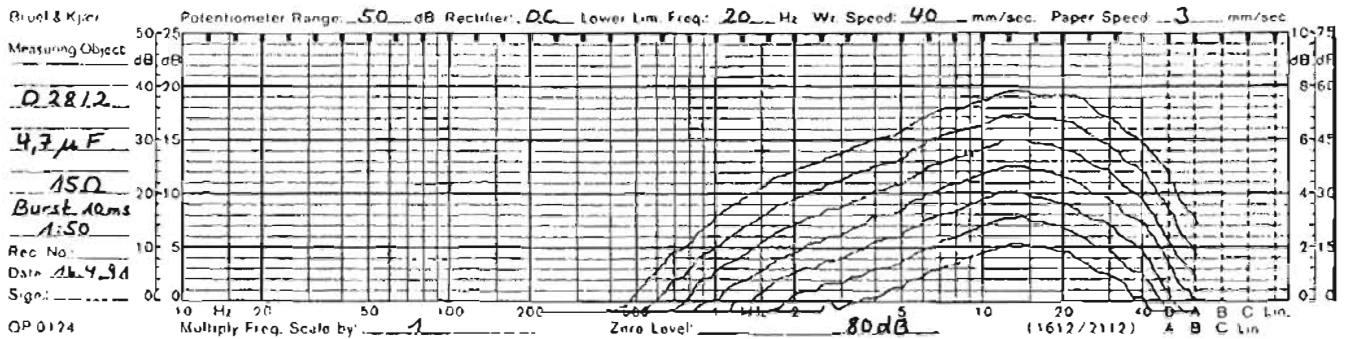
Frequency response and impedance curve of the D-28/2, distance: 1 m, on-axis, 30° and 60°.

The MLSSA measurements show the pulse response of the D-28/2.





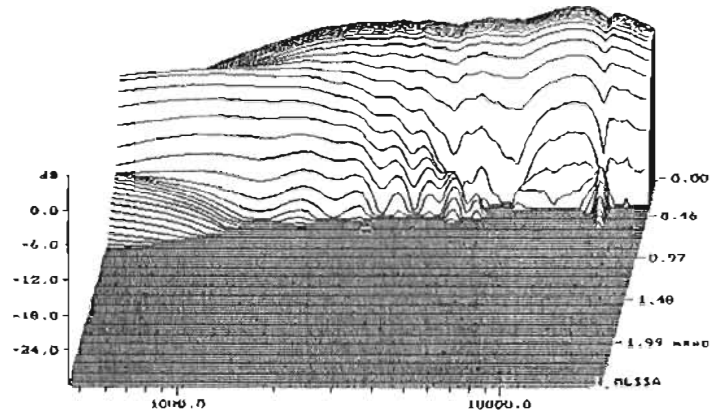
# Dynamic Measurements



Levels of 1, 3, 10, 30, 100, 300 and 1,000 watts were applied while recording the curves. The parallel arrangement of the curves indicates that even fast 1,000 W peaks do not produce any compression.

# MLSSA Waterfall Plot

The MLSSA cumulative spectral decay (waterfall) plot shows the energy/time response of the D-28/2. These unique results clearly show that delayed reflections have been reduced to a minimum.



# Specifications

## Thiele-Small Parameter:

Q, mechanical	$Q_{ms}$	0.71
Q, electrical	$Q_{es}$	0.97
Q, total	$Q_{ts}$	0.41
Resonance free air	$f_0$	880 Hz
force factor	$B \times L$	3.9 Tm
eff. cone area	$S_D$	7.7 cm <sup>2</sup>
moving mass	$M_{ms}$	0.53 g
lin. excursion (p-p)	$X_{max}$	0.3 mm
max. excursion (p-p)		3.2 mm

## Voice coil:

diameter	d	28 mm
length	h	2.8 mm
layers	n	2
inductance(10 KHz)	$L_v$	0.065
nom. impedance	$Z_{vc}$	8 ohms
DC resistance	$R_v$	5.2 ohms

**Sensitivity** 2.83 V see curve

## Power handling, depending on crossover:

nominal (long term)	IEC	130 W
transient	10ms	1,000 W

**Net weight** 560 g  
**Overall dimensions**  $\varnothing$  111 x 46mm

All specifications subject to change without notice.

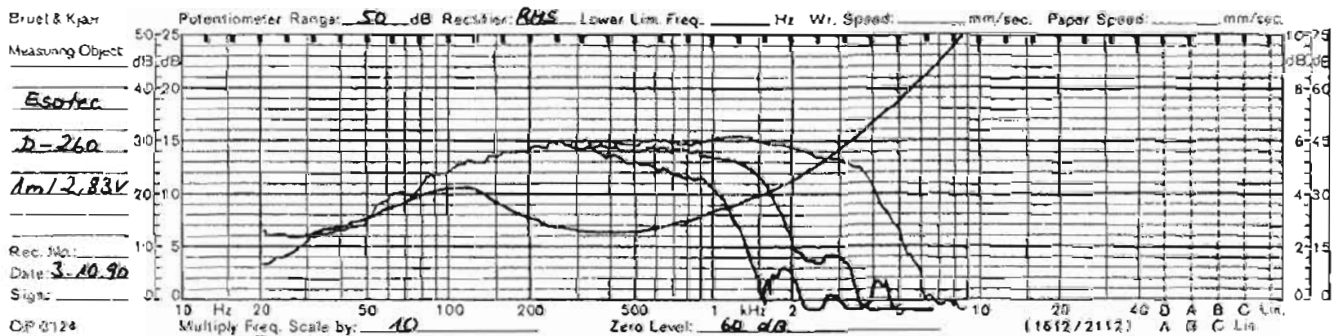
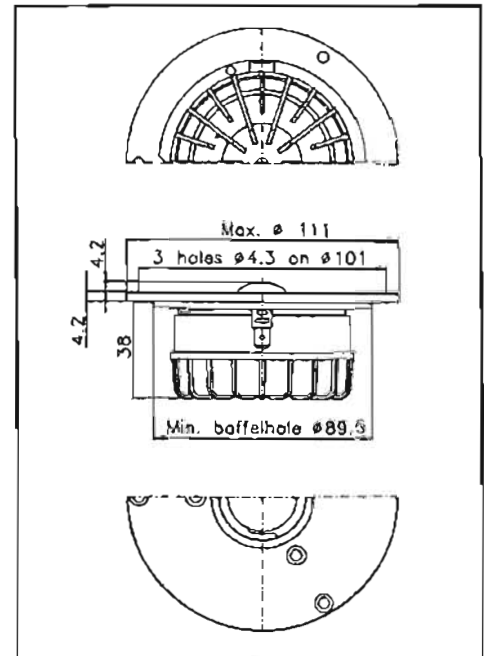
## Tweeter ESOTEC® D-260

The design of the ESOTEC® D-260 has capitalized on the experience and the numerous features which helped the famous ESOTAR® T-330 D acquire its legendary reputation.

The D-260 is equipped with a new Softdome for which a new coating process has been developed, too. Further improved damping characteristics are the result.

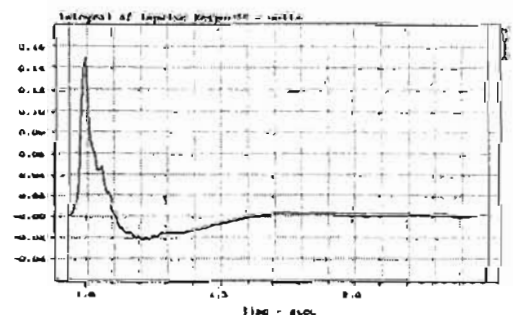
The design of the magnet system resembles a kind of transmission line enclosure. A special material reducing internal reflections has been used for any surface in the back of the diaphragm. Due to the well-defined densities of different kind of damping material a gradual absorption of the energy directed to the rear into the cone-shaped chamber is provided. The heavily ribbed rear chamber absorbs extraordinarily reliably any vibration attack from outside.

The front plate is made of cast aluminium (4 mm thick) featuring rugged bracings.



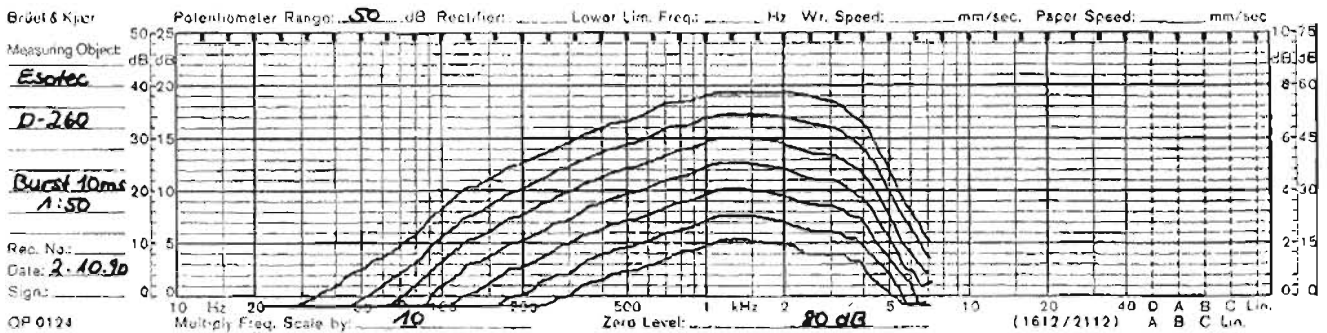
Frequency response and impedance curve ESOTEC® D-260, distance: 1 m, on-axis, 30° and 60°.

The MLSSA measurements show the pulse response of the ESOTEC® D-260. The ideal mechanical damping of the voice coil and the sophisticated acoustic damping of the rear chamber provide excellent decay characteristics.





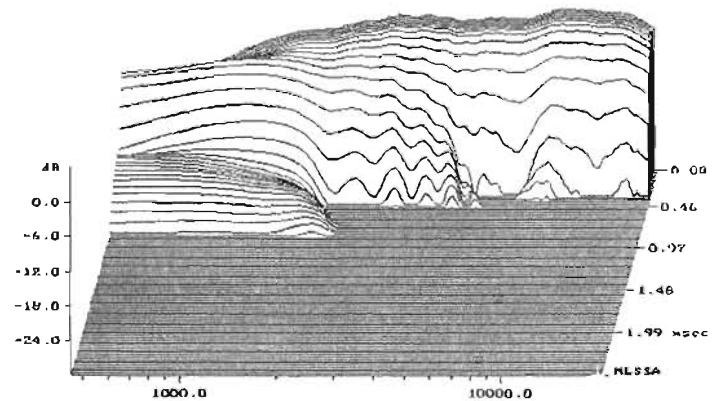
## Dynamic Measurements



Levels of 1, 3, 10, 30, 100, 300 and 1,000 watts were applied while recording the curves. The parallel arrangement of the curves indicates that even fast 1,000-W-peaks do not produce any compression.

## MLSSA Waterfall Plot

The MLSSA cumulative spectral decay (waterfall) plot shows the energy/time response of the ESOTEC® D-260. These fairly outstanding results clearly show that time delayed reflections have been reduced to a minimum.



## Specifications

### Thiele-Small Parameter:

Q, mechanical	$Q_{ms}$	0.83
Q, electrical	$Q_{es}$	1.14
Q, total	$Q_{ts}$	0.48
Resonance free air	$f_s$	1,000 Hz
force factor	$B \times L$	3.9 Tm
eff. cone area	$S_D$	7.7 cm <sup>2</sup>
moving mass	$M_{ms}$	0.51 g
lin. excursion (p-p)	$X_{max}$	0.3 mm
max. excursion (p-p)		3.2 mm

### Voice coil:

diameter	$d$	28 mm
length	$h$	2.8 mm
layers	$n$	2
inductance(1KHz)	$L_c$	0.063
nom. impedance	$Z_{vc}$	8 ohms
DC resistance	$R_c$	5.2 ohms

Sensitivity 2.83 V see curve

### Power handling,

depending on filter:		
nominal (long term)	IEC	130 W
transient	10ms	1000 W

Net weight 640 g

Overall dimensions 111 mm

All specifications subject to change without notice

## Product Information ESOTEC<sup>®</sup> D-260

### New Generation

The DYNAUDIO ESOTEC<sup>®</sup> D-260 is not just another off/spring of any existing model but an entirely new construction designated to be the basis of a new tweeter generation.

### Proven Basics

For more than 14 years the internationally acclaimed DYNAUDIO D-28 tweeter has been produced in ever increasing numbers and employed in the most renowned and expensive High End loudspeakers. Today there is no alternative technically as well as musically to a well tuned and optimized soft dome. Numerous new and exciting construction of tweeters have appeared during these past 14 years, but all of them have either disappeared or survive as exotic items only. The ESOTEC<sup>®</sup> D-260 is a soft dome.

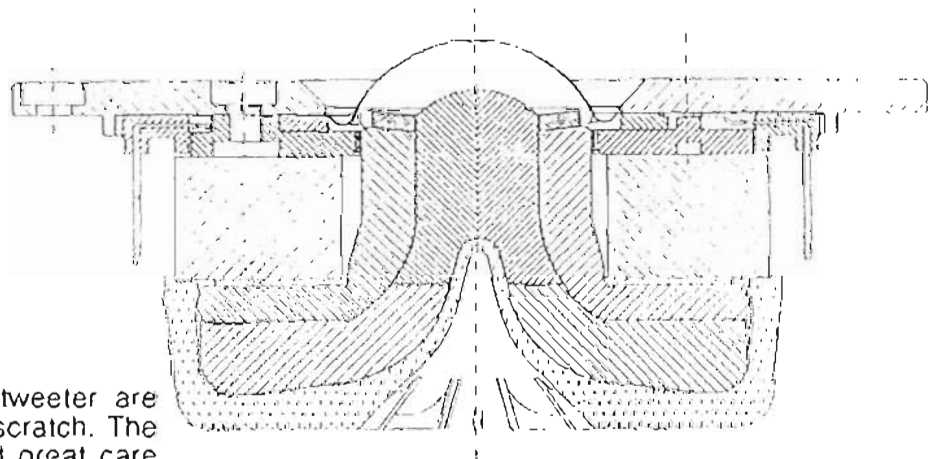
### Aiming High

A few years ago the ESOTAR<sup>®</sup> T-330 D was launched. It was soon recognized as a state-of-the-art item, which considerably upgraded the international standards for quality in high frequency transducers. The high price resulting from lavish use of material and labour made this driver out of reach for many potential customers. The target now was to create a new product integrating both the know-how obtained with the T-330 D and its outstanding properties in a unit within more popular price range.

### New Record

To reach this aim DYNAUDIO has invested considerably in both R & D and new tooling and machinery. This was the only way to reduce tolerances to an even lower level and still reach a given price target. On tooling and machinery alone for the ESOTEC<sup>®</sup> D-260 more than US \$ 500,000 was spent before the first product came off the production line.

### Rare Insight



All components of this tweeter are developed entirely from scratch. The cross section shows that great care has been given to every detail of the complicated inner construction.



## **Important Details**

Pole piece and back plate are made as one piece in a new process under very high pressure. Thus the precisely defined conical shape of the inner channel, which is of vital importance for the air flow area damping, is produced in one process. The back housing has been constructed to minimize any reflection by special shape and bracing. Also the pole plate is a new design. The dome with its bearing plate is centred on the pole plate by means of high-precision positioners. Heavy terminals are integrated in the bearing plate. Even for the front plate of the unit a new die cast was developed. The production of the soft dome itself is not based on existing tools, but a new geometric shape was constructed in accordance with our updated know-how.

## **In Pace**

The experience with the ESOTEC® T-330 D has impressively demonstrated the importance of the precise uniformity of drivers to the definition and imaging. Therefore all construction details are aimed at absolute uniformity of reproduction.

## **Optimized Absorption**

Apart from generally known parameters, technical priority was given to the perfect damping of the backwarded energy. With other tweeters a more or less heavy part of the energy is reflected by the pole piece resulting in heavy distortion of the transients. The internal labyrinth of the ESOTEC® D-260 absorbs all this energy. The plot of the MLSSA waterfall measurement shows clearly the ideal behaviour.

## **Inner Values**

All surfaces opposite the back of the dome are covered with absorbing materials. The centre-hole diameter of the pole piece increases towards the bottom piece. No parallel walls are found in the back housing, which points conically into this hole. Different damping materials of defined density in the vent opening and in the back housing result in a graduated absorption close to 100% of the backwarded energy in the dome movement.

## **The Bottom Line: The Achievement**

The unique quality of this construction is not so easy to demonstrate through conventional measurements of amplitude and frequency. Much more evident is the measurement of energy/time response. But most of the gains are evident in the musical qualities: resolution without any sharpness, dynamic without any aggressiveness are the outstanding qualities of the ESOTEC® D-260.

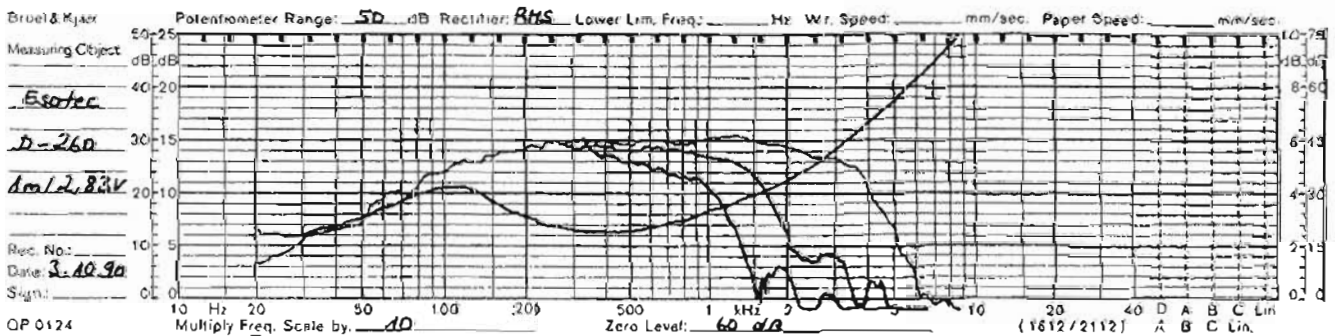
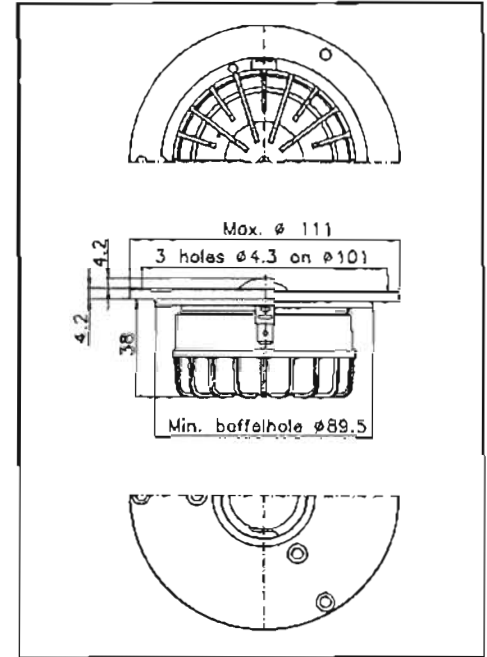
## Tweeter ESOTEC® D-260

The design of the ESOTEC® D-260 has capitalized on the experience and the numerous features which helped the famous ESOTAR® T-330 D acquire its legendary reputation.

The D-260 is equipped with a new Softdome for which a new coating process has been developed, too. Further improved damping characteristics are the result.

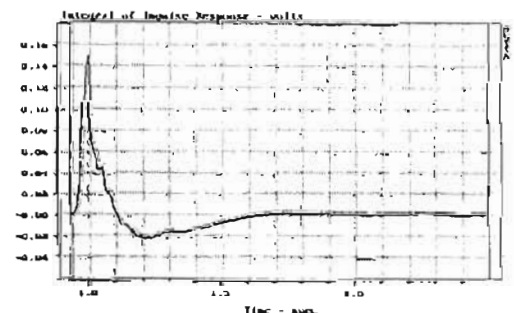
The design of the magnet system resembles a kind of transmission line enclosure. A special material reducing internal reflections has been used for any surface in the back of the diaphragm. Due to the well-defined densities of different kind of damping material a gradual absorption of the energy directed to the rear into the cone-shaped chamber is provided. The heavily ribbed rear chamber absorbs extraordinarily reliably any vibration attack from outside.

The front plate is made of cast aluminium (4 mm thick) featuring rugged bracings.



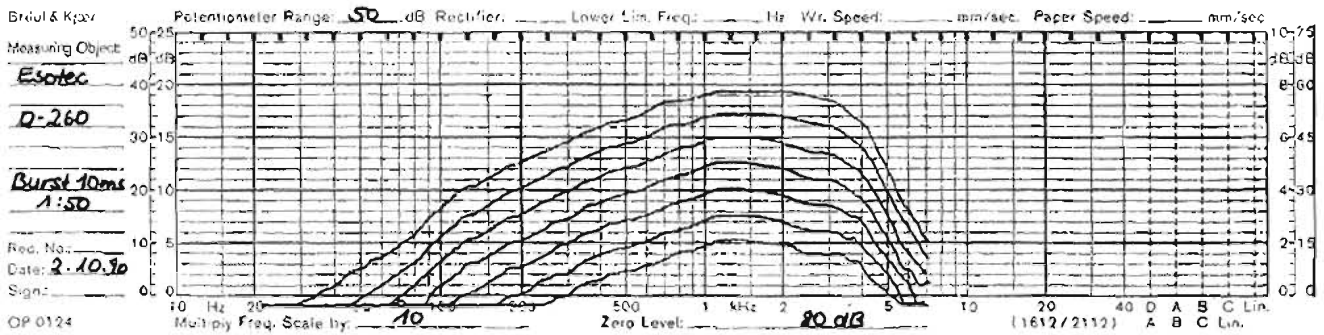
Frequency response and impedance curve ESOTEC® D-260, distance: 1 m, on-axis, 30° and 60°.

The MLSSA measurements show the pulse response of the ESOTEC® D-260. The ideal mechanical damping of the voice coil and the sophisticated acoustic damping of the rear chamber provide excellent decay characteristics.



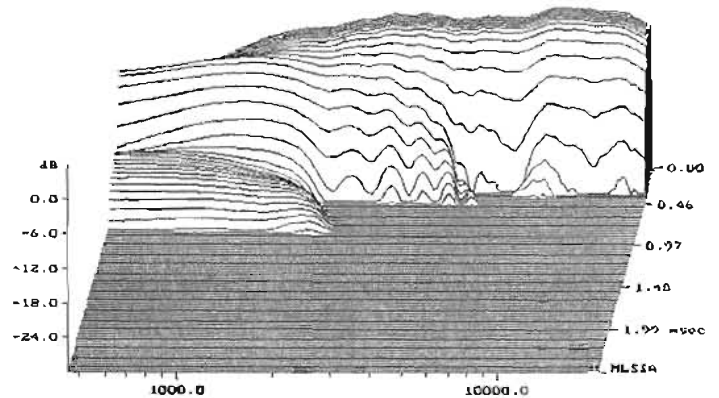


# Dynamic Measurements



Levels of 1, 3, 10, 30, 100, 300 and 1,000 watts were applied while recording the curves. The parallel arrangement of the curves indicates that even fast 1,000-W-peaks do not produce any compression.

# MLSSA Waterfall Plot



The MLSSA cumulative spectral decay (waterfall) plot shows the energy/time response of the ESOTEC® D-260. These fairly outstanding results clearly show that time delayed reflections have been reduced to a minimum.

# Specifications

## Thiele-Small Parameter:

Q, mechanical	$Q_{ms}$	0.83
Q, electrical	$Q_{es}$	1.14
Q, total	$Q_{ts}$	0.48
Resonance free air	$f_s$	1,000 Hz
force factor	$B \times L$	3.9 Tm
eff. cone area	$S_D$	7.7 cm <sup>2</sup>
moving mass	$M_{ms}$	0.51 g
lin. excursion (p-p)	$X_{max}$	0.3 mm
max. excursion (p-p)		3.2 mm

## Voice coil:

diameter	$d$	28 mm
length	$h$	2.8 mm
layers	$n$	2
inductance(1KHz)	$L_e$	0.063
nom. impedance	$Z_{vo}$	8 ohms
DC resistance	$R_e$	5.2 ohms

Sensitivity 2.83 V see curve

Power handling,  
depending on filter:  
nominal (long term)  
transient

IEC	130 W
10ms	1000 W

Net weight 640 g

Overall dimensions 111 mm

All specifications subject to change without notice

## Soft Dome Midrange ESOTAR® M-560 D

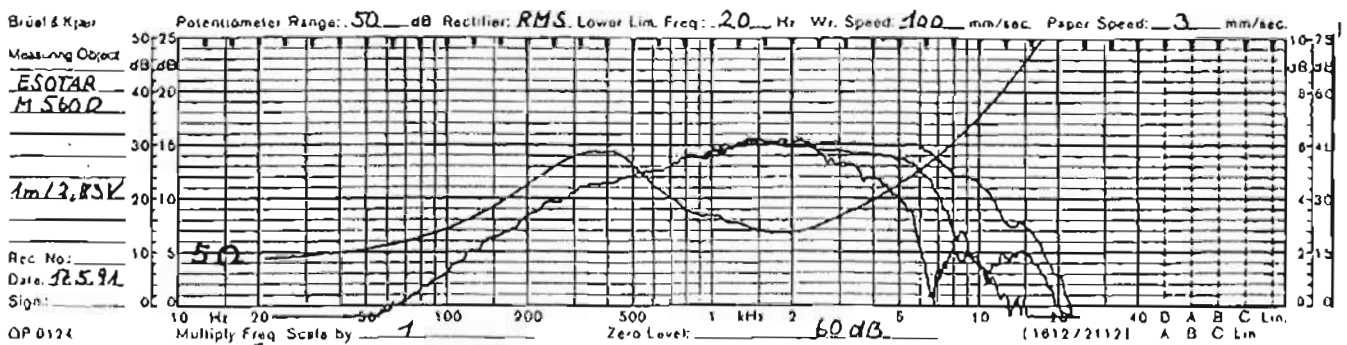
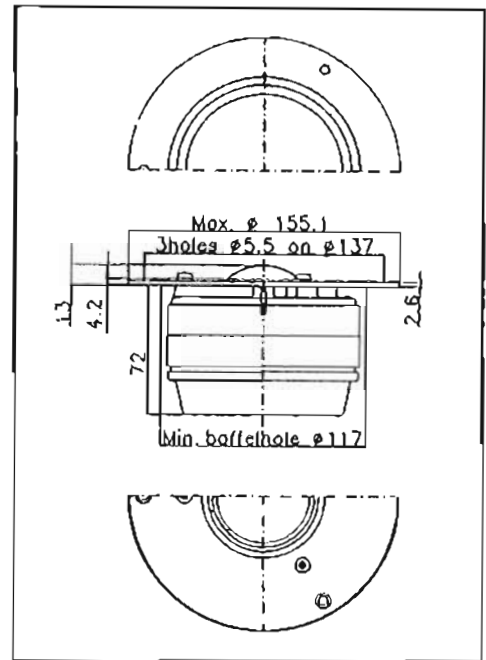
This soft dome midrange is the logical complementary to the world famous tweeter ESOTAR® T-330 D.

Many years of further research work was necessary to transfer the merits of this tweeter to this soft dome tweeter.

Extreme attention was given to the air flow behind the dome and inside the cavities. Experiments included rows of attempts under vacuum conditions as well. The result is a very special shape of the vent in the pole piece where air turbulences as well as reflexions are controlled now.

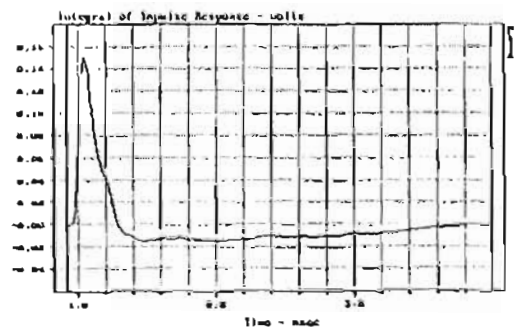
Hard dome material of course is more easy to produce and to work with, but once a soft dome has been designed and controlled correctly the results are superior due to lack of high resonance peaks.

The magnet system using heavy magnet rings is assembled with inhouse turned iron parts with lowest tolerances and the total construction is assembled under lab conditions. The ESOTAR® M-560 D is delivered by matched pairs only.



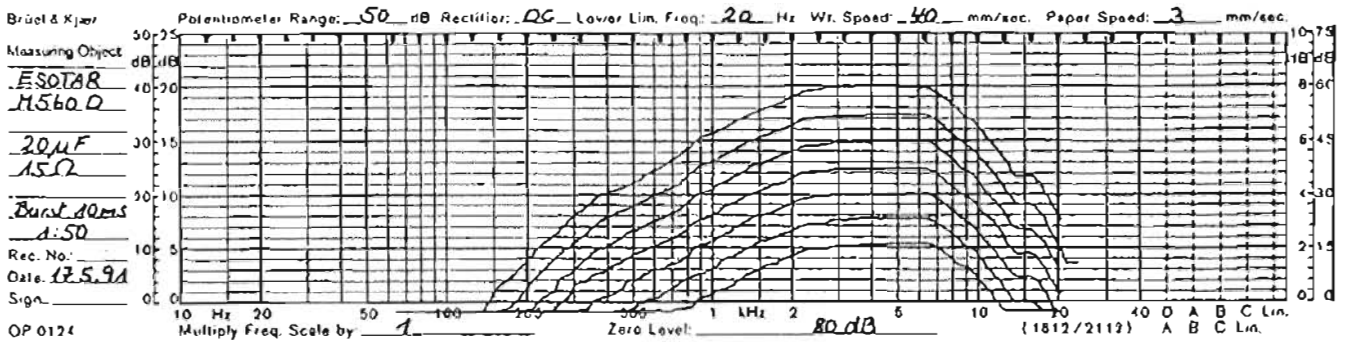
Frequency response and impedance curve of the ESOTAR® M-560 D on-axis, 30° and 60° (dist. 1 m).

The MLSSA measurements show the pulse response of the ESOTAR® M-560 D.





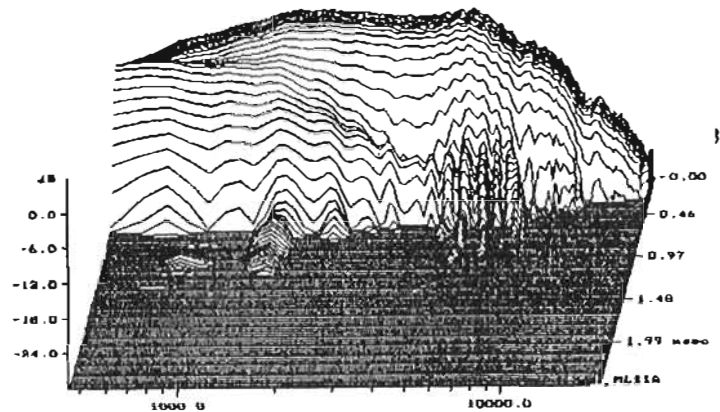
## Dynamic Measurements



Levels of 1, 3, 10, 30, 100, 300 and 1,000 watts were applied while recording the curves. The parallel arrangement of the curves indicates that even fast 1,000 watt peaks do not produce any compression. Signal: Tone-Burst 10 ms, Signal-Pause 1:50.

## MLSSA Waterfall Plot

The MLSSA cumulative spectral decay (waterfall) plot shows the energy/time response of the ESOTAR® M-560 D. These unique results clearly show that delayed reflections have been reduced to a minimum.



## Specifications ESOTAR® M-560 D

### Thiele-Small Parameter:

measured with Imp. corr. (6.8 ohms and 6.8 μF parallel):

Q, mechanical		
Q, electrical	$Q_{ms}$	0.85
Q, total	$Q_{ts}$	0.60
Resonance free air	$Q_{ia}$	0.35
force factor	$f_s$	325 Hz
eff. cone area	$B \times L$	6.75 Tm
moving mass	$S_D$	28 cm <sup>2</sup>
lin. excursion (p-p)	$M_{ms}$	3.1 g
max. excursion (p-p)	$X_{max}$	2 mm 5 mm

### Voice coil:

diameter	$d$	54 mm
length	$h$	7 mm
layers	$n$	2
inductance(10 KHz)	$L_c$	0.2
nom. impedance	$Z_{vo}$	8 ohms
DC resistance	$R_c$	4.5 ohms

Sensitivity 2.83 V see curve

### Power handling,

depending on crossover:		
nominal (long term)	IEC	>100 W
transient	10ms	>1000 W

Net weight 2400 g

Overall dimensions Ø 155 x 85 mm

All specifications subject to change without notice.

# DYNAUDIO®

TECHNOLOGY UNLIMITED



## APPLICATIONS

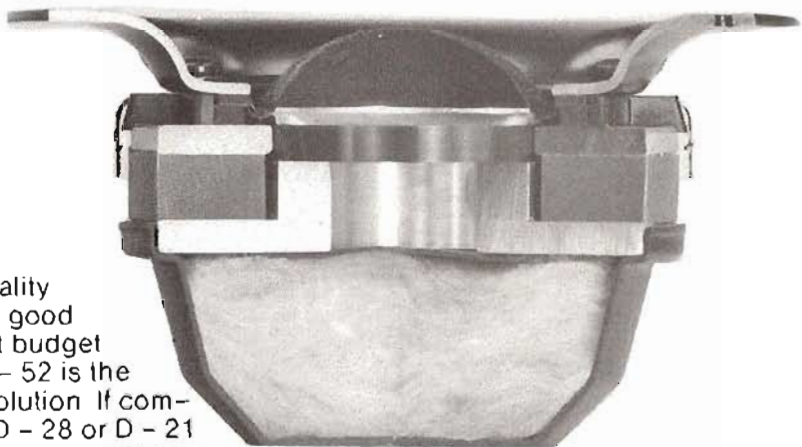
dome midrange  
for hifi systems  
500 Hz to 6000 Hz

good combination  
with D-28 and D-21  
or both

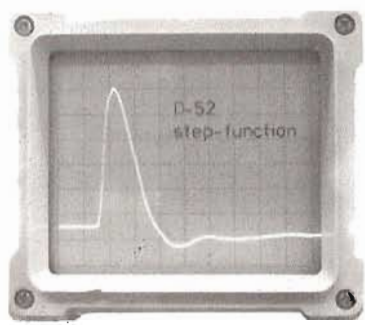
## FEATURES

- 54 mm soft dome
- vented magnet motor
- aperiodically damped
- soft-roll-off
- flexible connection wire
- Hexacoil technique
- Magnaflex damping/cooling

If the target is a high quality system with good efficiency at budget price the D - 52 is the midrange solution. If combined with D - 28 or D - 21 the phase is homogeneous which results in very good resolution and good balance. Of course all the known DYNAUDIO characteristics as high power handling, wide dynamic range etc are incorporated in the D-52.

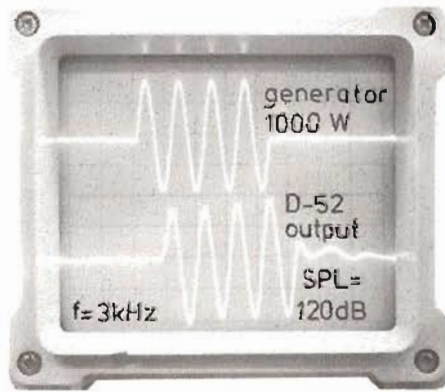
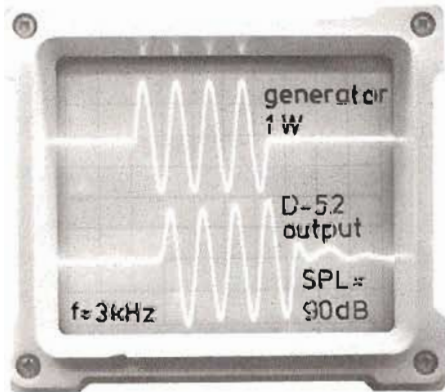


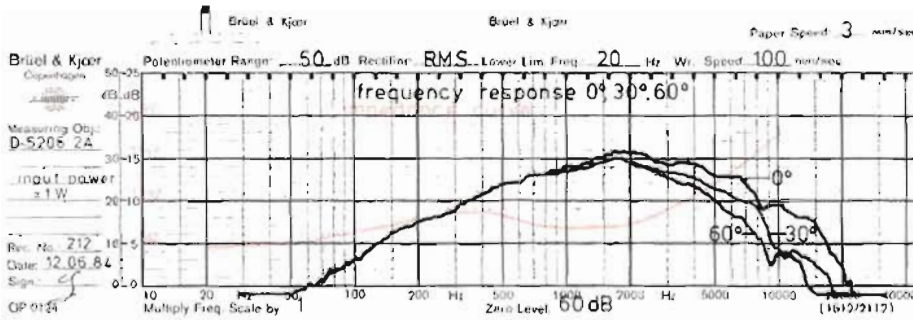
Already in 1969 our engineers did use the STEP - FUNCTION as a measuring method. Foreign drive units were used but the measuring results had been so disappointing that it was decided to start the development and production of speaker drivers. - The scope to the right shows that the work has lead close to the ideal.



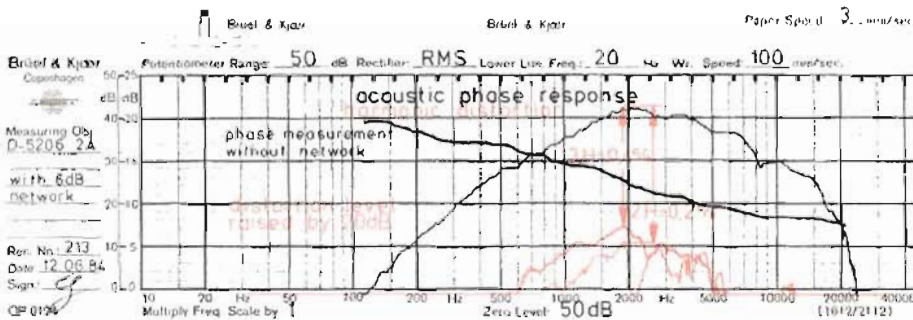
Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step funktion test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.

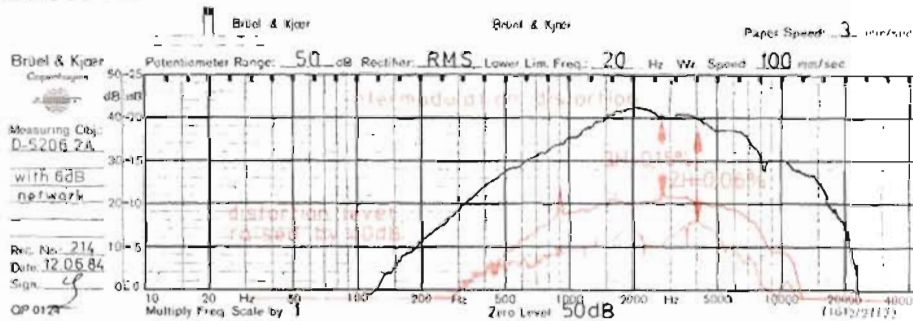




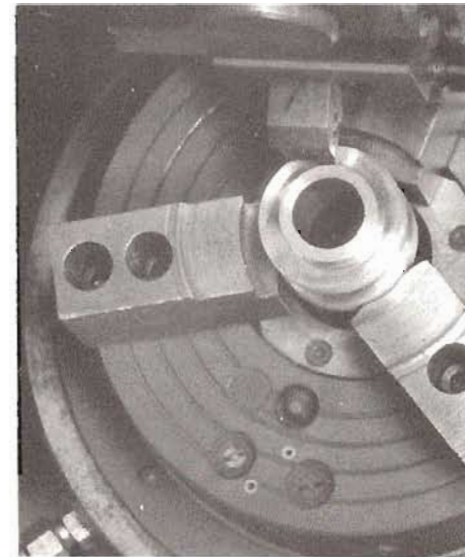
The dome shape of the frequency response curve is ideal for a mid-range driver as with 6 dB filters the results come out perfectly.



The acoustically measured phase runs as a straight line from 100 to 20.000 Hz.



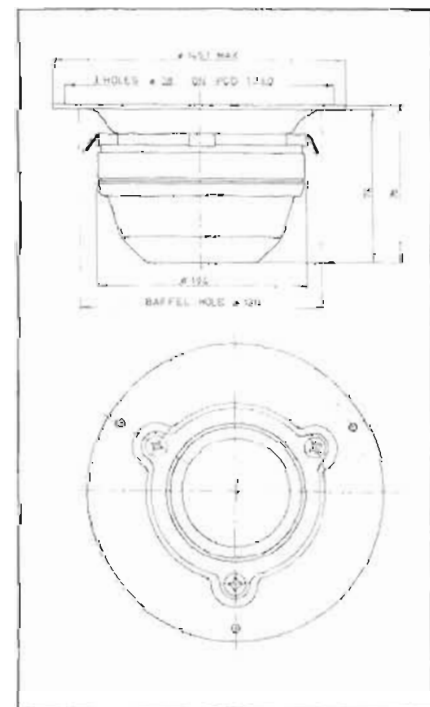
The I. D. curves are exceptional low and smooth. They had to be raised by 40 dB.



The iron parts of the Dynaudio magnet systems are not punched or caked but individually turned on CNC-machines. This is an important difference to bulk products. Because of the precision possible and the reliability our magnet systems are used i. e. as pumping motors in medical heart appliances.

Compliance		Overall dimensions:		145 x 78 mm	
suspension	Cms	Power handling:			
acoustic	Cas	nominal	DIN	200 W	
equivalent volume	Vas	music	DIN	800 W	
Cone:		transient	10ms	1000 W	
eff. cone area	SD	Q-factor:			
moving mass	Mms	mechanical	Qms	1,10	
lin. vol. displacement	Vd	electrical	Qes	1,03	
mech. resistance	Rms	total	Qts	0,53	
lin. excursion P-P	Xmax	Resonance frequency free air: fs		350 Hz	
max. excursion P-P		Sensitivity:		1 W / 1 m 92 dB	
Frequency response:	500 - 6000 Hz	Voice coil:			
Harmonic distortion:	≈ 0,4%	diameter	d	54 mm	
Intermodulation distortion:	≈ 0,15%	length	h	7 mm	
Magnetsystem:		layers	n	2	
total gap flux	960 μWb	inductance (1 kHz)	Le	0,07 mH	
flux density	1,15 Tesla	nom. impedance	Zvc	8 Ω	
gap energy	465 mWs	min. impedance	Zmin	6,4 Ω	
force factor	B x L 6,4 Tm	DC resistance	Re	4,6 Ω	
air gap volume	Vg 0,88 cm³	Data given are as after 30 hours of running			
air gap height	5 mm	*Depends on cabinet construction			
air gap width	1,05 mm				
Net weight:	1200 g				

► These / Small parameters are measured not statically but dynamically.





# DYNAUDIO®

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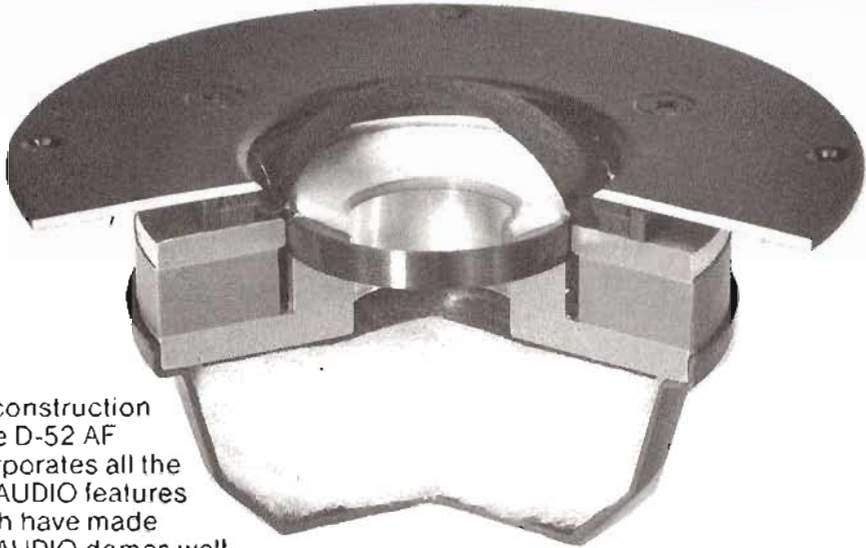
D-52 AF

## APPLICATIONS

2" (54 mm) midrange  
soft dome  
500 to 5000 Hz  
HiFi Systems  
PA and commercial use

## FEATURES

high power handling  
wide dispersion  
low THD  
smooth frequency response  
aperiodically damped  
Hexacoil technique  
Magnaflex damping/cooling  
vented magnet motor



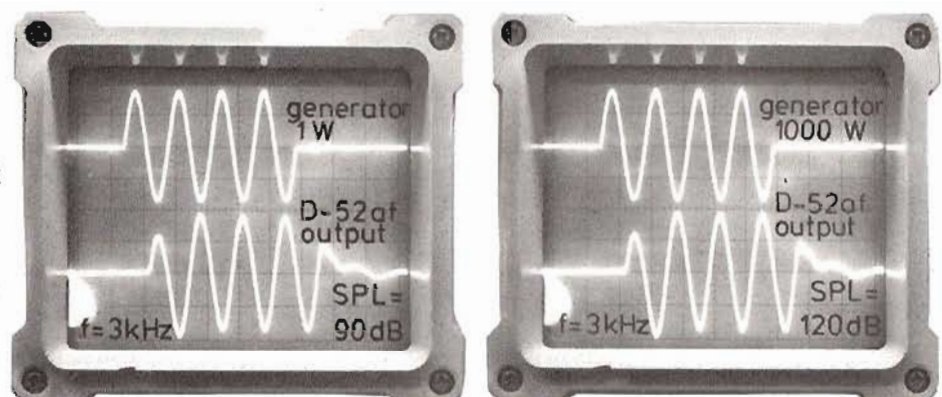
The construction of the D-52 AF incorporates all the DYNAUDIO features which have made DYNAUDIO domes well known worldwide. - The resonance is well damped below each critical point so the unit may be used even in this area without creating sharpness or any kind of phase problems. In respect to the price/feature relation the D-52 AF is quite inexpensive

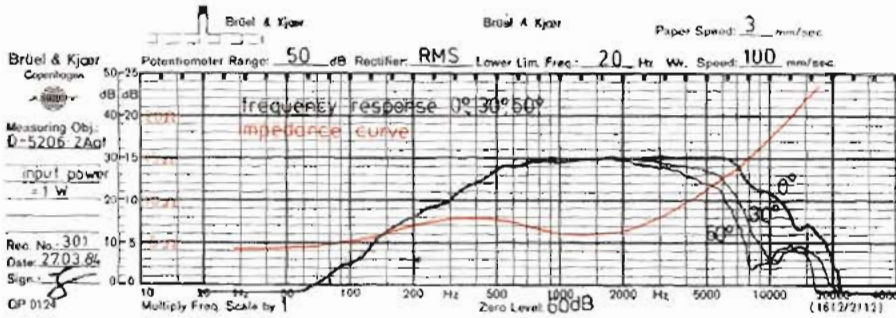
The STEP FUNCTION should be much more popular than it is today as it is one of the most important tools for development of high quality speakers. The rise of the D-52 AF shown on the screen to the right is clean, also in acceleration and deceleration phase. The aperiodic damping of the unit results in a slope without any peak or bump or afterswinging.



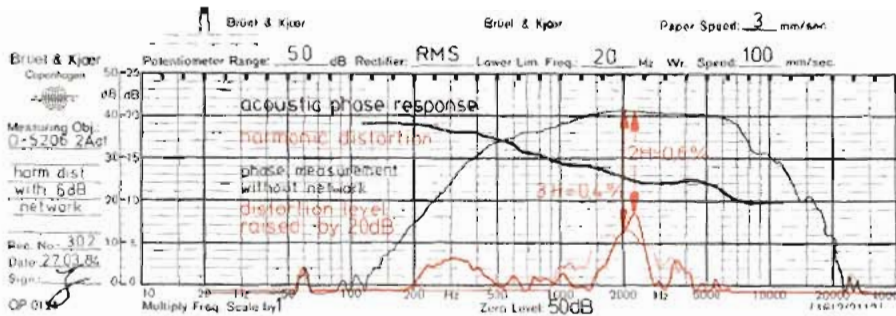
Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.

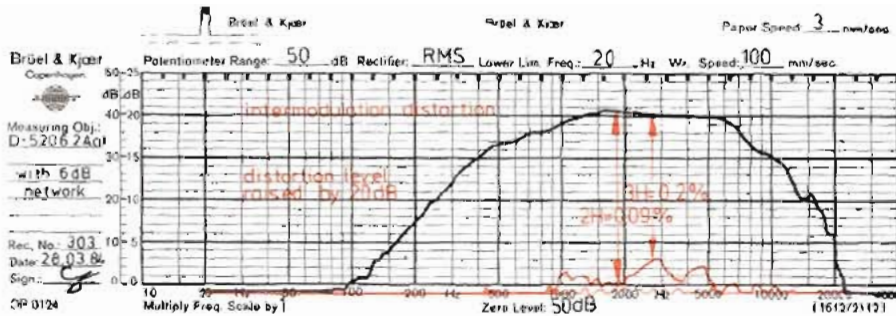




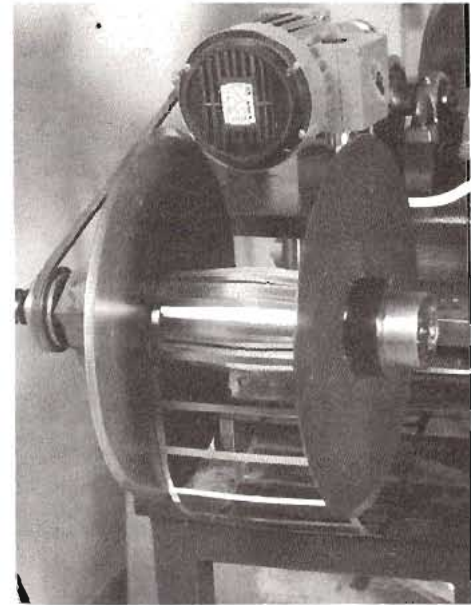
The curve indicates wide dispersion and smooth dropping at both ends which is the correct behaviour of a midrange.



Breakup of diaphragm not measurable. The acoustical phase is as straight as aruler.



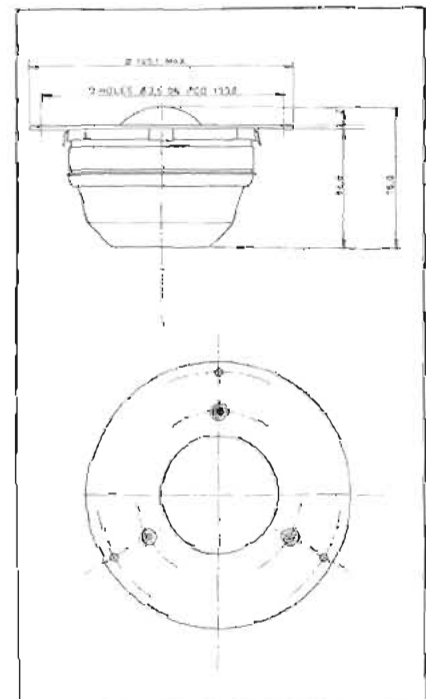
These figures and dates prove that the soft dome is today's ultimate material



Normal suppliers often are unable to fill our quality demands, so we were forced to build our own machinery for production of various important key parts. As we are making all the voice coils in the hexacoil technique we have to make even the aluminium former at our factory. This is a must to secure the high quality standard.

Compliance:		Overall dimensions:	∅ 145 x 78	mm		
suspension	Cms	Power handling:				
acoustic	Cas	nominal	DIN 200	W		
equivalent volume	Vas	music	DIN 800	W		
Cone:		transient	10 ms	1000 W		
eff. cone area	S <sub>D</sub>	28	cm <sup>2</sup>	Q-factor:		
moving mass	M <sub>ms</sub>	2.78	g	mechanical	Q <sub>ms</sub>	1.10
lin. volume displacement	V <sub>d</sub>	8.4	cm <sup>3</sup>	electrical	Q <sub>es</sub>	1.03
mech. resistance	R <sub>ms</sub>	3.0	mm	total	Q <sub>ts</sub>	0.53
lin. excursion P-P	X <sub>max</sub>	5.0	mm	Resonance frequency free air: f <sub>s</sub>		350 Hz
max. excursion P-P				Sensitivity	1W/1m	91 dB
*Frequency response:	400-8000	Hz		Voice coil:		
Harmonic distortion:	< 0.4	%		diameter	d	54 mm
Intermodulation distortion:	< 0.2	%		length	h	7 mm
Magnetsystem:				layers	n	2 mm
total gap flux		980	µWb	inductance (1 kHz)	L <sub>e</sub>	0.07 mH
flux density		1.15	Tesla	nom. impedance	Z <sub>cv</sub>	8 Ω
gap energy		465	mWs	min. impedance	Z <sub>min</sub>	6.4 Ω
force factor	BxL	6.4	Tm	DC resistance	R <sub>e</sub>	4.6 Ω
air-gap volume	V <sub>g</sub>	0.88	cm <sup>3</sup>	Data given as at		after 30 hours of running
air gap height		5	mm	*Depends on cabinet construction		
air gap width		1.05	mm			
Net weight:		1.2	kg			

\* Thiele/Small parameters are measured not statically but dynamically





# DYNAUDIO®

TECHNOLOGY UNLIMITED



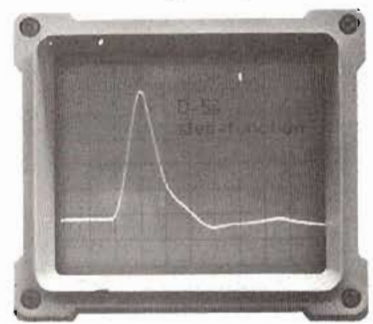
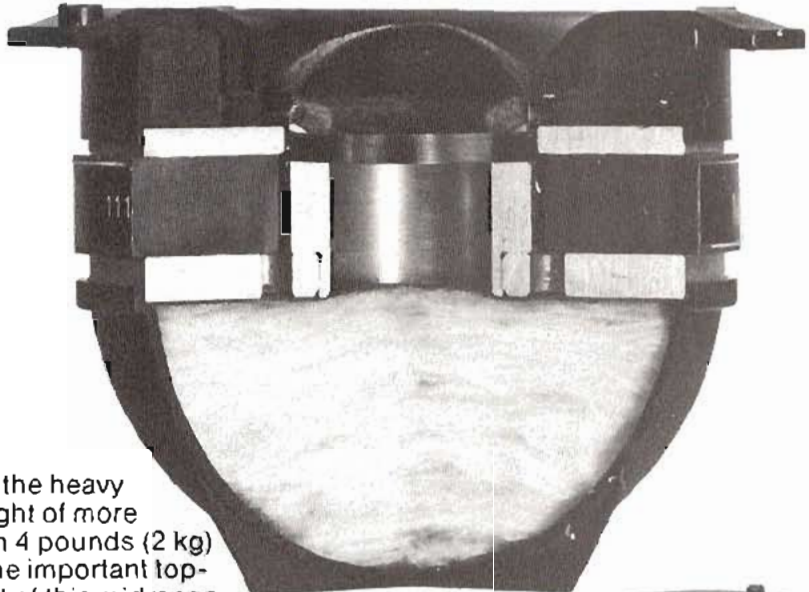
## APPLICATIONS

dome midrange for  
3-, 4- and 5-way-  
systems  
HiFi-midrange for  
PA and commercial  
use

## FEATURES

Soft dome type  
very high sensitivity  
high power handling  
no compression  
soft-roll-off  
suspension  
aperiodically damped  
vented magnet motor  
Magnaflex damping/  
cooling  
phase adjusted with  
D-28 and D-21

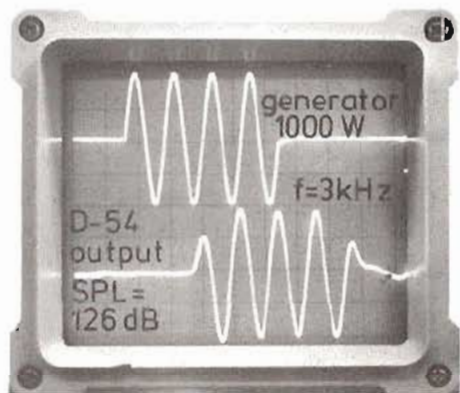
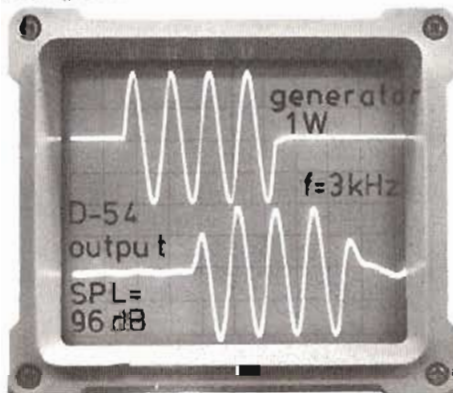
Not the heavy weight of more than 4 pounds (2 kg) is the important top-light of this midrange but the material together with the construction features made this type the most advanced unit: vented voice coil, maximum magnet power with 1200 uWb flux, separately damped back air volume. Not only in top high fidelity systems but more and more also in commercial systems the D-54 is used as it produces SPL's of more than 130 dB without compressions and extremely low THD.



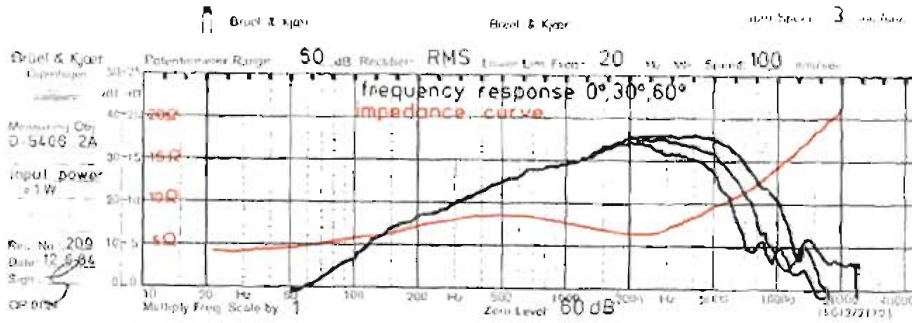
The STEP-FUNCTION of the D-54 is unusual clean. The rise indicates no break, the down slope is close to the ideal of an exponential function. No distortion or overshoot is to be noted.

Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil! With a given frequency the SPL should be 30 dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values

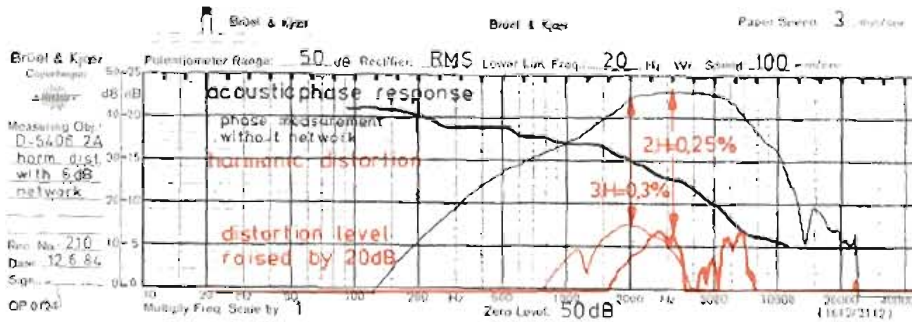
This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.



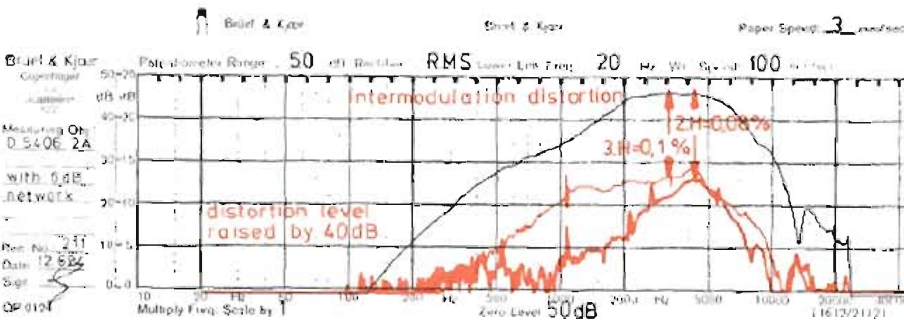




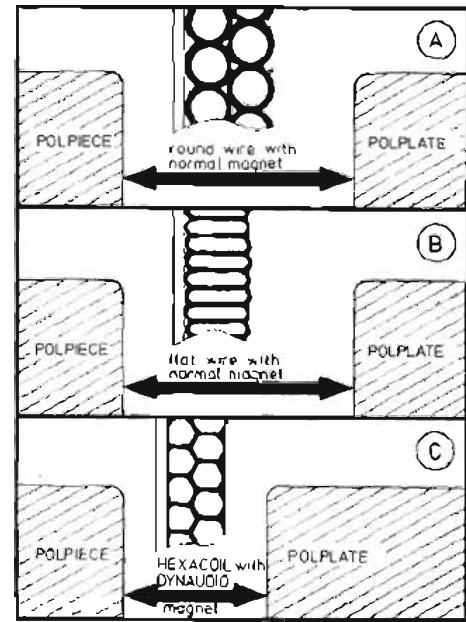
Usable from 800 Hz. Well damped resonance. No impedance peak. Off-axis curves run parallel without jumps.



Low harmonic distortions, even at high SPL. The acoustic phase keeps smooth also beyond operating area.



The intermodulation distortions are very low not only around 3 kHz but also at the low end.



Schematic drawing: airgap of a usual magnet system with stamped pole pieces. A) with conventional V.C., B) with a flat wire V.C., picture C) shows a V.C. in hexacoil technique and precision turned pole pieces

The power of a magnet motor is not only depending on size of magnet or internal filling factor of the V.C. but also on width of air gap because air leads the magnetic power quite bad - 2000 times less than iron. A narrow air gap may be obtained by making the pole pieces on a precision turning machine. All DYNAUDIO pole pieces are made like this. The result is more power, more energy, more dynamic.

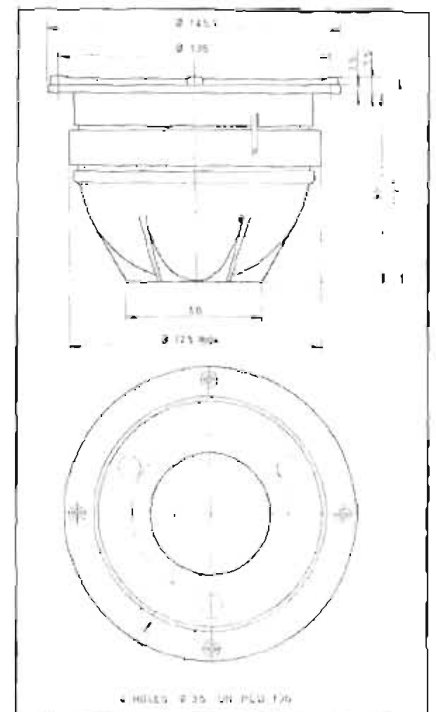
Compliance:			Overall dimensions:	145 x 103 mm
suspension	Cms	-	Power handling:	
acoustic	Cas	-	* nominal	DIN 250 W
equivalent volume	Vas	-	* music	DIN 1000 W
Cone:			transient	10 ms 1000 W
eff. cone area	SD	28 cm <sup>2</sup>	Q-factor:	
moving mass	Mms	2,78 g	mechanical	Oms 1,00
lin. vol. displacement	Vd	8,4 cm <sup>3</sup>	electrical	Qes 0,56
mech. resistance	Rms	-	total	Qts 0,36
lin. excursion	P-P Xmax	3,0 mm	Resonance frequency free air: fs	350 Hz
max. excursion	P-P	5,0 mm		
* Frequency response:		800 - 7000 Hz	Sensitivity:	1 W / 1 m 96 dB
Harmonic distortion:		< 0,3%	Voice coil:	
Intermodulation distortion:		< 0,1%	diameter	d 54 mm
Magnetsystem:			length	h 7 mm
total gap flux		1200 μ Wb	layers	n 2
flux density		1,45 Tesla	inductance (1 kHz)	Le 0,07 mH
gap energy		710 mWs	nom. impedance	Zvc 8 Ω
force factor	B x L	8,1 Tm	min. impedance	Zmin 6,4 Ω
air gap volume	Vg	0,88 cm <sup>3</sup>	DC resistance	Re 4,6 Ω
air gap height		5 mm		
air gap width		1,05 mm		

Data given are as after 30 hours of running

\* Depends on cabinet construction

\* Thiele/Small parameters are measured not statically but dynamically.

All specifications subject to change without notice



# DYNAUDIO<sup>®</sup>

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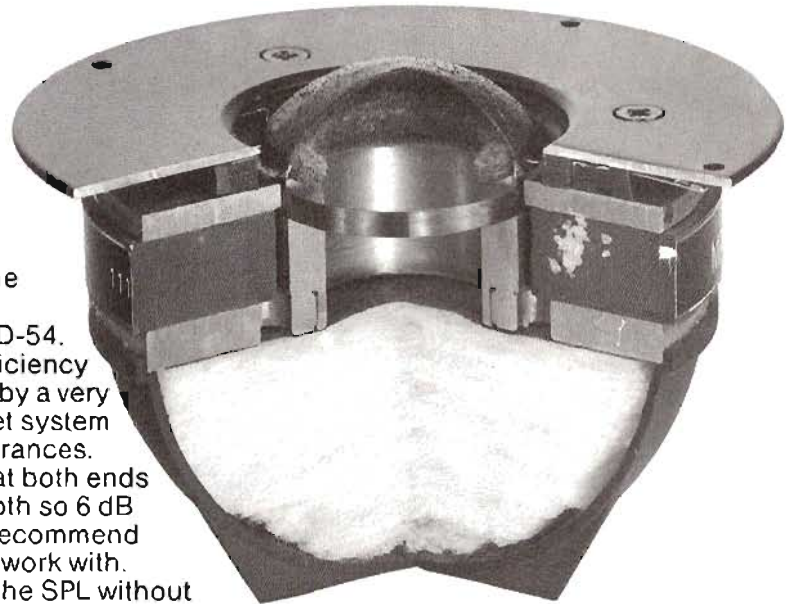


## APPLICATIONS

2" soft dome midrange  
for high efficient  
3-, 4- and 5-way  
systems  
mobile sound  
hifi-PA  
different face plates  
for OEM

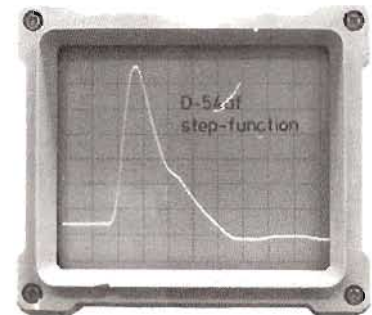
## FEATURES

fabric diaphragm doped  
soft roll-off  
suspension  
flexible copper cords  
HEXACOIL technique  
very high power hand-  
ling  
huge magnet system  
MAGNAFLEX liquid  
cooling  
ideal phase  
characteristic  
wide dispersion  
aperiodic damped double  
chamber enclosure



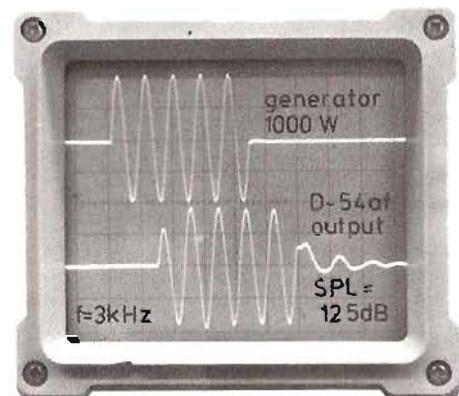
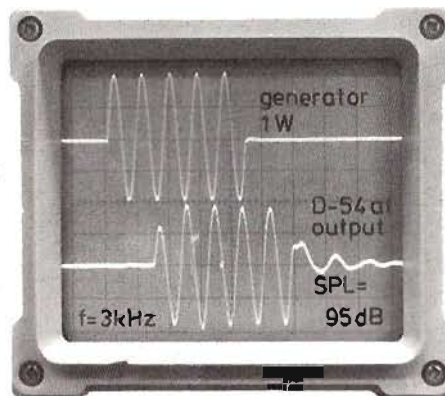
This is the flush mount version of the well known DYNAUDIO D-54. The high efficiency is achieved by a very large magnet system and low tolerances. The roll-off at both ends is very smooth so 6 dB slopes are recommend and easy to work with. The limit of the SPL without ringing and overshoots is beyond the limit of our test equipment with 127 dB. No compression can be observed. The venting of the magnetsystem is aerodynamically designed to avoid internal reflexions. The good dispersion, the excellent transient response and the ideal phase allow very good resolution and image characteristic.

For the speaker pros the STEP FUNCTION is the most important measurement. The correct designed damping (double chamber, magnet size, magnaflex) leads to a first class step function curve: no ringing, not overshoot, no dangling.

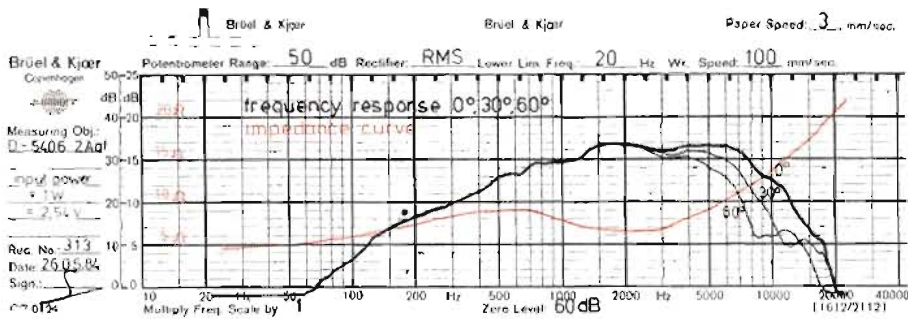


Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

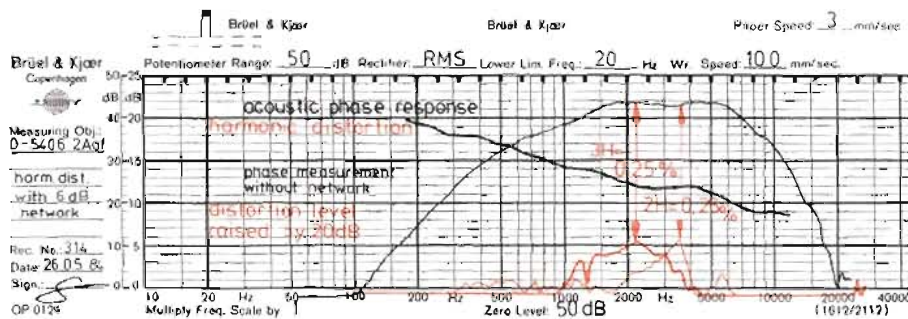
This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.



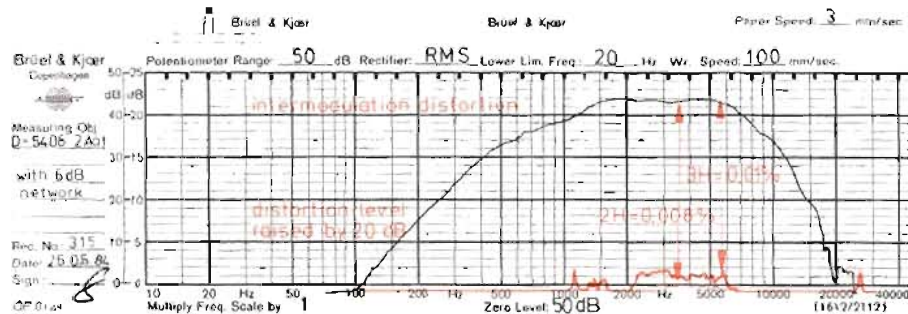




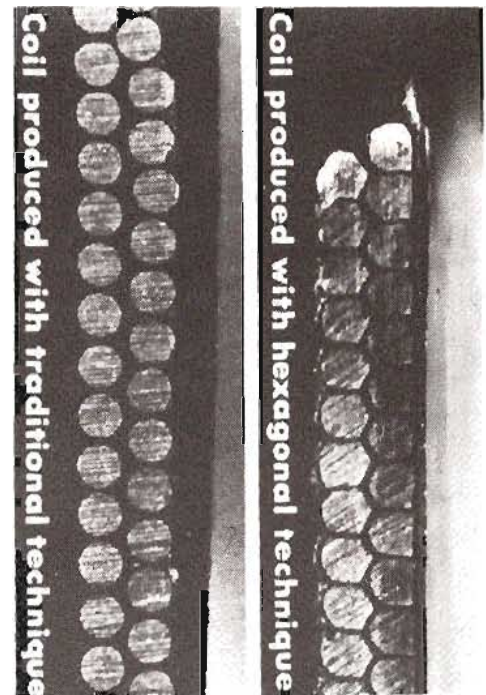
Significant flat impedance curve. Slope characteristics equal at 30° and 60° Easy filter design.



The acoustic phase proves the unproblematic handling of this midrange driver.



The sensitive spectrum of human voice requires distortionless response as shown here.



The cut of a HEXACOIL shows the honeycomb structure: high density of layers, intimate geared contact with the former which in return gives high grade packing for less width of air gap, fast heat dissipation, rigidity and strength of the voice coil. The power handling is many times higher than that of a conventional coil. All DYNAUDIO voice coils are made in HEXACOIL technique. (U. S. pat.)

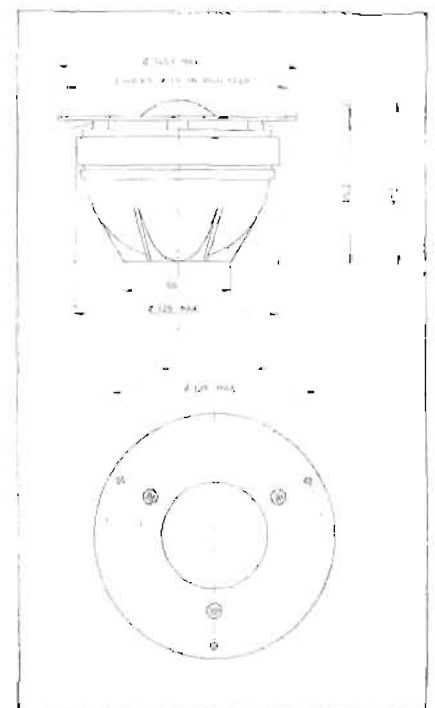
Compliance:		Overall dimensions:		ø 145 x 100	mm
suspension	C <sub>ms</sub>	-	Power handling		
acoustic	C <sub>as</sub>	-	nominal	DIN 250	W
equivalent volume	V <sub>as</sub>	-	music	DIN 1000	W
			transient	10 ms	1000 W
Cone:		Q-factor:			
eff. cone area	S <sub>D</sub>	28	mechanical	O <sub>ms</sub>	1,00
moving mass	M <sub>ms</sub>	2,78	electrical	Q <sub>es</sub>	0,56
lin. volume displacement	V <sub>d</sub>	8,4	total	Q <sub>ts</sub>	0,36
mech. resistance	R <sub>ms</sub>		Resonance frequency free air, f <sub>s</sub>		350 Hz
lin. excursion P-P	X <sub>max</sub>	3,0	Sensitivity	IW/lm	94 dB
max. excursion P-P		5,0	Voice coil:		
Frequency response:		500-9000 Hz	diameter	d	54 mm
Harmonic distortion:		< 0,25 %	length	h	7 mm
Intermodulation distortion:		< 0,01 %	layers	n	2
Magnetsystem:			inductance (1 kHz)	L <sub>e</sub>	0,07 mH
total gap flux		1200 μWb	nom. impedance	Z <sub>vc</sub>	8 Ω
flux density		1,45 Tesla	min. impedance	Z <sub>min</sub>	6,4 Ω
gap energy		710 mWs	DC resistance	R <sub>e</sub>	4,6 Ω
force factor	B x L	8,1 Tm			
air gap volume	V <sub>g</sub>	0,88 cm <sup>3</sup>			
air gap height		5 mm			
air gap width		0,105 mm			
Net weight:		1,95 kg			

Data given are as after 30 hours of running

\*Depends on cabinet construction

\* Thiele/Small parameters are measured not statically but dynamically

All specifications subject to change without notice





# DYNAUDIO®

TECHNOLOGY UNLIMITED

D-76

## APPLICATIONS

Soft dome for midrange with very low crossover point (300 Hz)

In 3-way combination with DYNAUDIO D-21 or 4-way with D-28 and D-21

## FEATURES

3"/75 mm soft dome center-magnet system  
roll-off suspension  
aperiodically-damped dome movement by center vented system and damped enclosure  
high power handling  
3"/75 mm voice coil  
flexible copper connectors  
hexacoil technique

The soft dome construction is the ultimate for midrange and high-frequency radiation. It combines a large and homogeneous dispersion pattern and high dynamic levels without compression or non-linearity.

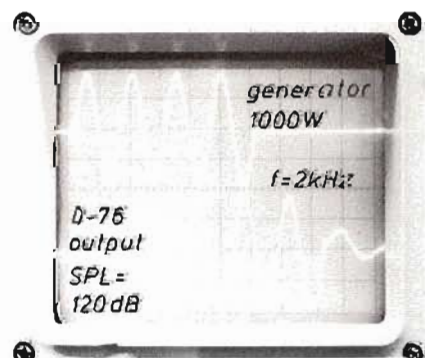
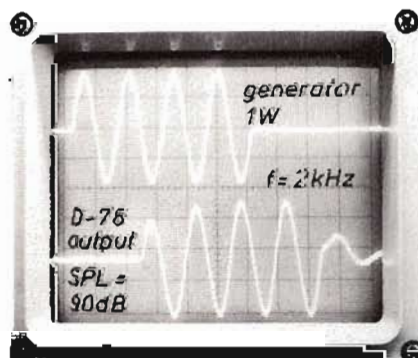
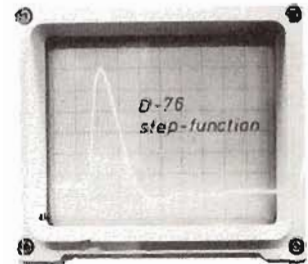
Normally the lower end of a soft midrange dome is restricted to 500 Hz or up in order to avoid instability.

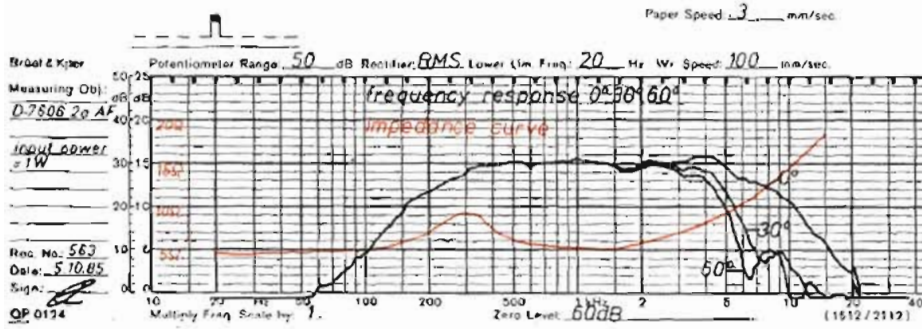
The D 76 shows that research, choice of material and a high production standard can break conventional barriers. The D 76 does not become directional nor is showing partial break ups and eliminates delicate crossing in the range of the human voice.

There are different ways to judge the quality of a speaker. The step function is a common method of measuring the quality of amplifiers as it gives a picture of all frequencies at once. It is astonishing that this method is used by virtually no speaker manufacturer, as with some experience many details are made visible.

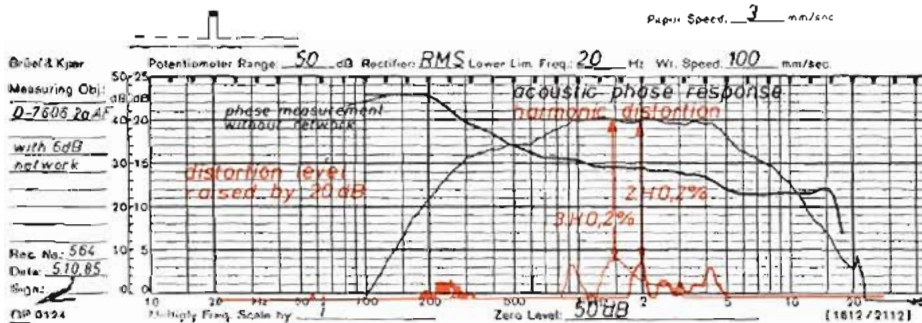
TONE BURSTS are the best way to obtain accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing — which shows much more clearly with a step function test! With a tone burst, all the moving parts of speaker can be loaded without burning the voice coil. With given frequency the SPL should be 30 dB higher at 1000 W input compared with a 1 W input, if output is linear. This test shows driver's ability to reproduce the transients without compression. Right picture shows that even 1000 W input is not the limit: the dynamic response is absolutely linear. Datas given in catalogues (and even test reports) normally are calculated figures and not measured values.

This compression effect is either under-rated or ignored very often. Many speakers do not produce SPD's above 100 dB, despite higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.

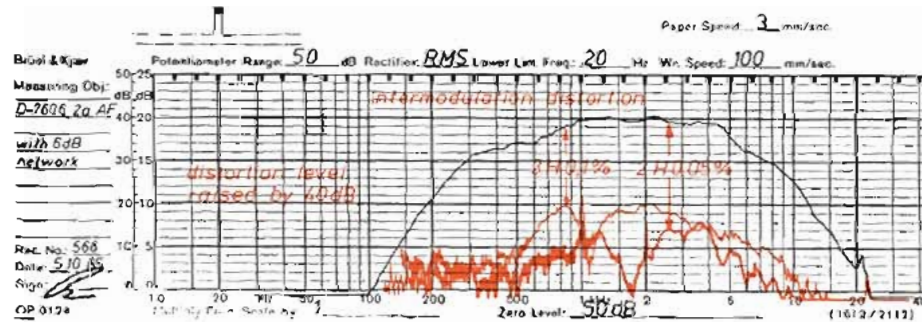




Extremely wide usable range - full output from 300 Hz. The off-axis curves mean wide dispersion angles without phase errors.



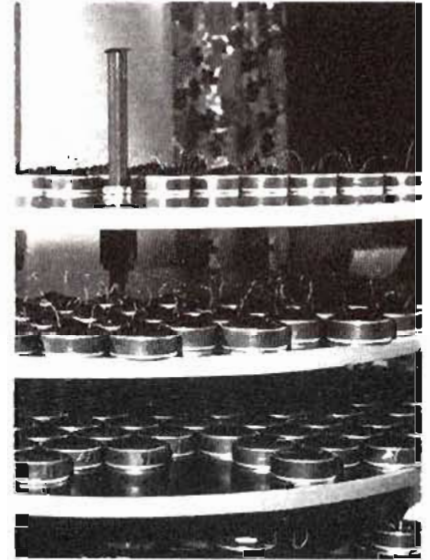
Phase linear even around resonance frequency 50 dB. Therefore ideal crossover network (6 dB slope) at 300 Hz may be employed. Low harmonic distortion and linear phasing.



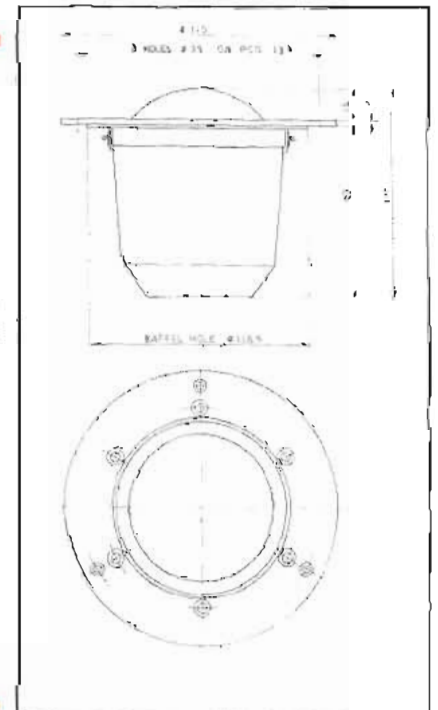
The intermodulation is so low it has been amplified by 40 dB on this curve in order to visualize it.

Compliance:		Overall dimensions:		145 x 110 mm
suspension	Cms	$10^{-3}$ m/N	Power handling:	
acoustic	Cas	$10^{-65}$ m <sup>5</sup> /N	nominal	DIN 180 W
equivalent volume	Vas	l	music	DIN 220 W
Cone:		transient		10 ms 1000 W
eff. cone area	SD	45 cm <sup>2</sup>	Q-factor:	
moving mass	Mms	4.2 g	mechanical	Qms 2.0
lin. vol. displacement	Vd	13.5 cm <sup>3</sup>	electrical	Qes 1.54
mech. resistance	Rms	- kg/s	total	Qts 0.87
lin. excursion	P-P Xmax	3 mm	Resonance frequency f <sub>res</sub>	280 Hz
max. excursion	P-P	7 mm	Sensitivity:	1W/1m 90dB
* Frequency response:		300 - 5000 Hz	Voice coil:	
Harmonic distortion:		< 0.2%	diameter	d 75 mm
Intermodulation distortion:		< 0.1%	length	h 6 mm
Magnetsystem:			layers	n 2
total gap flux		660 μWb	inductance (1kHz)	Le 0.20 mH
flux density		0.917 Tesla	nom. impedance	Zvc 8 Ω
gap energy		248 mJ	min. impedance	Zmin 6 Ω
force factor	B x L	4.3 Tm	DC resistance	Re 5.1 Ω
air gap volume	Vg	0.74 cm <sup>3</sup>	Data given are as after 30 hours of running	
air gap height		3 mm		
air gap width		1.03 mm		
Net weight:		730 kg		

\* Thiele/Small parameters are measured not statically but dynamically.



A „time is money“ a fast production cycle is a characteristic of today's mass production. High-grade products do need a certain maturing time. The fresh doping on the dome material needs an exact drying cycle. The high quality glues must also be fully cured before testing. Reducing this maturing period to raise production creates the risk of lower performance and an shorter lifetime. The D 76 production takes about 120 hours before final testing.





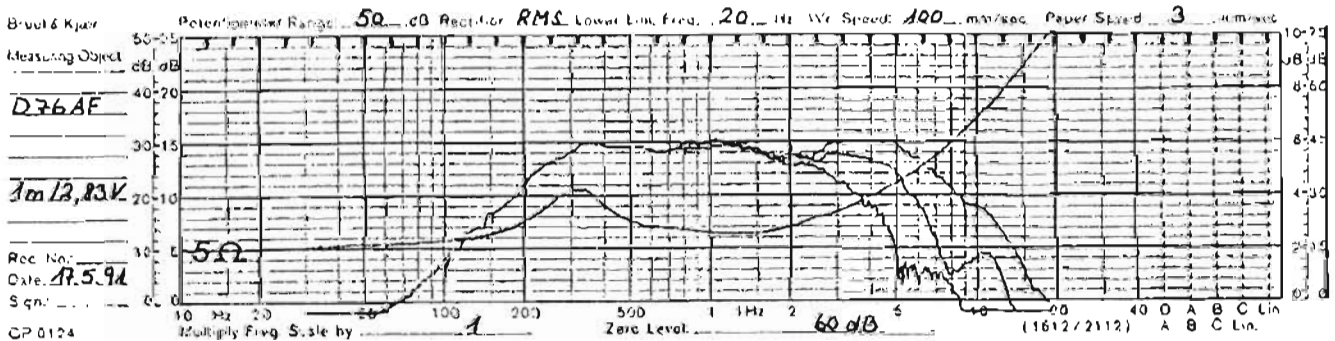
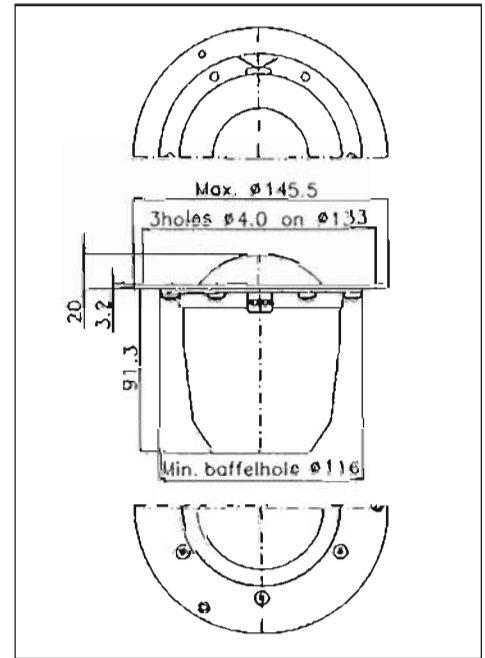
## Soft Dome Midrange D-76 AF

This soft dome midrange construction has a center magnet system - the magnet material is placed inside the ridged huge voice coil.

The D-76 AF with its very low resonance frequency is ideal where the delicate range of the human voice shall be reproduced without crossing points.

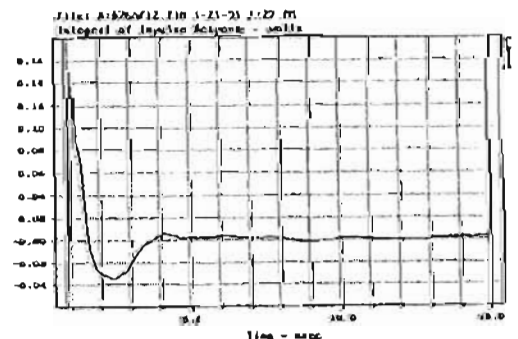
The dome material is doped fabric. Its internal damping is well controlled and gives a wide dispersion. The inside reflexions are minimized and the air pressure is aperiodically damped in the back cavity through the vented magnet system.

High power handling, smooth phase response and high dynamic levels without compression are the merits of this midrange unit.



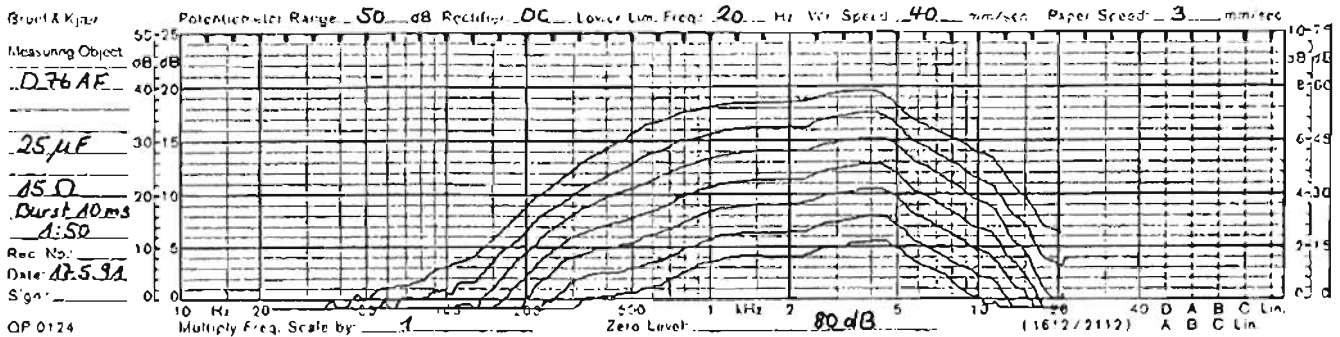
Frequency response and impedance curve of the D-76 AF on-axis, 30° and 60°, distance 1 m.

The MLSSA measurements show the pulse response of the D-76 AF.



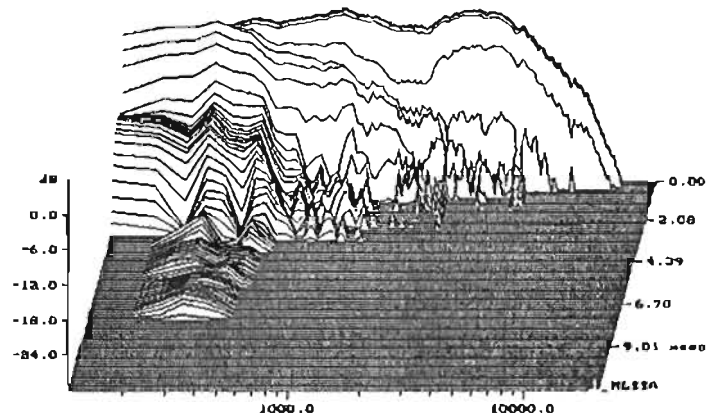


## Dynamic Measurements



Levels of 1, 3, 10, 30, 100, 300 and 1,000 watts were applied while recording the curves. The parallel arrangement of the curves indicates that even fast 1,000 W peaks do not produce any compression. Signal: Tone-Burst 10 ms, Signal-Pause 1:50.

## MLSSA Waterfall Plot



The MLSSA cumulative spectral decay (waterfall) plot shows the energy/time response of the D-76 AF.

## Specifications D-76 AF

### Thiele-Small Parameter:

Q, mechanical  
 Q, electrical  
 Q, total  
 Resonance free air  
 force factor  
 eff. cone area  
 moving mass  
 lin. excursion (p-p)  
 max. excursion (p-p)

$Q_{ms}$  1.5  
 $Q_{es}$  2.1  
 $Q_{ts}$  0.9  
 $f_s$  300 Hz  
 $B \times L$  4.3 Tm  
 $S_D$  45 cm<sup>2</sup>  
 $M_{ms}$  4 g  
 $X_{max}$  3 mm  
 7 mm

### Voice coil:

diameter d 75 mm  
 length h 6 mm  
 layers n 2  
 inductance(10 KHz)  $L_v$  0.2  
 nom. impedance  $Z_{vc}$  8 ohms  
 DC resistance  $R_v$  5.1 ohms

Sensitivity 2.83 V see curve

Power handling,  
 depending on crossover:  
 nominal (long term)  
 transient

IEC >100 W  
 10ms >1000 W

Net weight 750 g

Overall dimensions Ø 145 x 111 mm

## Woofer 15 W-75

### Advantages

The Dynaudio 15 W-75 is designed with a low reflecting aluminium cast basket.

The all aluminium voice coil has a huge diameter of not less than 75 mm securing a very controlled sound reproduction.

In spite of its small size the 15 W-75 nonetheless is capable of very high power handling and can give an impressive bass reproduction.

Even the standard version is equipped with an XL magnet system.



### Applications

Designed for 5 to 10 liter sealed or bass reflex cabinets.

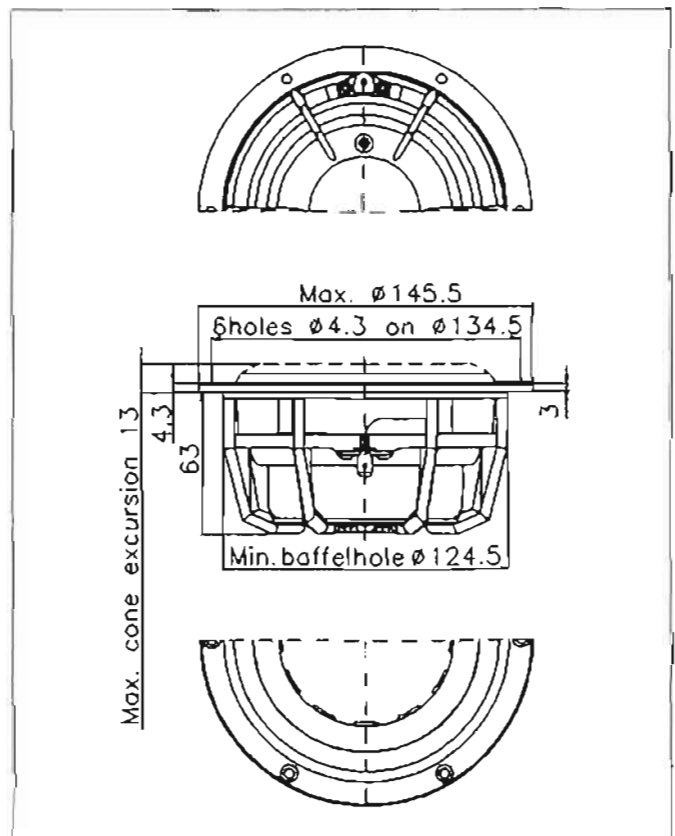
Woofer in small 2 way systems, E.G. satellites, or midrange in bigger constructions.

Can be used with 6 dB or higher order crossover.

### Typical Data

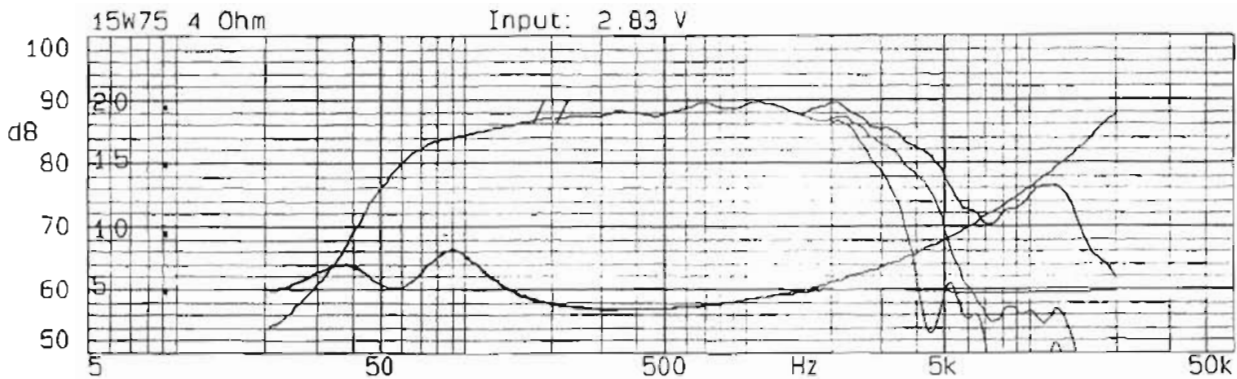
	4 Ohm	8 Ohm
F <sub>s</sub>	55 Hz	55 Hz
Q <sub>t</sub>	0.4	0.4
V <sub>as</sub>	7.5 liter	7.5 liter

If not indicated otherwise we deliver 4 Ohm version.

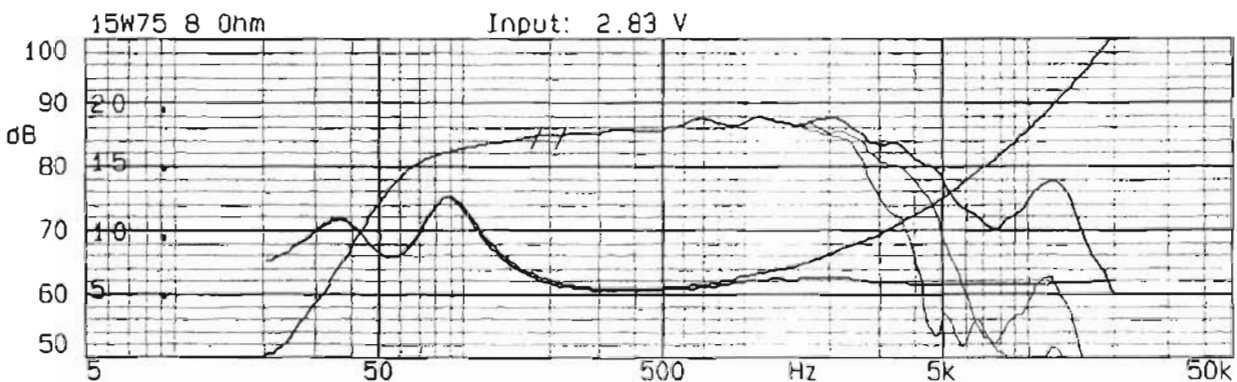


# Woofers 15 W-75

## Measurements



Frequency response 15 W-75 on-axis, 30° and 60°, distance 1m, 4 ohm version. Impedance curve with and without correction circuit (5.6 ohm and 10  $\mu$ F).



Frequency response 15 W-75 on-axis, 30° and 60°, distance 1m, 8 ohm version. Impedance curve with and without correction circuit (6.8 ohm and 10  $\mu$ F).

Measured in a 8 liter bass reflex cabinet (port 35 x 60 mm). Measurements below 200 Hz nearfield.

## Specifications

Thiele-Small Parameter <sup>1</sup>		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q, mechanical	Q <sub>m</sub>	1.7	1.6	Diameter	d	75 mm	75 mm
Q, electrical	Q <sub>e</sub>	0.6	0.6	Length	h	11.5 mm	10.5 mm
Q, total	Q <sub>t</sub>	0.4	0.4	Layers	n	2	2
Resonance frequency	F <sub>s</sub>	55 Hz	55 Hz	Inductance 10 kHz	L <sub>e</sub>	0.15 mH	0.19 mH
Maximum impedance	Z <sub>max</sub>	12 ohm	19 ohm	Nom impedance	Z <sub>vc</sub>	4 ohm	8 ohm
Moving mass	M <sub>ms</sub>	12 g	12 g	DC resistance	R <sub>e</sub>	3.0 ohm	4.9 ohm
Force factor	BL	4.7 Tm	6.0 Tm	Sensitivity	2.83 V	see curve	see curve
Equiv. volume	V <sub>as</sub>	7.5 liter	7.5 liter	Power Handling:			
Effective cone area	S <sub>d</sub>	87 cm <sup>2</sup>	87 cm <sup>2</sup>	Nominal long term	IEC >	130 watts	130 watts
Lin. excursion (p-p)	X <sub>max</sub>	6.5 mm	5.5 mm	Transient	10ms >	1000 W	1000 W
Max. excursion (p-p)		15 mm	15 mm	Net weight		1.1 kgs	1.1 kgs
				Overall dimension		Ø 145.5 x 70 mm	

<sup>1</sup>Thiele-Small Parameter measured with correction circuit.

All specifications subject to change without notice.



# DYNAUDIO<sup>®</sup>

TECHNOLOGY UNLIMITED

## 17 M-75

### APPLICATIONS

Cone midrange, usable range  
100 - 2500 Hz  
ideal 4-way combination:  
30 W-54, 17 M-75, D-28  
and D-21  
for satellite systems  
combined with subwoofer  
for car fidelity door mounting  
rear mounting without  
sealed enclosure

### FEATURES

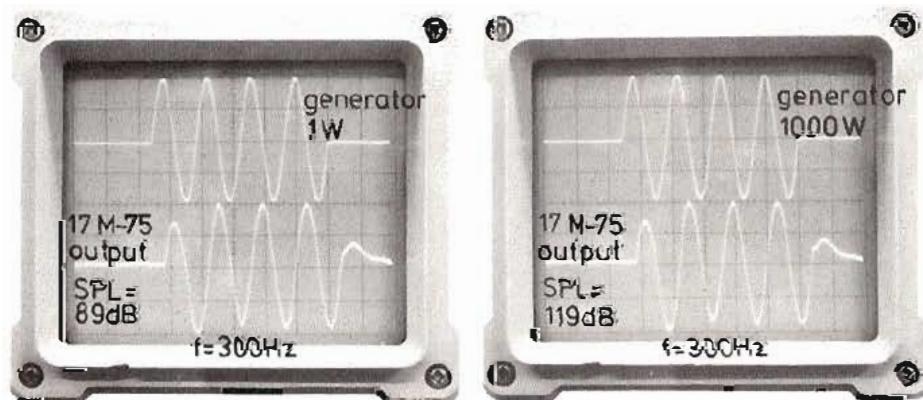
shallow design  
high power handling  
wide dispersion pattern  
excellent phase  
characteristics  
vented magnet system  
tropic proof  
total concave shape of cone  
PHA cone material  
hexacoil technique  
center-magnet system

The unusual construction of 17 M-75 shows definitely that in field of cone midranges remarkable improvements were possible and necessary. The delicate low end of human voice can now be reproduced by one driver rather than have the crossover frequency disturb phasing and sourcing in middle of this critical range. Center-magnet construction enables use of huge (3" / 75 mm) voice coil which drives the cone linearly. New geometrical shape of cone and new PHA-material (Phase Homogeneous Area) enables this speaker to deliver astounding phase linearity. Wide phase linear dispersion angle creates a hitherto unobtained spatial reproduction.

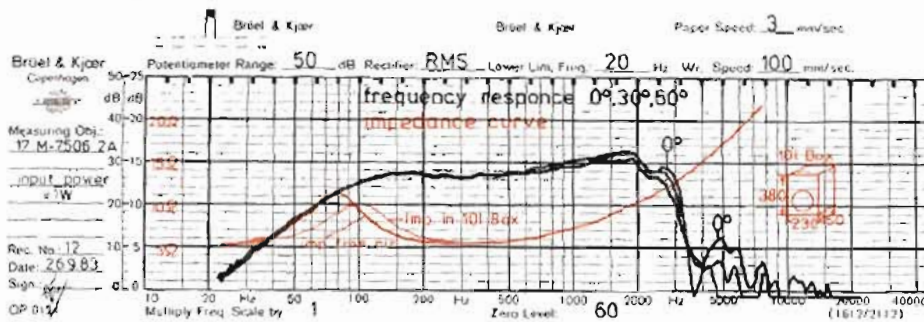
When measuring with a STEP-FUNCTION the signal we use is a voltage step which is a sharp rise from 0 volt to defined voltage. The radiated signal then measured with very fast measuring microphone and shown on storage oscilloscope screen. When plotting this step by computer almost all relevant data are included, giving much more precise interpretation than possible with conventional methods. In our constant search for more precise data, we have developed this measurement program.

TONE BURSTS are the best way to obtain accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise time and ringing - which shows much more clearly with a step function test! With a tone burst, all the moving parts of speaker can be loaded without burning the voice coil. With given frequency the SPL should be 30 dB higher at 1000 W input compared with a 1 W input, if output is linear. This test shows driver's ability to reproduce the transients without compression. Right picture shows that even 1000 W input is not the limit: the dynamic response is absolutely linear. Datas given in catalogues (and even test reports) normally are calculated figures and not measured values.

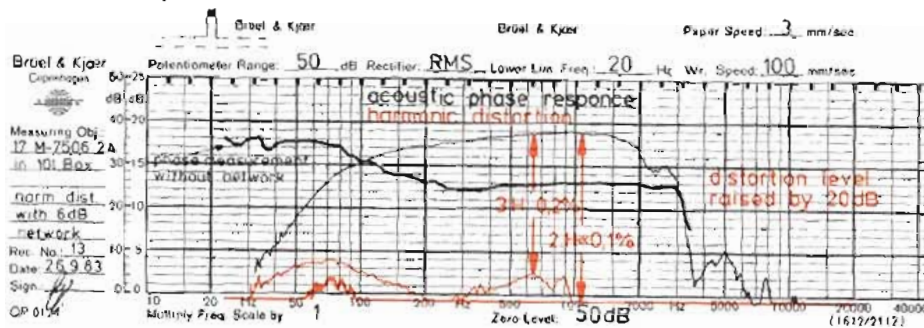
This compression effect is either under-rated or ignored very often. Many speakers do not produce SPL's above 100 dB, despite higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.



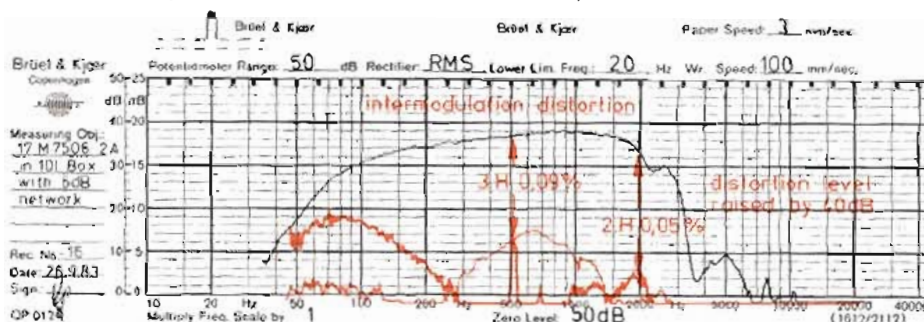




Smooth frequency characteristics are shown in response from 100 to 2500 Hz. Simultaneous, smooth and equal drop at all three off-axis angles is particularly important. Allows use of very simple crossover because response errors do not occur outside crossover frequencies.



The advantages of the 17 M as a midrange driver are clearly shown by the intermodulation curve. Very low distortion even at the lower frequencies.



Flat phase response over entire useful range. Even when the scale is boosted by 20 dB the distortions are hardly detectable.



With DYNAUDIO speakers all the connection wires to the voice coils are of flexible copper cord to allow the moving system to act without hindrance.

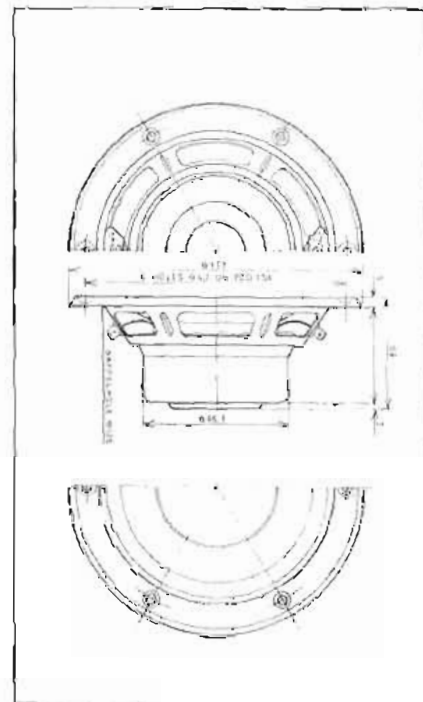
Most DYNAUDIO voice coils are wound with aluminium wire for minimum mass.

According to conventional belief it is not possible to satisfactorily solder copper to aluminium - research and know how of the DYNAUDIO engineering team made it possible. In the past ten years our staff has successfully made millions of trouble-free soldered connections of copper with aluminium

<b>Compliance:</b>		<b>Overall dimensions:</b>		177 x 69 mm
suspension	Cms	0,295 · 10 <sup>-3</sup> m/N	<b>Power handling:</b>	
acoustic	Cas	0,425 · 10 <sup>-6</sup> m <sup>2</sup> /N	* nominal	DIN 180 W
equivalent volume	Vas	5,95l	* music	DIN 220 W
<b>Cone:</b>			transient	10 ms 1000 W
eff. cone area	SD	120 cm <sup>2</sup>	<b>Q-factor:</b>	
moving mass	Mms	15 g	mechanical	Qms 2,05
lin. vol. displacement	Vd	66 cm <sup>3</sup>	electrical	Qes 2,13
mech. resistance	Rms	3,46 kg/s	total	Qts 1,35
lin. excursion P-P	Xmax	5,5 mm	<b>Resonance frequency free air:</b>	fs 74 Hz
max. excursion P-P		19 mm	<b>Sensitivity:</b>	1W/1m 89 dB
* Frequency response:		80 - 3500 Hz	<b>Voice coil:</b>	
<b>Harmonic distortion:</b>		< 0,2%	diameter	d 75 mm
<b>Intermodulation distortion:</b>		< 0,09%	length	h 10,5 mm
<b>Magnetsystem:</b>			layers	n 2
total gap flux		670 μWb	inductance (1 kHz)	Le 0,45 mH
flux density		0,56 Tesla	nom. impedance	Zvc 8 Ω
gap energy		294 mWs	min. impedance	Zmin 6,4 Ω
force factor	B x L	4,3 Tm	DC resistance	Re 5,5 Ω
air gap volume	Vg	1,65 cm <sup>3</sup>		
air gap height		5 mm		
air gap width		1,38 mm		
<b>Net weight:</b>		800 g		

\* Thiele/Small parameters are measured not statically but dynamically.

All specifications subject to change without notice



## Woofer 17 W-75

### Advantages

The Dynaudio 17 W-75 woofer is equipped with a large 75 mm voice coil which ensures ability to handle high dynamics and very high power.

Voice coil wire and former both are made of aluminium to reduce the weight of the swinging system which allows very good transient response.

The Dynaudio hexact coil winding technique creates a more rigid and more compact voice coil. This again gives ultimate stability under all circumstances.

The one-piece moulded PP cone has no "dust cap" which procures a very good controlled roll off, allowing 6dB crossover with very fine results. The center-magnet system is largely vented which gives a smooth frequency response with a homogeneous output.



### Applications

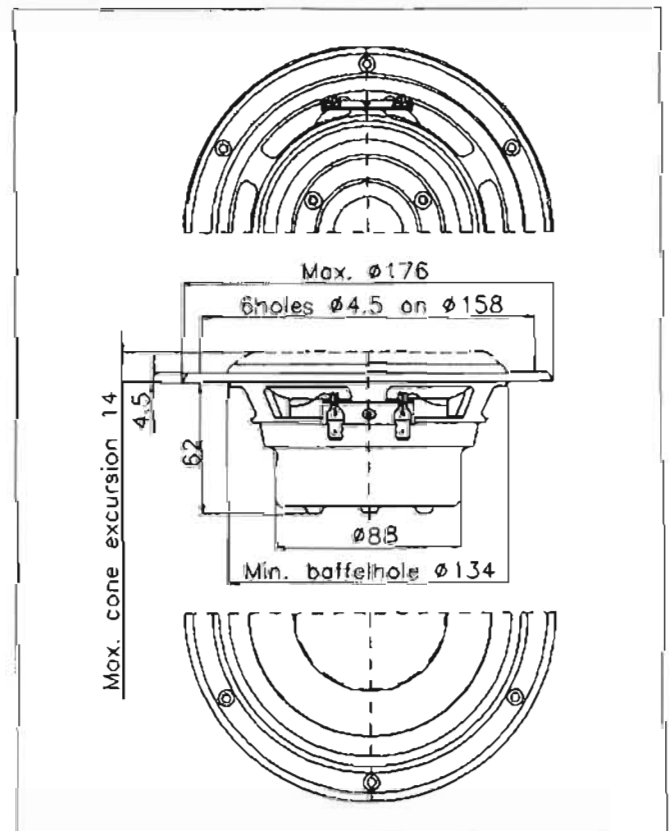
The high power handling unit works best in closed cabinets of 10 to 15 liter volume.

Woofer in 2 way systems or mid woofer in bigger systems. Can be used with 6dB or higher order crossover.

### Typical Data

	4 Ohm	8 Ohm
FS	40 Hz	40 Hz
Q <sub>t</sub>	0.7	0.8
VAS	22 liter	22 liter

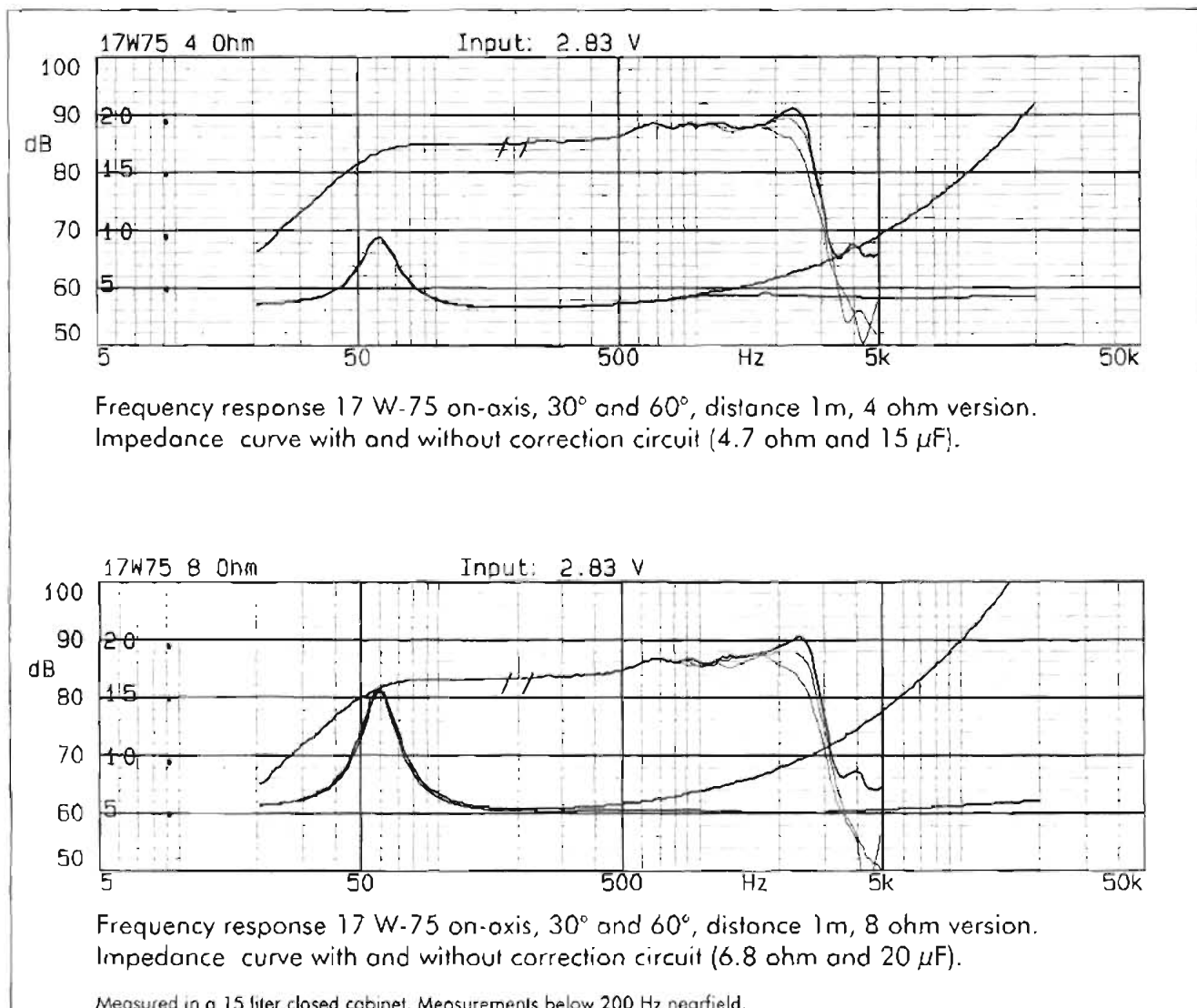
If not indicated otherwise we deliver 8 Ohm version.





# Woofers 17 W-75

## Measurements



## Specifications

Thiele-Small Parameter <sup>1</sup>		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q, mechanical	Q <sub>m</sub>	3	2.8	Diameter	d	75 mm	75 mm
Q, electrical	Q <sub>e</sub>	0.9	1.1	Length	h	11 mm	11 mm
Q, total	Q <sub>t</sub>	0.7	0.8	Layers	n	2	2
Resonance frequency	F <sub>s</sub>	40 Hz	40 Hz	Inductance 10 kHz	Le	0.17 mH	0.23 mH
Maximum impedance	Z <sub>max</sub>	13 ohm	19 ohm	Nom. impedance	Z <sub>vc</sub>	4 ohm	8 ohm
Moving mass	M <sub>ms</sub>	15 g	15 g	DC resistance	Re	3.0 ohm	5.1 ohm
Force factor	BL	3.5 Tm	4.3 Tm	Sensitivity	2.83 V	see curve	see curve
Equiv. volume	V <sub>as</sub>	22 liter	22 liter	Power Handling:			
Effective cone area	S <sub>d</sub>	120 cm <sup>2</sup>	120 cm <sup>2</sup>	Nominal long term	IEC >	130 watts	130 watts
Lin. excursion (p-p)	X <sub>max</sub>	6 mm	6 mm	Transient	10ms >	1000 W	1000 W
Max. excursion (p-p)		19 mm	19 mm	Net weight		0.9 kgs	0.9 kgs
				Overall dimension		Ø 176 x 70 mm	

<sup>1</sup>Thiele-Small Parameter measured with correction circuit.

All specifications subject to change without notice.

## Woofer 17 W-75 EXT

### Advantages

Being an offspring of the famous 17 W-75 this woofer has all the same advantages as the basic type.

Even most of the data are the same except for the frequency response.

Changing the center part of the PP one-piece cone to a special designed concave shape results in an extended frequency response.



### Applications

The high power handling unit is designed for closed cabinets of 10 to 15 liter.

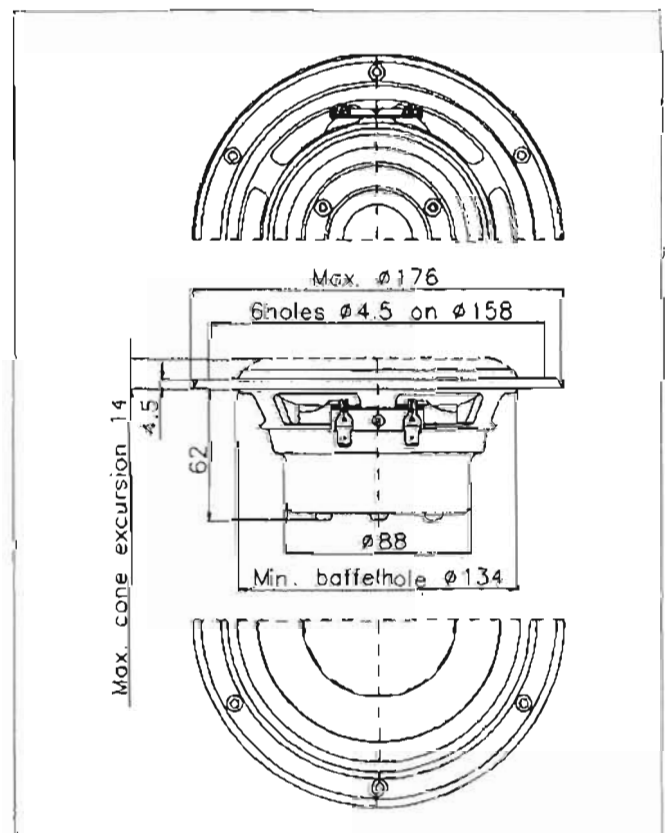
To be used in 2 way systems or as mid woofer in bigger constructions.

Can be used with 6 dB or higher order crossover.

### Typical Data

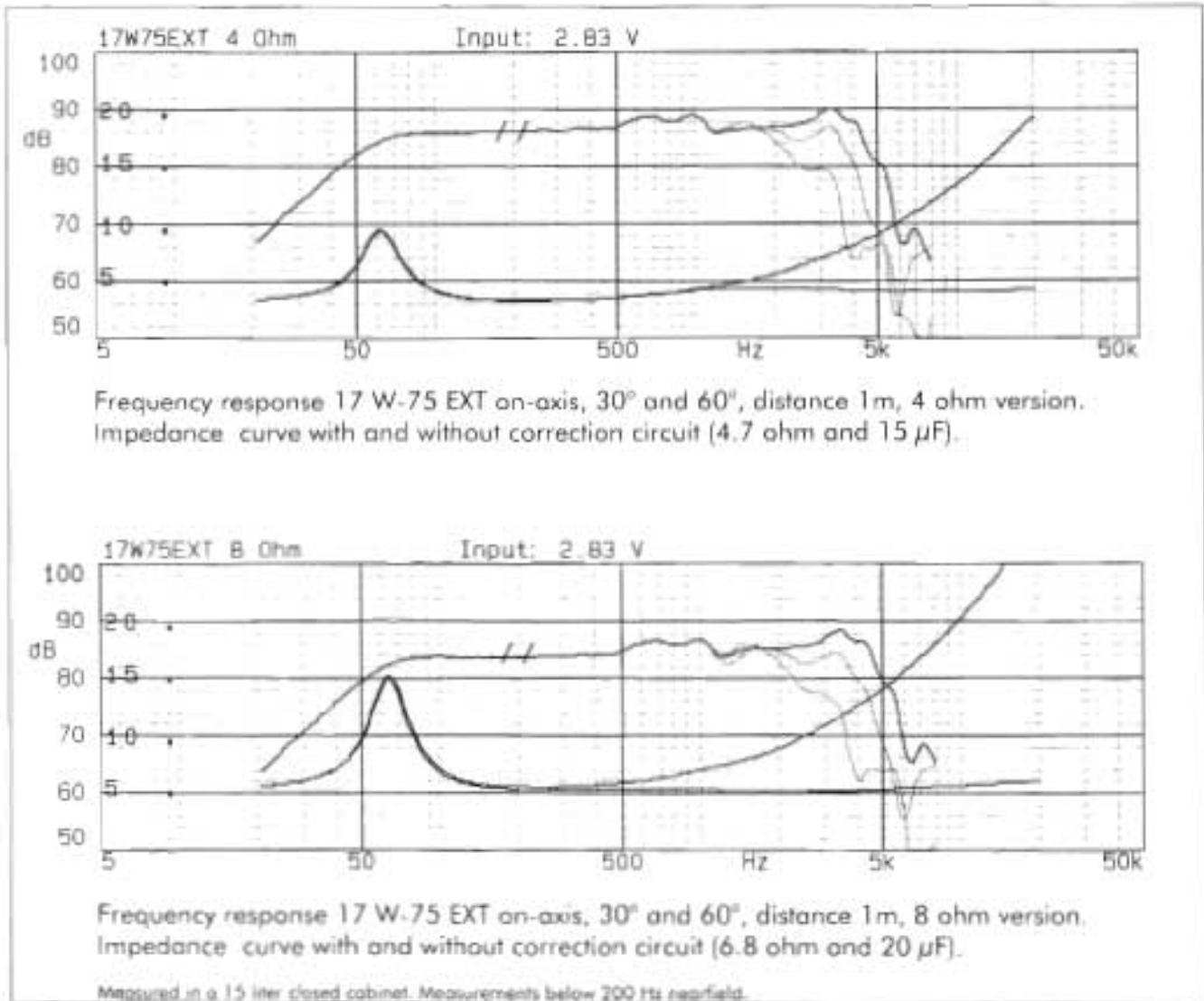
	4 Ohm	8 Ohm
Fs	40 Hz	40 Hz
Qt	0.7	0.8
Vas	22 liter	22 liter

If not indicated otherwise we deliver 8 Ohm version.



# Woofers 17 W-75 EXT

## Measurements



## Specifications

Thiele-Small Parameter <sup>1</sup>		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q <sub>m</sub> mechanical	Q <sub>m</sub>	3	2.8	Diameter	d	75 mm	75 mm
Q <sub>e</sub> electrical	Q <sub>e</sub>	0.9	1.1	Length	h	11 mm	11 mm
Q <sub>t</sub> total	Q <sub>t</sub>	0.7	0.8	Layers	n	2	2
Resonance frequency	F <sub>s</sub>	40 Hz	40 Hz	Inductance 10 kHz	L <sub>e</sub>	0.17 mH	0.23 mH
Maximum impedance	Z <sub>max</sub>	13 ohm	19 ohm	Nom. impedance	Z <sub>vc</sub>	4 ohm	8 ohm
Moving mass	M <sub>ms</sub>	15 g	15 g	DC resistance	R <sub>e</sub>	3.0 ohm	5.1 ohm
Force factor	BL	3.5 Tm	4.3 Tm	Sensitivity	2.83 V	see curve	see curve
Eqv. volume	V <sub>as</sub>	22 liter	22 liter	Power Handling:			
Effective cone area	S <sub>d</sub>	120 cm <sup>2</sup>	120 cm <sup>2</sup>	Nominal long term	IEC >	130 watts	130 watts
Lin. excursion (p-p)	X <sub>max</sub>	6 mm	6 mm	Transient	10ms >	1000 W	1000 W
Max. excursion (p-p)		19 mm	19 mm	Net weight		0.9 kgs	0.9 kgs
				Overall dimension		Ø 176 x 70 mm	

<sup>1</sup>Thiele-Small Parameter measured with correction circuit.

All specifications subject to change without notice.

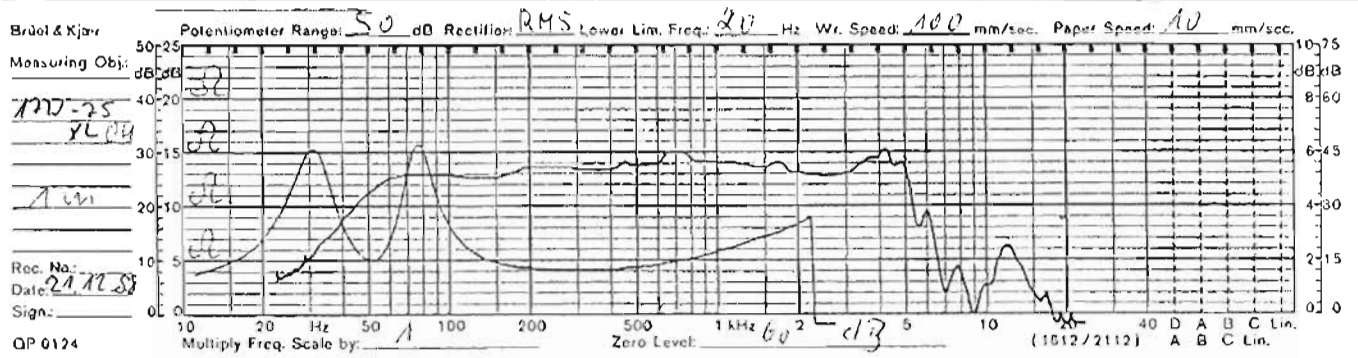
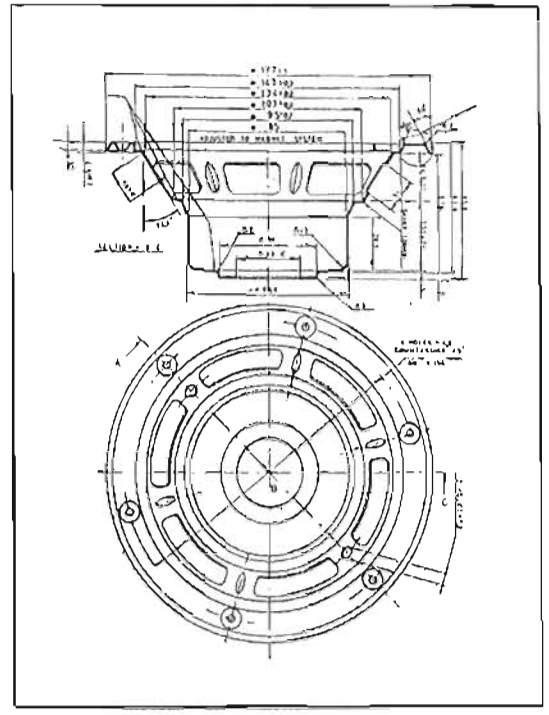


# 17 W-75 XL

The new 17 W-75 XL may be employed as a woofer in small enclosures, ideal also in rows in slim line tower design.

In bigger systems also as low-medium driver. Compared with the proven 17 W-75 this new type has a bigger magnet system making this driver ideal for applications in small bass reflex constructions with a higher sensitivity and enormous power handling.

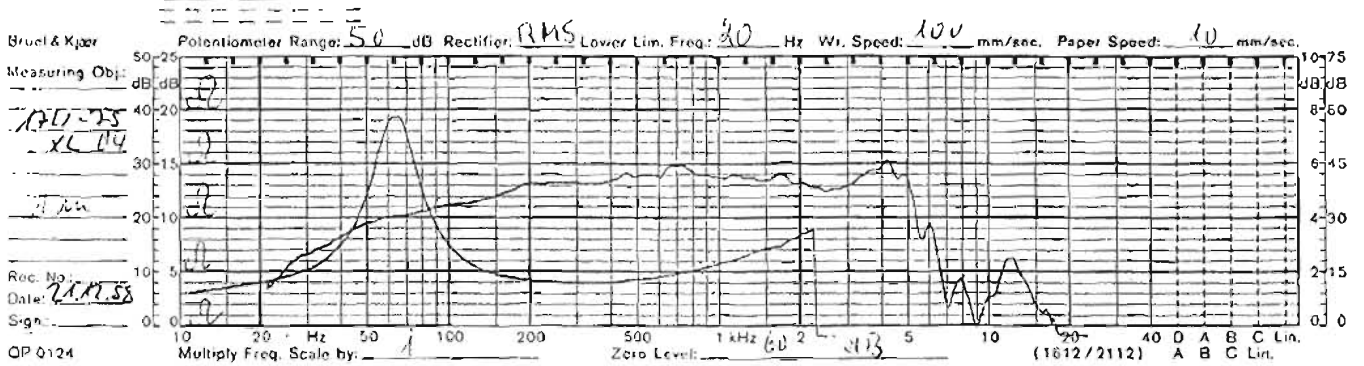
- The considerable highlights are
- 75 mm (3") alu voice coil in hexacoll technique
  - PP-cone in a one-piece mould, DYNAUDIO technology
  - controlled roll-off
  - ideal dispersion pattern
  - unusual high power handling
  - center-magnetsystem without strayfield
  - optimal impule response
  - vented magnetsystem
  - shallow design
  - high dynamic range



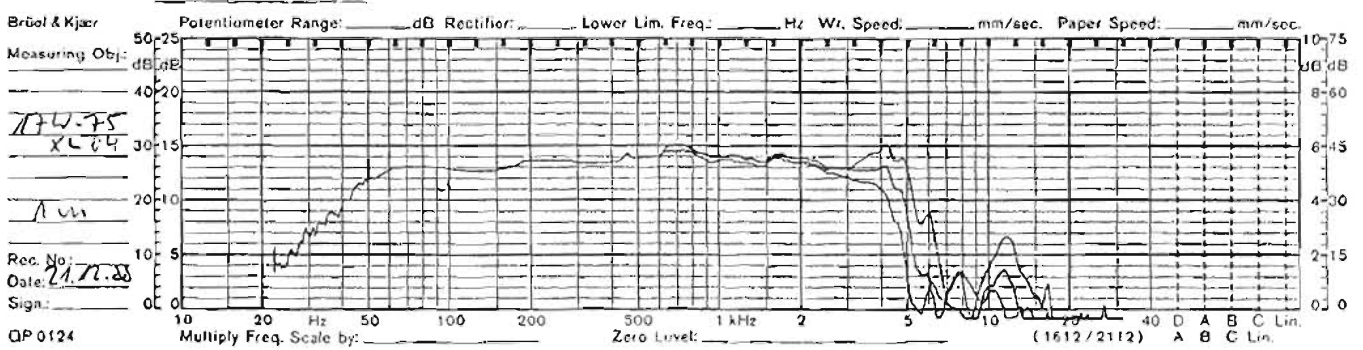
Frequency response and impedance curve in 14,5 l bass reflex enclosure (port: d=45mm, l=50mm)

Thiele-Small Parameter:		8(4) ohms:		Voice coil:	
Q, mechanical	Q <sub>ms</sub>	2,00(1,90)	diameter	d	75 mm
Q, electrical	Q <sub>es</sub>	0,57(0,54)	length	h	10,5mm
Q, total	Q <sub>ts</sub>	0,44(0,42)	layers	n	2
Resonance free air	f <sub>0</sub>	42(41) Hz	inductance(1KHz)	L <sub>c</sub>	0,43(0,39)mH
equiv.volume	V <sub>as</sub>	22,6(23,0)	nom. impedance	Z <sub>vc</sub>	8(4) Ohm
force factor	BxL	5,7(4,6)Tm	DC resistance	R <sub>c</sub>	5,5(3,5) Ohm
eff. cone area	S <sub>D</sub>	120cm <sup>2</sup>	Sensitivity	2,8V	see curve
moving mass	M <sub>ms</sub>	13,0(13,4)g	Power handling:		
lin. excursion (p-p)	X <sub>max</sub>	5,5mm	nominal (long term) IEC		130 W
max. excursion (p-p)		19mm	transient	10ms	1000 W
			Net weight		1.1 kg
			Overall dimensions		177x69 mm

# 17 W-75 XL



Frequency response and impedance, sealed enclosure, 14.5 l

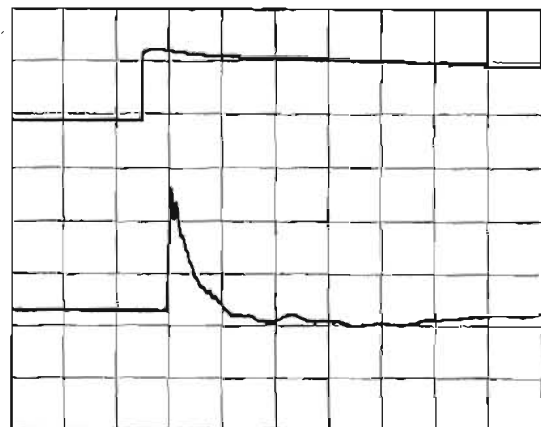


Frequency response at 0°, 30° und 60°.

Following pictures show the pulse response of a step function on the screen of an oscilloscope (direct plot):



Pulse response, vented box



Pulse response, sealed box.

## Woofers ESOTEC® 17 W LQ

### Advantages

The typical Dynaudio die cast basket is very rigid although the ribs are slim which do not allow any early reflexion.

The Dynaudio cone material is a special mix of PP with magnesium silicate for very high internal damping. It is moulded in just one piece including the center part which results in a controlled roll off and high dynamic range.

The legendary huge 75 mm voice coil is of pure aluminium. The low weight of the aluminium allows for a fast transient response.

The magnet motor is designed with the XL magnet construction rendering maximum power.



### Applications

Designed for 10 to 15 liter bass reflex or passive radiator systems.

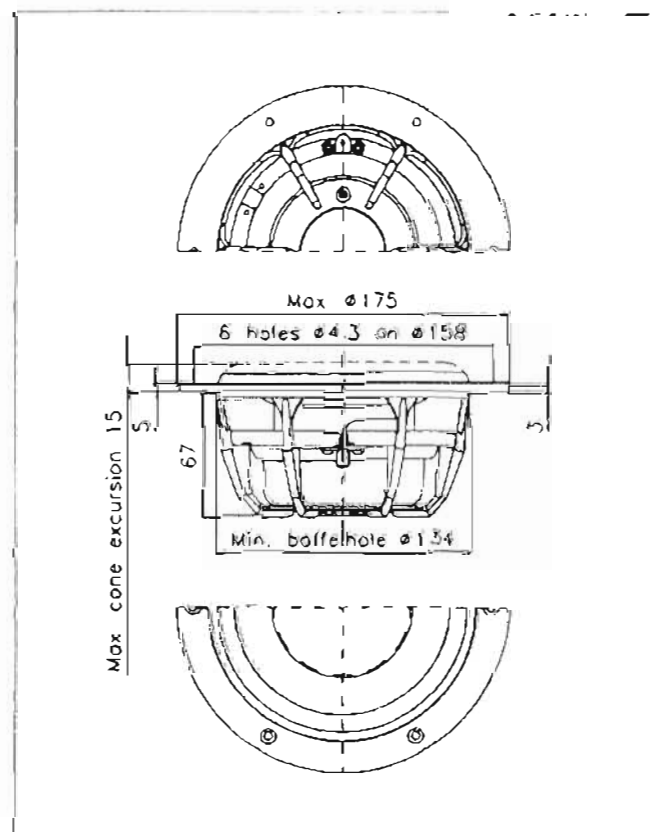
Woofer in 2 or 3 way systems or midwoofer in bigger constructions.

Can be used with 6dB or higher order crossover.

### Typical Data

	4 Ohm	8 Ohm
F <sub>s</sub>	40 Hz	40 Hz
Q <sub>1</sub>	0.4	0.4
V <sub>as</sub>	22 liter	22 liter

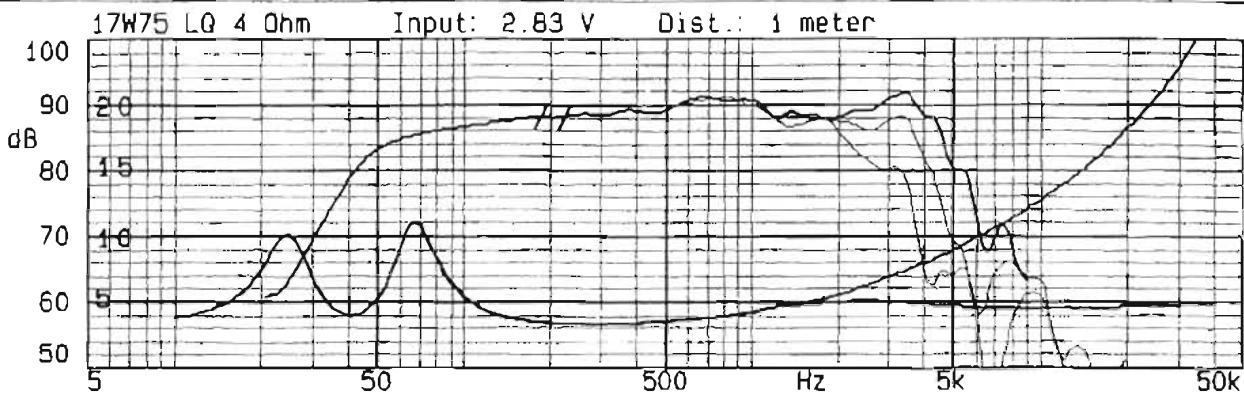
If not indicated otherwise we deliver 4 Ohm version



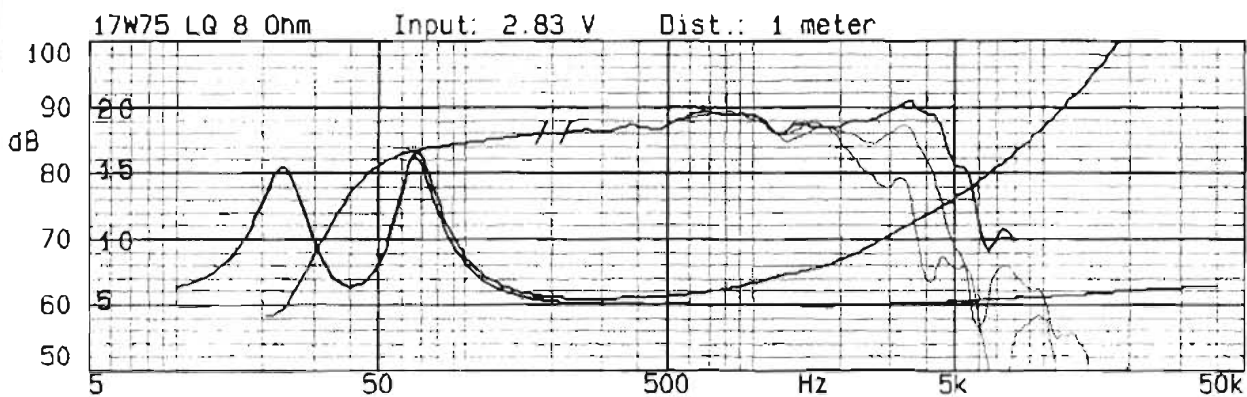


# Woofer 17 ESOTEC® W LQ

## Measurements



Frequency response 17 W LQ on-axis, 30° and 60°, distance 1m, 4 ohm version.  
Impedance curve with and without correction circuit (5.6 ohm and 10  $\mu$ F).



Frequency response 17 W LQ on-axis, 30° and 60°, distance 1m, 8 ohm version.  
Impedance curve with and without correction circuit (6.8 ohm and 10  $\mu$ F).

Measured in a 15 liter basreflex cabinet (port 45 x 100) Measurements below 200 Hz nearfield.

## Specifications

Thiele-Small Parameter		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q, mechanical	Qm	1.8	1.8	Diameter	d	75 mm	75 mm
Q, electrical	Qe	0.5	0.5	Length	h	11.5 mm	10.5 mm
Q, total	Qt	0.4	0.4	Layers	n	2	2
Resonance frequency	Fs	40 Hz	40 Hz	Inductance 10 kHz	Le	0.15 mH	0.19 mH
Maximum impedance	Zmax	15 ohm	22 ohm	Nom. impedance	Zvc	4 ohm	8 ohm
Moving mass	Mms	15 g	15 g	DC resistance	Re	3.0 ohm	4.9 ohm
Force factor	BL	5.0 Tm	6.0 Tm	Sensitivity	2.83 V	see curve	see curve
Equiv. volume	Vas	22 liter	22 liter	Power Handling:			
Effective cone area	Sd	120 cm <sup>2</sup>	120 cm <sup>2</sup>	Nominal long term	IEC >	130 watts	130 watts
Lin. excursion (p-p)	Xmax	6.5 mm	5.5 mm	Transient	10ms >	1000 W	1000 W
Max. excursion (p-p)		17 mm	17 mm	Net weight		1.2 kgs	1.2 kgs
				Overall dimension		Ø 175 x 72 mm	

\*Thiele-Small Parameter measured with correction circuit

All specifications subject to change without notice

## Woofer 19 W-38

### Advantages

The largely vented magnet system of the Dynaudio 19 W-38 woofer yields very low compression, ideal heat dissipation and an outstanding resonance damping.

The cone is moulded as one piece including the "dust cap" which totally eliminates the problems a separate dust cap can create and secures homogeneity of the response. The cone material is a PP based mixture with high rigidity and excellent damping at the same time.

The rubber surround is fastened to the back side of the cone to ensure stability of performance.



### Applications

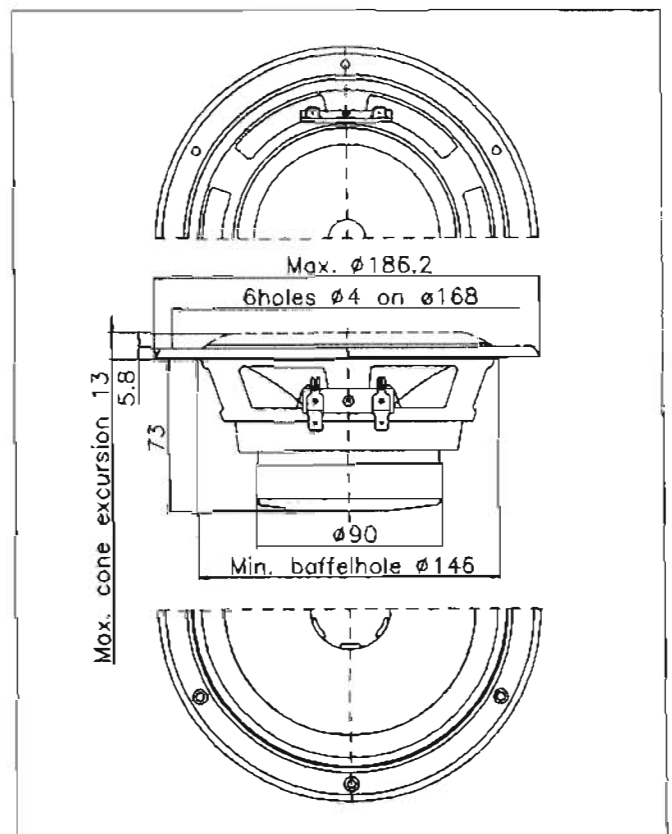
For use in high quality two way bass reflex systems with a volume between 10 - 20 liter.

Can be used with 6dB or higher order crossover.

### Typical Data

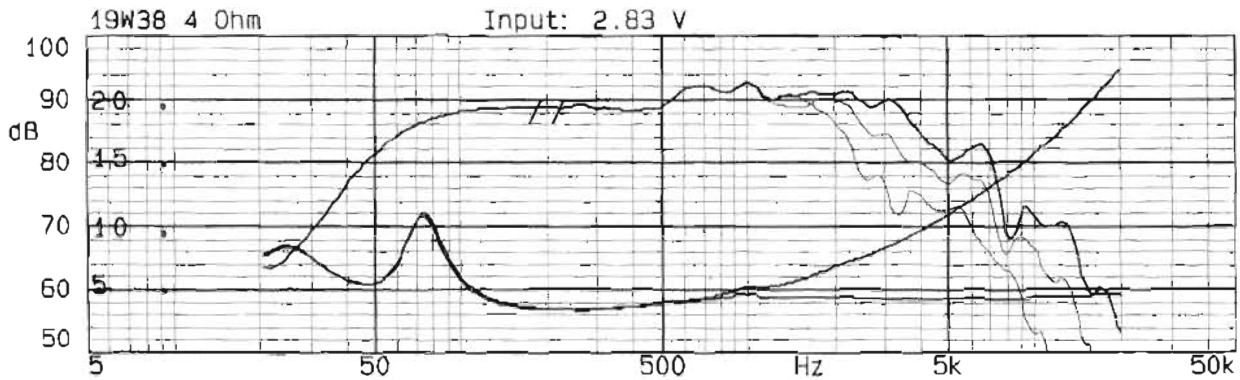
	4 ohm	8 ohm
Fs	45 Hz	45 Hz
Qt	0.3	0.4
Vas	21 liter	23 liter

If not indicated otherwise we deliver 8 ohm version.

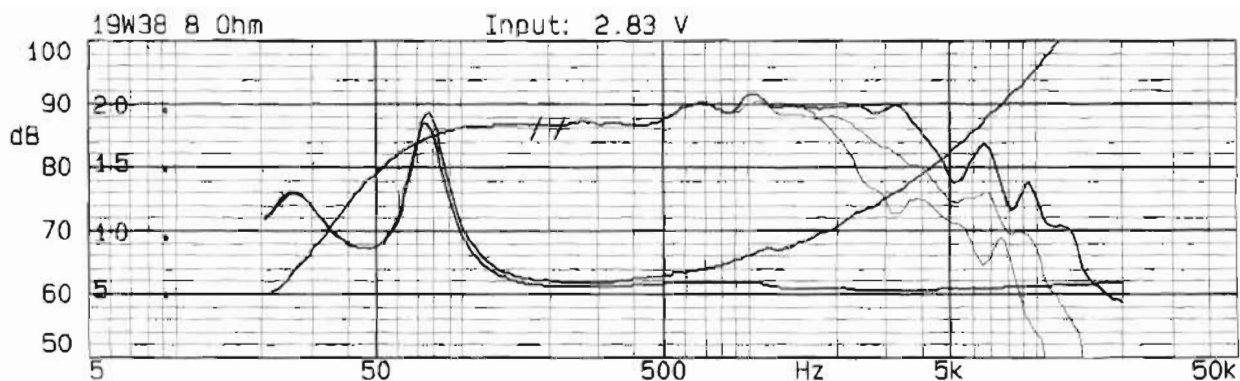


# Woofers 19 W-38

## Measurements



Frequency response 19 W-38 on-axis, 30° and 60°, distance 1m, 4 ohm version.  
Impedance curve with and without correction circuit (4.7 ohm and 20  $\mu$ F).



Frequency response 19 W-38 on-axis, 30° and 60°, distance 1m, 8 ohm version.  
Impedance curve with and without correction circuit (6.8 ohm and 20  $\mu$ F).

Measured in a 15 liter bass reflex cabinet (port 35 x 80 mm). Measurements below 200 Hz nearfield.

## Specifications

Thiele-Small Parameter <sup>1</sup>		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q, mechanical	Q <sub>m</sub>	2.1	2.5	Diameter	d	38 mm	38 mm
Q, electrical	Q <sub>e</sub>	0.4	0.5	Length	h	13 mm	12 mm
Q, total	Q <sub>t</sub>	0.3	0.4	Layers	n	2	2
Resonance frequency	F <sub>s</sub>	45 Hz	45 Hz	Inductance 10 kHz	L <sub>e</sub>	0.19 mH	0.27 mH
Maximum impedance	Z <sub>max</sub>	17 ohm	30 ohm	Nom. impedance	Z <sub>vc</sub>	4 ohm	8 ohm
Moving mass	M <sub>ms</sub>	16 g	15 g	DC resistance	R <sub>e</sub>	2.9 ohm	5.2 ohm
Force factor	BL	5.5 Tm	6.4 Tm	Sensitivity	2.83 V	see curve	see curve
Equiv. volume	V <sub>as</sub>	21 liter	23 liter	Power Handling:			
Effective cone area	S <sub>d</sub>	138 cm <sup>2</sup>	138 cm <sup>2</sup>	Nominal long term	IEC>	75 watts	75 watts
Lin. excursion (p-p)	X <sub>max</sub>	6 mm	5 mm	Transient	10ms>	250 W	250 W
Max. excursion (p-p)		26 mm	26 mm	Net weight		1.4 kgs	1.4 kgs
				Overall dimension		Ø 187 x 80 mm	

<sup>1</sup>Thiele-Small Parameter measured with correction circuit.

All specifications subject to change without notice.



## Woofer 20 W-75

### Advantages

The rigid aluminium basket has very slim but solid ribs, thus avoiding most of the rear air reflections of conventional broad ribbed baskets. The largely vented magnet system together with the vented voice coil result in very low compression and an extremely smooth frequency response.

The one-piece moulded PP cone makes it possible to use the large 75 mm voice coil without having the problems that separate dust caps and large voice coils are likely to create. The large aluminium voice coil gives a long linear excursion and thereby very low distortion.

The 20 W-75 woofer furthermore is equipped with the XL magnet construction already in the standard version.



### Applications

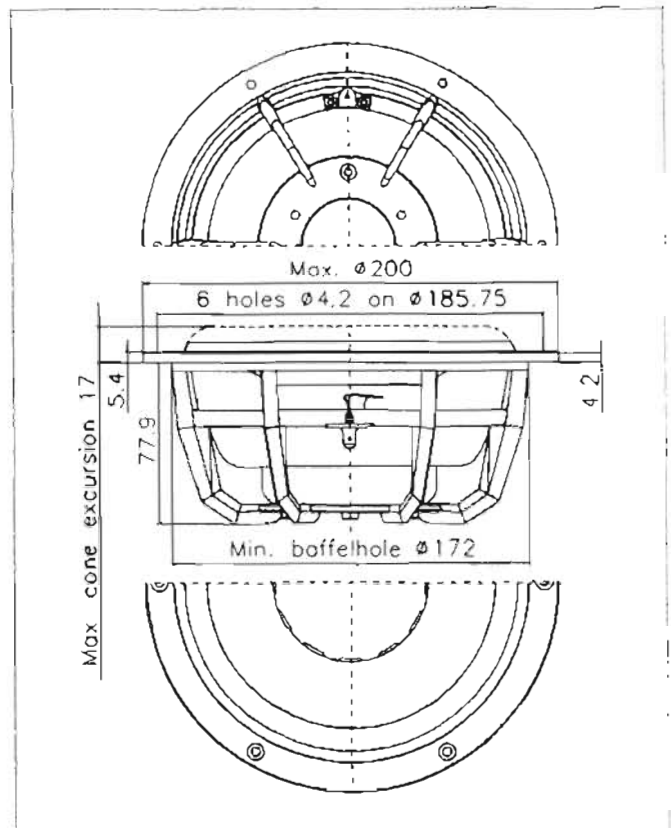
The high power handling unit is designed for 18 liter closed cabinets giving an approx.  $Q_T = 0.7$ .

For use as woofer in high quality 2 and 3 way systems or as mid woofer in bigger constructions. Can be used with 6 dB or higher order crossover.

### Typical Data

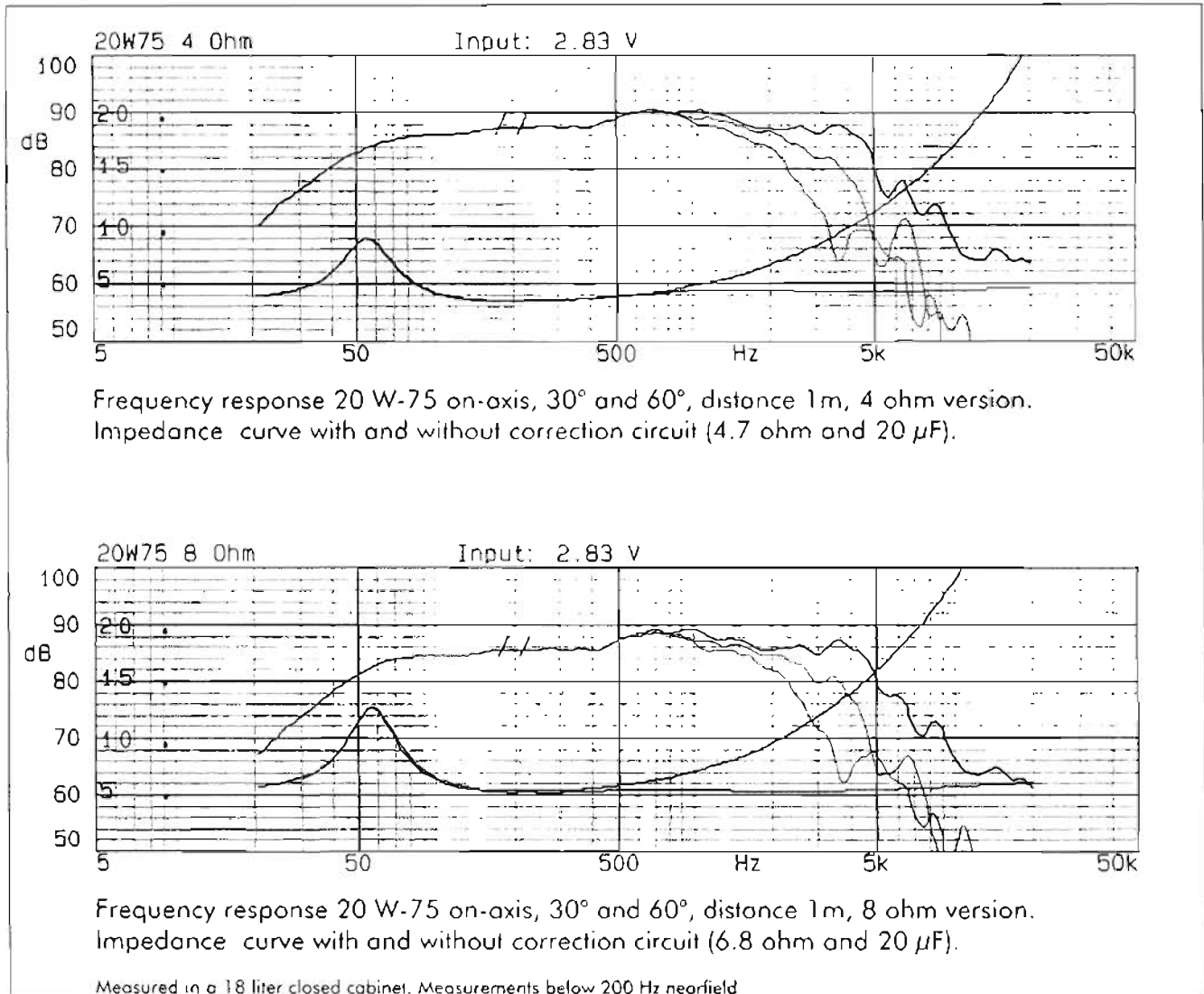
	4 Ohm	8 Ohm
$F_s$	30 Hz	30 Hz
$Q_T$	0.4	0.5
$V_{as}$	65 liter	65 liter

If not indicated otherwise we deliver 4 Ohm version



# Woofers 20 W-75

## Measurements



## Specifications

Thiele-Small Parameter <sup>1</sup>		4 ohm	8 ohm	Voice Coil		4 ohm	8 ohm
Q, mechanical	Q <sub>m</sub>	1.5	1.8	Diameter	d	75 mm	75 mm
Q, electrical	Q <sub>e</sub>	0.5	0.7	Length	h	14 mm	14 mm
Q, total	Q <sub>t</sub>	0.4	0.5	Layers	n	2	2
Resonance frequency	F <sub>s</sub>	30 Hz	30 Hz	Inductance 10 kHz	Le	0.20 mH	0.30 mH
Maximum impedance	Z <sub>max</sub>	12 ohm	17 ohm	Nom impedance	Z <sub>vc</sub>	4 ohm	8 ohm
Moving mass	M <sub>ms</sub>	20 g	20 g	DC resistance	Re	3.2 ohm	5.0 ohm
Force factor	BL	4.8 Tm	5.0 Tm	Sensitivity	2.83 V	see curve	see curve
Equiv. volume	V <sub>as</sub>	65 liter	65 liter	Power Handling:			
Effective cone area	S <sub>d</sub>	180 cm <sup>2</sup>	180 cm <sup>2</sup>	Nominal long term	IEC >	130 watts	130 watts
Lin. excursion (p-p)	X <sub>max</sub>	9 mm	9 mm	Transient	10ms >	1000 W	1000 W
Max. excursion (p-p)		15 mm	15 mm	Net weight		1.2 kgs	1.2 kgs
				Overall dimension		Ø 200 x 89 mm	

<sup>1</sup>Thiele-Small Parameter measured with correction circuit.

All specifications subject to change without notice.

# DYNAUDIO<sup>®</sup>

TECHNOLOGY UNLIMITED

## 21 W-54

### APPLICATIONS

8" woofer for all kind of hi-fi-use:  
2way (or up) systems  
transmission line  
bass reflex  
aperiodic damped or  
sealed enclosure

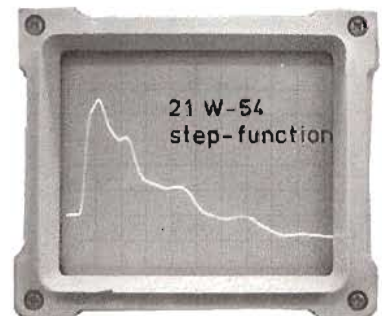
### FEATURES

magnesium die cast  
basket  
very high power  
handling  
high BL-factor  
rigid construction  
tropic proof  
vented long throw  
system  
hexacoil technique  
PHA cone material  
(phase homogeneous area)

Many years of lifetime have branded this type to be the most rigid and most precise 8" woofer. Now some very important specifications got upgraded: the cone is changed to polymer based mixture (PHA=phase homogeneous area), enriched with metal oxide particles for higher damping and the geometric shape is revised for almost unmeasurable distortion (see diagram h. d.) The magnet system is enlarged substantially and allows now cone displacement of total 29 mm. The center venting is adjusted accordingly. The highrated advantages as DTL (dynamic transient linearity), HEXACOIL and the rigid magnesium die cast frame remain unchanged.



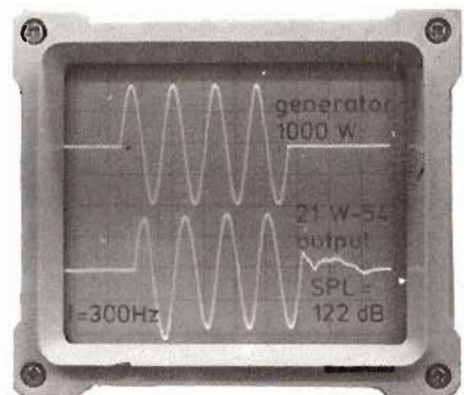
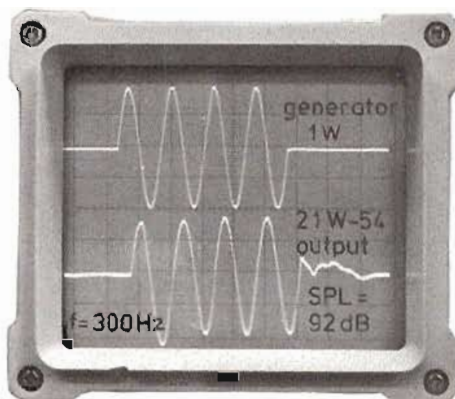
With a STEP-FUNCTION datas about SPL and time scale are not important. A trained expert can compare stepfunctions made with even different scales. The cone steps up and creates a sound wave which meets a 1/4" B&K measuring mic. The slope shown on the screen shows the amount of air moved. So with woofers of same diameter the average of slope is the same. If now rise and slope is set in relation to each other two stepfunctions can be compared. The right picture shows that the 21 W-54 has a rise time ten times as fast as normal speakers of this size.



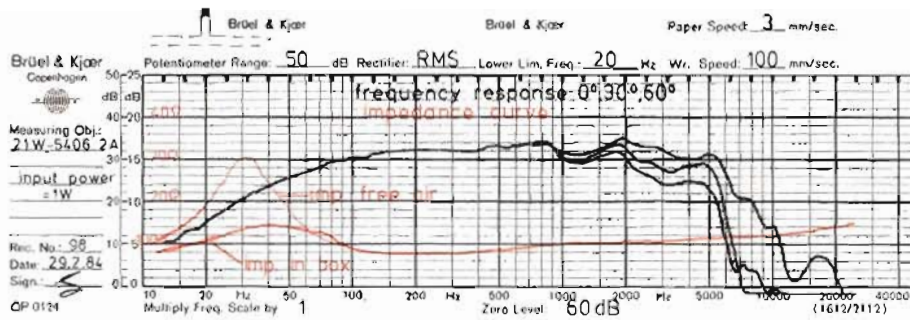
### TONE BURSTS

Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step funktion test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

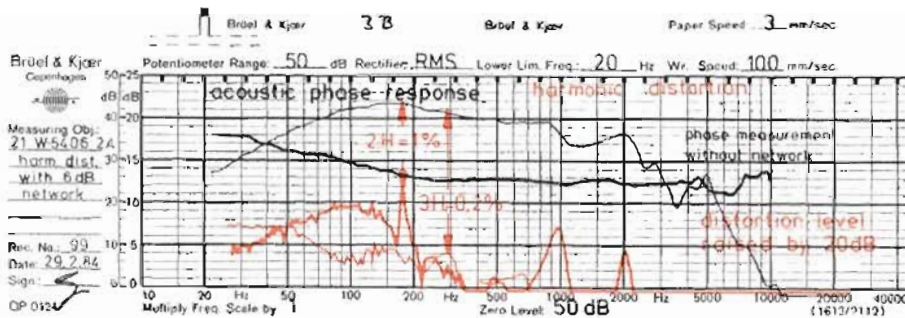
This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.



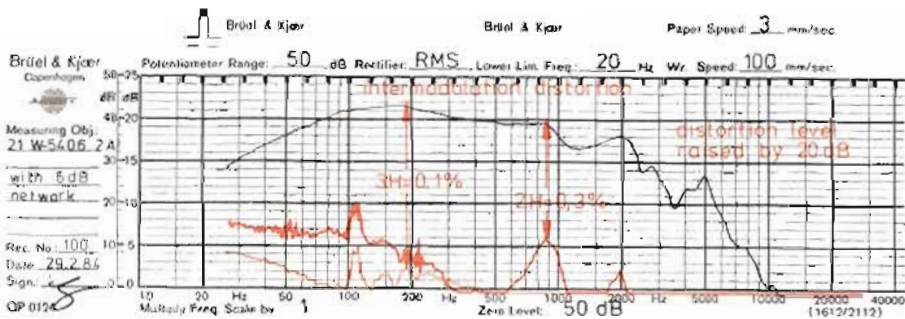




Balanced response up to 4 kHz, important in 2way combinations. Early roll-off and high but narrow resonance impedance indicate high magnetic damping and energy.



The h. d. does not exceed 1% all over. The acoustic phase is linear up to 10 kHz (!) - no sharpness in 2way systems



The intermodulation distortions are below 1%. A 6dB filter will serve best.



Full automatic production lines spitting out big numbers of more or less one-way-products with infernal speed have impressed most of the visitors of far eastern electronic factories.

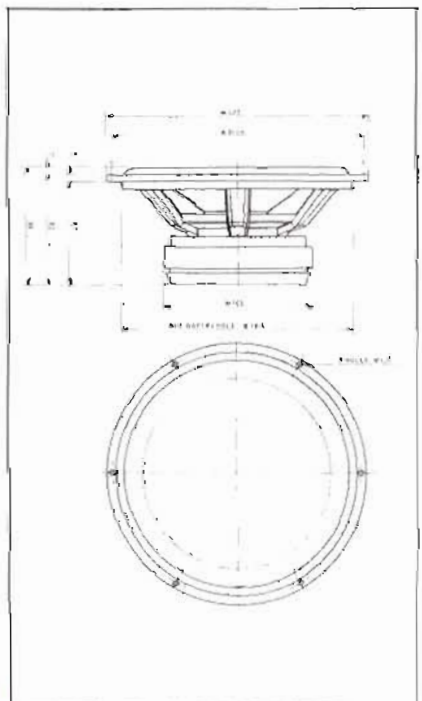
Impressed said the production engineer of a high grade rationalised speaker factory when visiting the DYNAUDIO-plant. "My god, you are making speakers like the swiss watch makers are making their world famous watches!"

Compliance:		Overall dimensions:		222 x 83 mm
suspension	$C_{ms}$	$0,886 \cdot 10^{-3} \text{ m/N}$	Power handling:	
acoustic	$C_{as}$	$0,429 \cdot 10^{-6} \text{ m}^5/\text{N}$	nominal	DIN 160 W
equivalent volume	$V_{as}$	59,6 l	music	DIN 220 W
Cone:			transient	10 ms. 1000 W
eff. cone area	$S_D$	220 cm <sup>2</sup>	Q-factor:	
moving mass	$M_{ms}$	27 g	mechanical	$Q_{ms}$ 2,03
lin. volume displacement	$V_D$	154 cm <sup>3</sup>	electrical	$Q_{es}$ 0,356
mech. resistance	$R_{ms}$	2,60 kg/s	total	$Q_{ts}$ 0,303
lin. excursion P-P	$X_{max}$	7 mm	Resonance frequency free air: $f_s$	30 Hz
max. excursion P-P		29 mm	Rise time	95 $\mu$ s
* Frequency response		35-5000 Hz	Sensitivity:	1W/1m 92 dB
Harmonic distortion:		< 1%	Voice coil:	
Intermodulation distortion:		< 1%	diameter	$d$ 54 mm
Magnetsystem:			length	$h$ 17 mm
total gap flux		1490 $\mu$ Wb	layers	$n$ 2
flux density		0,91 Tesla	inductance (1 kHz)	$L_e$ 0,25 mH
gap energy		849,4 mWs	nom. impedance	$Z_{nc}$ 8 $\Omega$
force factor	$B \times L$	9,09 Tm	min. impedance	$Z_{min}$ 6,4 $\Omega$
air gap volume	$V_g$	2,57 cm <sup>3</sup>	DC resistance	$R_e$ 5,6 $\Omega$
air gap height		10 mm		
air gap width		1,55 mm		
Net weight:		2,5 kg		

Data given are as after 30 hours of running

\* Depends on cabinet construction

\* Thiele/Small parameters are measured not statically but dynamically.



# DYNAUDIO®

TECHNOLOGY UNLIMITED

## 24 W-75

### FEATURES

9" woofer for enclosures of 20 - 60 litres in sealed, aperiodically damped, transmission line or bass reflex designs.

In combination with the D-28 it gives a very homogenous 2-way speaker

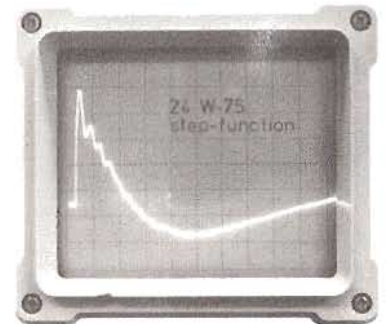
### DETAILS

- high power handling
- low distortion
- shallow construction
- wide dispersion
- phase linearity
- vented magnet system
- tropic proof
- hexacoil technique
- PHA-cone material
- center-magnet system

Here is the successor of the legendary 22W-75. It adds to all the advantages, even more important features. The proven motor with the big (3"/75mm) voice coil is now equipped with an even bigger magnet. Long-throw movement is now possible. More magnetic power is available. Perfectly suitable for use also in bass reflex and transmission line systems. The important alteration however is the new style cone, moulded out of one piece of PHA (Phase Homogeneous Area) material, based on a thermoplastic polymer reinforced with magnesium oxide. It has high sonic speed combined with high internal damping and allows an ideal shallow, uniformly curved shape.

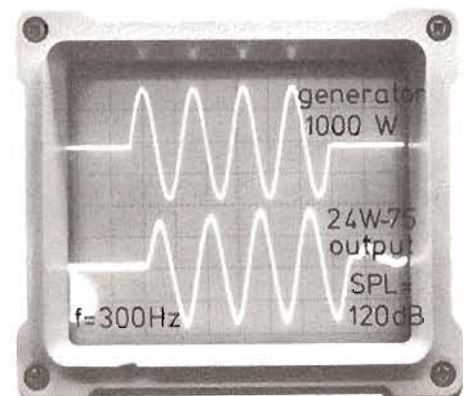
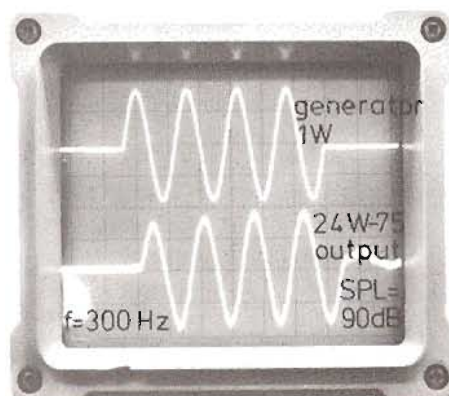


This curve shows response of woofer after peak pulse has been applied to voice coil, and released. As woofer returns to rest it does so through series of steps corresponding to resonance of speaker itself. The more uniformly and flatly the speaker response drops off, the less spurious response is produced. Here a bass reflex enclosure, with a lower limit designed to produce a response of about 20 Hz (measured using sine waves). Comparing output from speaker with signal generator input, a sharp drop in output with ringing (spurious response) is produced. Using Variovent to produce aperiodically damped system raises low frequency limit to about 30 Hz when measured with sine waves, but measured with step function (impulse) slope drops slowly and smoothly without ringing. This proves that, even in "ideal" tuned bass reflex cabinet, low end is produced by modulation between cabinet and port. You have impression of powerful bass (but rather "boomy"), but is not accurate reproduction of input signal, whereas the heavily damped aperiodic system gives accurate reproduction which is smooth and clean rather than "boomy"

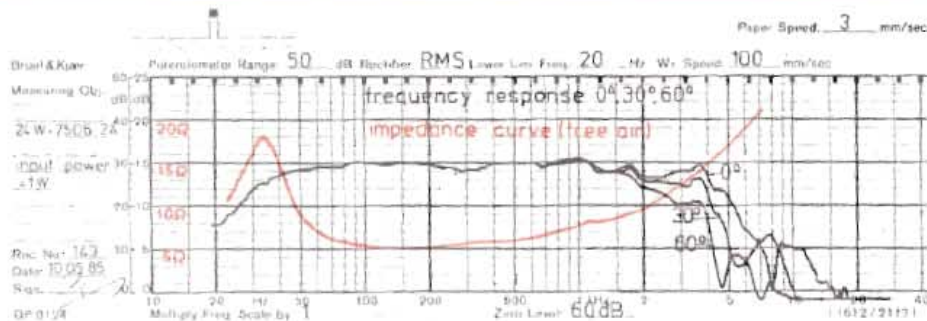


**TONE BURST:** The right picture shows that even a 1.000 W input is not the limit: the dynamic response is absolutely linear.

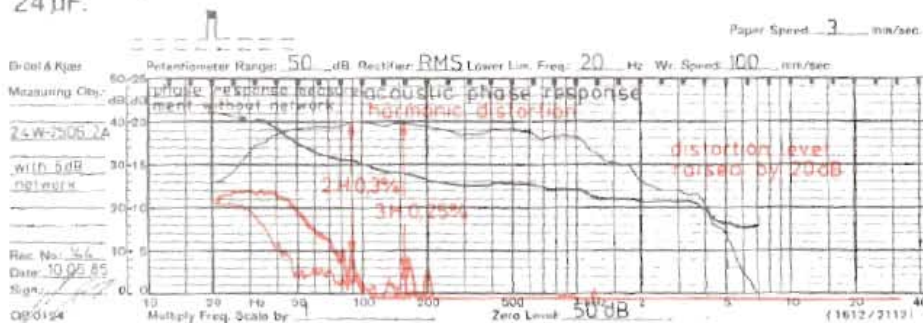
Datas given in catalogues (and even test reports) normally are calculated figures and not measured values. The compression effect is either underrated or ignored very often.



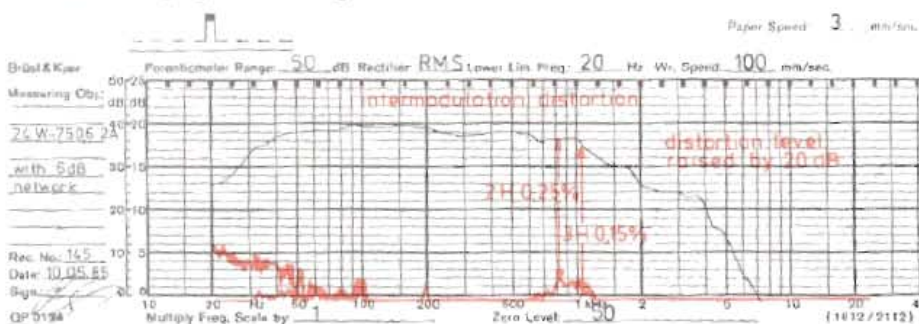




Curve is linear down to 40 Hz, only -3 dB at 30 Hz. Smooth roll-off. Combined with D-28 the unit may be crossed at 2.5 KHz. Huge 3"/75 mm voice coil gives impedance rise from 500 Hz easily to be compensated by 6.8 ohm and 24  $\mu$ F.



The harmonic distortions are at a very low level. At 100 Hz they are below 0.3%. At 50 Hz they do not reach 1%! Linear acoustic phase gives easy-to-handle 2-way system designs.

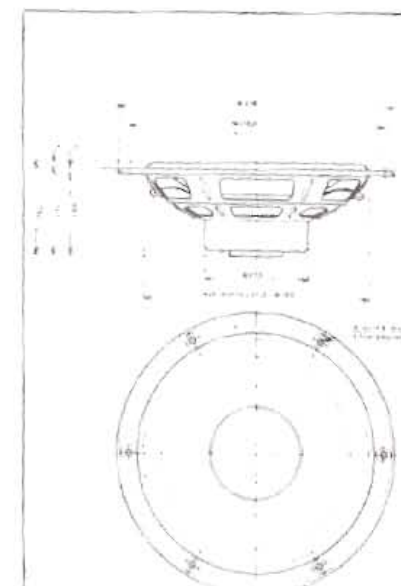


Using a fixed frequency of 100 Hz crossing it with a measuring frequency, the intermodulation is shown here.



Despite most exacting production quality control there will always also remain human function. From voice coil to the complete driver the product will pass 8 to 12 quality control fields depending on type. Our demands for quality, for which DYNAUDIO is known, require exact observance of a low tolerance bandwidth. Tolerances of more than 0.0011 mm will cause rejection of the coil mandrel, and more than 0,5% in frequency response results in rejection of the unit.

Compliance:		Overall dimensions:	240 x 75 mm	
suspension	Cms	1,25 · 10 <sup>-3</sup> m/N	Power handling:	
acoustic	Gas	0,63 · 10 <sup>-6</sup> m <sup>5</sup> /N	* nominal	DIN 120 W
equivalent volume	Vas	88,2l	* music	DIN 200 W
Cone:			transient	10 ms 1000 W
eff. cone area	SD	220 cm <sup>2</sup>	Q-factor:	
moving mass	Mms	18 g	mechanical	Qms 3,37
lin. vol. displacement	Vd	121 cm <sup>3</sup>	electrical	Qes 1,11
mech. resistance	Rms	1,12 kg/s	total	Qts 0,835
lin. excursion P-P	Xmax	5,5 mm	Resonance frequency free air: fs	33 Hz
max excursion P-P		23 mm	Risetime:	130 $\mu$ s
* Frequency response:		35 - 5000 Hz	Sensitivity:	1W/1m 90 dB
Harmonic distortion:		< 0,3%	Voice coil:	
Intermodulation distortion:		< 0,25%	diameter	d 75 mm
Magnetsystem:			length	h 10,5 mm
total gap flux		670 $\mu$ Wb	layers	n 2
flux density		0,56 Tesla	inductance (1 kHz)	Le 0,45 mH
gap energy		204 mWs	nom. impedance	Zvc 8 $\Omega$
force factor	B x L	4,3 Tm	min. impedance	Zmin 6,4 $\Omega$
air gap volume	Vg	1,65 cm <sup>3</sup>	DC resistance	Re 5,5 $\Omega$
air gap height		5 mm		
air gap width		1,38 mm		
Net weight:		920 g	Data given are as after 30 hours of running	
			* Depends on cabinet construction	



Thiele/Small parameters are measured not statically but dynamically.

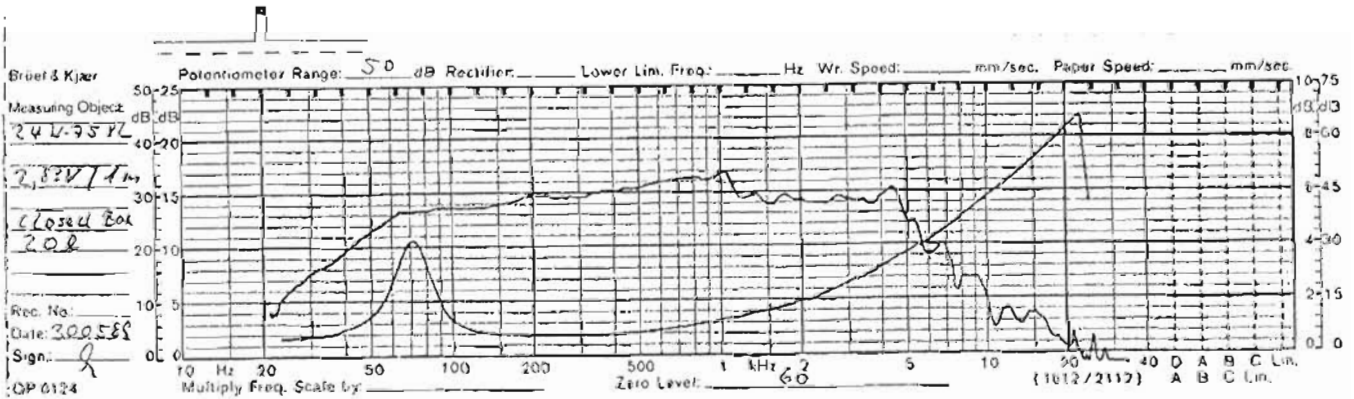
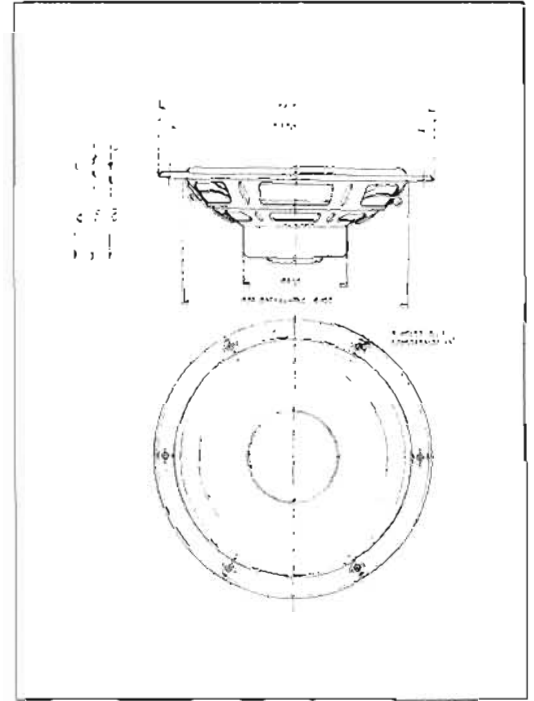


**24 W-75 XL**

Continuing all the proven construction details of the 24 W-75 the redesigned motor now having governed magnetic flux is delivering even more total energy. The parameters of this driver allow ideal employment in sealed enclosures or aperiodically damped constructions delivering more dynamic but also more precise deep bass.

The considerable highlights are

- 75 mm (3") alu voice coil in hexacoil technique
- PP-cone in a one-piece mould, DYNAUDIO technology
- controlled roll-off
- ideal dispersion pattern
- unusual high power handling
- center-magnetsystem
- optimal impulse response
- vented magnetsystem
- shallow design
- high dynamic range



Frequency response and impedance 24 W-75 XL, closed box 20 l

Technische Daten 24 W-75 XL:

Thiele-Small Parameter:		8(4) ohms:	Voice coil:	
Q, mechanical	Q <sub>ms</sub>	2,20 (2,30)	diameter	d 75 mm
Q, electrical	Q <sub>es</sub>	0,61 (0,58)	length	h 11,5 mm
Q, total	Q <sub>ts</sub>	0,48 (0,46)	layers	n 2
Resonance free air	f <sub>s</sub>	33 (32) Hz	inductance(1KHz)	L <sub>c</sub> 0,43(0,39)mH
equiv.volume	V <sub>as</sub>	88,8 (92,4)	nom. impedance	Z <sub>vc</sub> 8 (4) Ohm
force factor	BxL	5,7 (4,6)Tm	DC resistance	R <sub>e</sub> 5,5(3,5) Ohm
eff. cone area	S <sub>D</sub>	220cm <sup>2</sup>	Sensitivity	2.8V sec curve
moving mass	M <sub>ms</sub>	18,0 (18,4)g	Power handling:	
lin. excursion (p-p)	X <sub>max</sub>	6,5 mm	nominal (long term) IEC	130 W
max. excursion (p-p)		23mm	transient 10ms	1000 W
			Net weight	1,1 kg
			Overall dimensions	240x75 mm

# DYNAUDIO<sup>®</sup>

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24-W-100

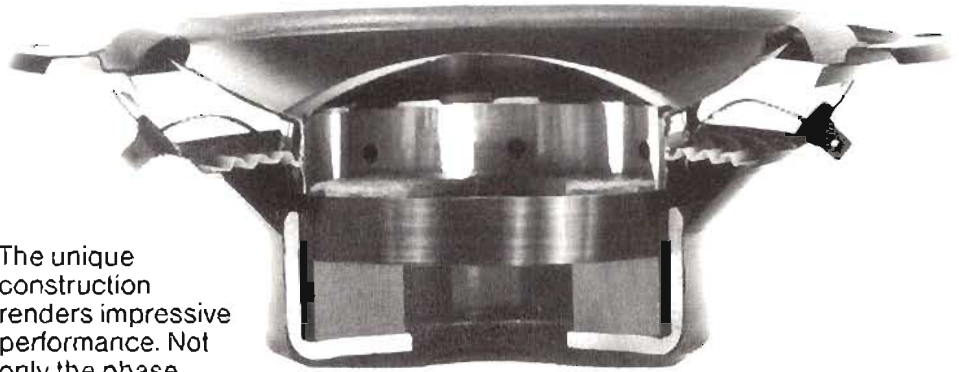
## APPLICATIONS

woofer in 2-, 3- and 4-way systems, slim towers  
versatile utility: closed box, variovented box, bass-reflex, transmission line  
in bigger systems as „upper bass” or „low mid”

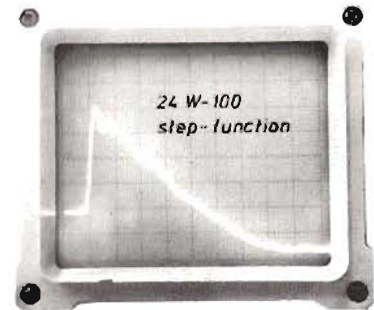
## FEATURES

Unusual large 4" (100 mm) vented center magnet motor  
hexacoil technique  
PHA cone material  
high power handling  
wide dynamic range  
smooth phase response  
low magnet flux leakage  
no dynamic compression  
stable acoustic center

The unique construction renders impressive performance. Not only the phase linearity but also the wide dynamic range allows an unusual precise bass reproduction. The frequency curve runs flat and drops smooth at both ends, the off axis curves show the excellent dispersion. The crisp and well dissolved midrange grants splendid 2 way designs.



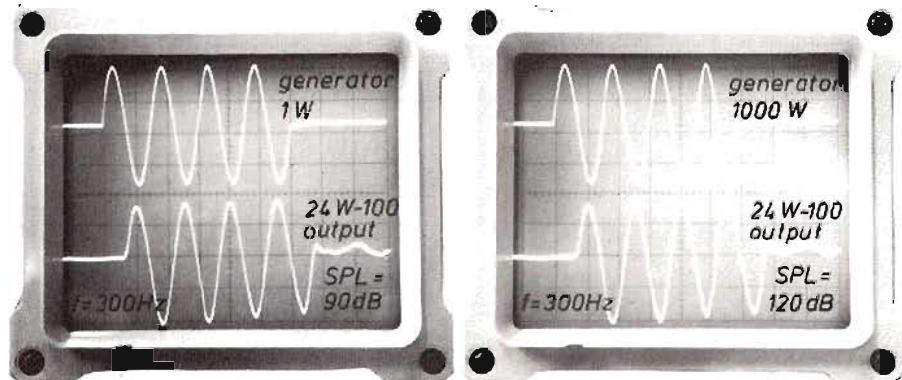
The center magnet system not only exploits the magnet strength about double as good as conventional systems but also allows construction of very low leakage of the magnetic flux. Already 15 mm (0.6") off the flange there is near to none magnetic stray field against a conventional system which shows this figure only at a distance of about 150 mm (6"). This allows employment of the 24 W-100 in monitoring systems placed near to video TV screens without extra shielding.



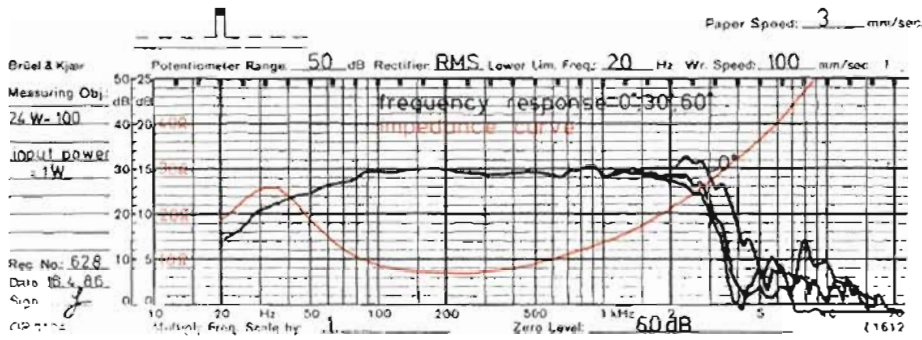
The STEP-FUNCTION:  
a typical DYNAUDIO result

A few people only know about dynamic compression in loudspeakers, and most manufacturers pass over in silence about it. When program power is fed into a speaker, part of this power will be converted into heat in the voice coil. At high power levels this temperature is likely to reach appr. 250 degrees Celsius (500 degrees Fahrenheit). Under this condition the impedance figure will double up, which in return easy can result in a compression of output of about 5 dB (!). Without any subtlety one can imagine that the result is an audible imbalance as not all drive units of the complete system will reach the same

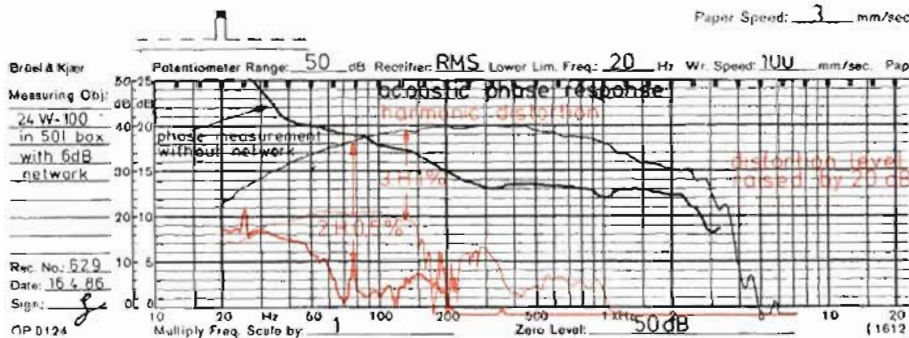
temperatur level and the same level of compression. What to do? First of all you have to choose the voice coil diameter as big as possible, still light-weight of course (using i.e. aluminium wire). Secondly the air gap width has to show a low figure in order to dissipate the heat via the iron and magnet material. Last not least the entire construction should goal to come off with temperature rises.



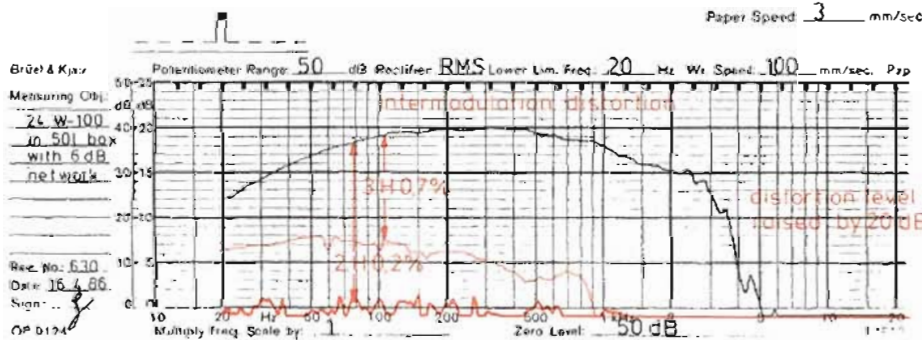
The BURSTS: input and output are analogous



Frequency response straight up to 3 kHz allowing excellent 2-way combinations, i.e. with D 28 (AF). From 3 kHz the frequency drops with 20 dB, ideal for 6 dB filter.



HD measured in 50 liter enclosure. Exceptional is the low distortion even at 20 Hz.



The PHA material allows unconventional shape of cone: no break up, high internal damping.

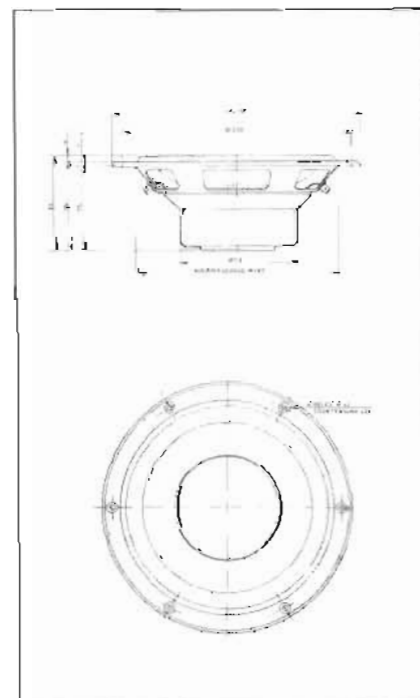


An extra advantage of a big voice coil is that the forcing power is transferred to the cone at about the middle of the radius. Small voice coils have an unbalanced force transfer provoking breakups and distortions. The costs of manufacturing a big high precision DYNAUDIO hexacoil are considerably higher than for an entire ordinary drive unit.

<b>Compliance:</b>		<b>Overall dimensions:</b>		Ø 240x85 mm	
suspension	Cms	0,93	10 <sup>-3</sup>	m/N	
acoustic	Gas	0,45	10 <sup>-6</sup>	m <sup>5</sup> /N	
equivalent volume	Vas	62	l		
<b>Cone:</b>		<b>Power handling:</b>		DIN 350 W	
exit cone area	SD	220	cm <sup>2</sup>		
moving mass	Mms	30	g		
lin. vol. displacement	Vd	176	cm <sup>3</sup>		
mech. resistance	Rms	3,5	kg/s		
lin. excursion P-P	X <sub>max</sub>	8	mm		
max. excursion P-P		26	mm		
* Frequency response:		35-3000 Hz			
Harmonic distortion:		1 %			
Intermodulation distortion:		0,7 %			
<b>Magnetsystem:</b>		<b>Q-factor:</b>		DIN 450 W	
total gap flux		mechanical		10 ms 1000 W	
flux density		electrical		Qms 1,6	
gap energy		total		Qes 0,45	
force factor	B x L	6,26	Tm		
air gap volume	Vg	4,27	cm <sup>3</sup>		
air gap height		8	mm		
air gap width		1,68	mm		
Net weight:		1,85	kg		
			<b>Resonance frequency free air:</b>		fs 32 Hz
			<b>Sensitivity:</b>		1 W/1 m 90 dB
			<b>Voice coil:</b>		
			diameter	d	100 mm
			length	lh	16 mm
			layers	lt	2
			inductance (1 kHz)	Le	0,73 mH
			nom. impedance	Zvc	8 Ω
			min. impedance	Zmin	6,4 Ω
			DC resistance	Re	5,2 Ω
					020486 MT

\* Thick / Small parameters are measured not statically but dynamically.

All specifications subject to change without notice





# DYNAUDIO®

TECHNOLOGY UNLIMITED

## 30 W-54

### APPLICATIONS

12" woofer for enclosures of 80 to 140 litres for 3-, 4- and 5way systems  
PHA cone allows midrange from 800 Hz  
transmission line bassreflex sealed or aperiodic damped enclosures

### FEATURES

magnesium die cast basket with aerodynamic ribs  
very high power handling  
vented long throw magnet system  
low distortion  
hacacoil technique  
PHA-cone material (phase homogeneous area)  
DTL-system (dynamic transient linearity)  
tropic proof  
high BL-factor

When the old 30W-54 came out some years ago it soon got famous to be the best 12" woofer for high end high fidelity systems. Now we have improved some important specifications. Making the cones now in our own plant of special polymer/oxide mixture the frequency response runs straight giving an even higher definition of complex music. The new long throw magnet system allows cone displacement of 1" (25 mm) so it can be used even in transmission line systems. The proven basket with the aerodynamic ribs integrates the complete vented magnet system. The hexacoil technique allows high power handling and the DTL-system reduces the rise time by the factor 10!

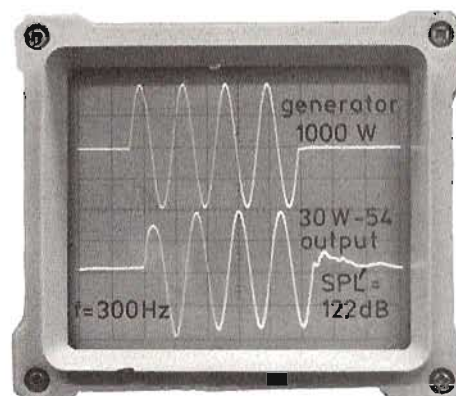
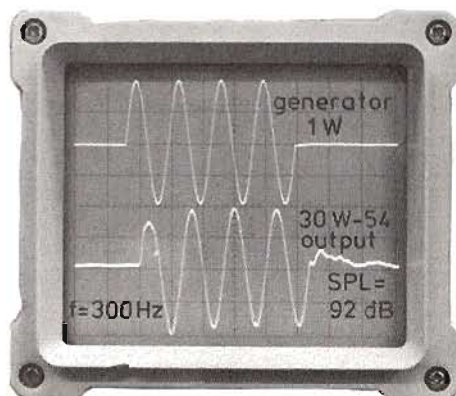


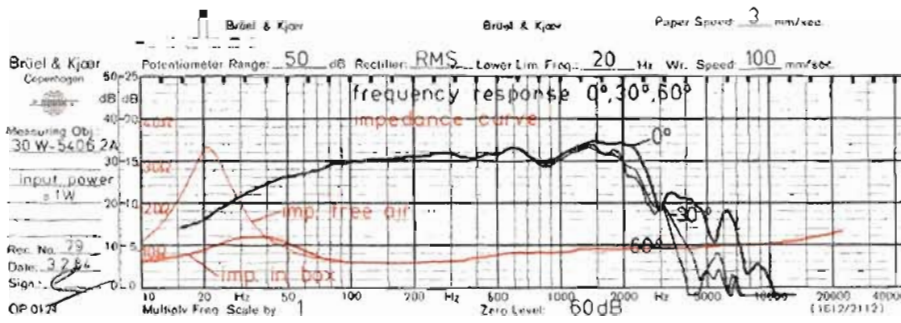
The STEP-FUNCTION of a 12" woofer normally has a slow rise, not much steeper than the dropping due to the heavy weight of big systems. The step function to the right shows the efficiency of our pat. DTL-system. The rise time is reduced to 1/10. The copper capsule around the pole piece is extended and acts as a magnetic short circuit to the voice coil. The iron in the pole piece normally creates nonlinearities to the voice coil which now is eliminated.



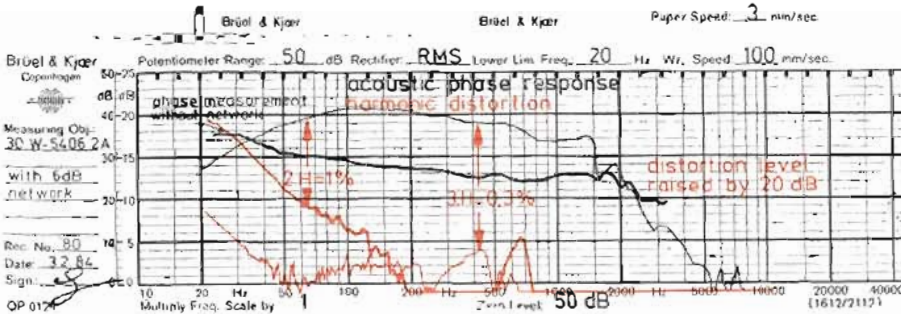
Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step funktion test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

This compression effect is either under-rated or ignored very often. That is why many speakers do not produce SPL's above 100 dB, in spite of higher theoretical specifications. However this test exposes such anomalies between calculations and actual measurements.

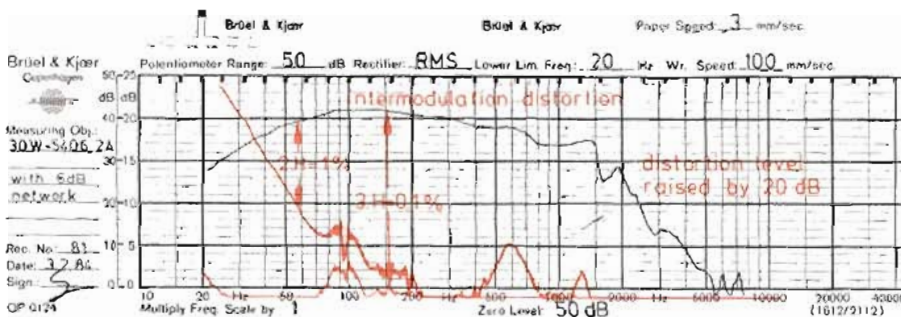




The narrow impedance peak at resonance under free air measurement indicates strong magnetic damping and energy. In enclosure the impedance is flat and balanced.



With a 6 dB filter the 30 W-54 is excellent usable up to 1000 Hz. The acoustic phase is linear even beyond that point.



The scale was raised by 20 dB for this measurement.



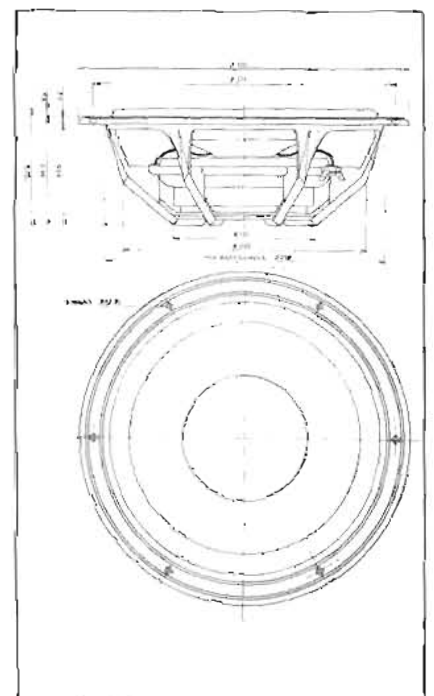
Combining different materials together requires experience and know how about the behavior even under extrem conditions - Here we glue aluminium former to the fabric spider. An exact amount of high temperature resistant glue is precisely placed to the spiders neck. The voice coil of the woofer survives temperature peaks of even 400 to 650° F (300-400° C). Furthermore the connection point has to withstand accelerations of some hundred miles/h altering the direction some thousand times per second.

<b>Compliance:</b>		<b>Overall dimensions</b>		300 x 104,5 mm
suspension	$C_{ms}$	$1,15 \cdot 10^{-3}$ m/N	<b>Power handling:</b>	
acoustic	$C_{as}$	$1,85 \cdot 10^{-6}$ m <sup>5</sup> /N	*nominal	DIN 210 W
equivalent volume	$V_{as}$	257 l	*music	DIN 350 W
<b>Cone:</b>			Transient	10 ms 1000 W
eff. cone area	$S_D$	400 cm <sup>2</sup>	<b>Q-factor:</b>	
moving mass	$M_{ms}$	41,6 g	mechanical	$Q_{ms}$ 2,39
lin. volume displacement	$V_d$	280 cm <sup>3</sup>	electrical	$Q_{es}$ 0,42
mech. resistance	$R_{ms}$	2,5 kg/s	total	$Q_{ts}$ 0,357
lin. excursion P-P	$X_{max}$	7 mm	Resonance frequency free air	$f_s$ 22 Hz
max. excursion P-P		25 mm	<b>Sensitivity:</b>	1W/1m 92 dB
*Frequency response:		30-3000 Hz	<b>Voice coil:</b>	
Harmonic distortion:		< 1,5 %	diameter	$d$ 54 mm
Intermodulation distortion:		< 1 %	length	$h$ 17 mm
<b>Magnetsystem:</b>			layers	$n$ 2
total gap flux		1490 $\mu$ Wb	inductance (1 kHz)	$L_e$ 0,25 mH
flux density		0,91 Tesla	nom. impedance	$Z_{vc}$ 8 $\Omega$
gap energy		849,4 mWs	min. impedance	$Z_{min}$ 6,4 $\Omega$
force factor	$B \times L$	9,44 Tm	DC resistance	$R_e$ 6,25 $\Omega$
air gap volume	$V_g$	2,57 cm <sup>3</sup>		
air gap height		10 mm		
air gap width		1,55 mm		
Net weight:		2,9 kg		

\*Thiele/Small parameters are measured not statically but dynamically.

Data given are as after 30 hours of running

\*Depends on cabinet construction





# DYNAUDIO®

TECHNOLOGY UNLIMITED

30 W-100

## APPLICATIONS

12" woofer for  
3-, 4- and 5-way systems  
subwoofer constructions  
transmission line  
bass reflex and  
aperiodic damped systems

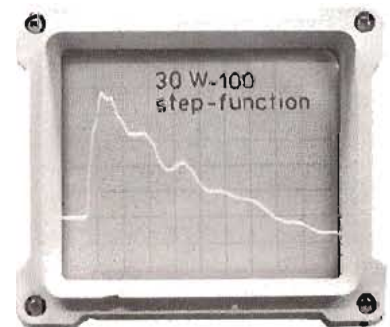
## FEATURES

rigid magnesium die  
cast basket with  
aerodynamic ribs  
vented long throw  
magnet system  
high BL-factor  
lowest distortion figures  
very low rise time  
PHA cone material  
haxaciol technique  
tropic proof

Not just another woofer but quite a new construction. High targets are realized. The distortion is minimized, the power handling maximized. All this was possible using the center magnet system, the PHA-cone material and the advanced DYNAUDIO principles. The system is easily handling 600 watts of clean music programme thanks to the center magnet system with the 4" (100 mm) VC. The intermodulation distortion is hardly measurable and due to the PHA cone not exceeding 0.8% even at the lowest end of the B&K-test equipment with 20 Hz. Normally good woofers show figures about 10-20%. The 30 W-100 is a challenge to the manufactures of big high end power amps.

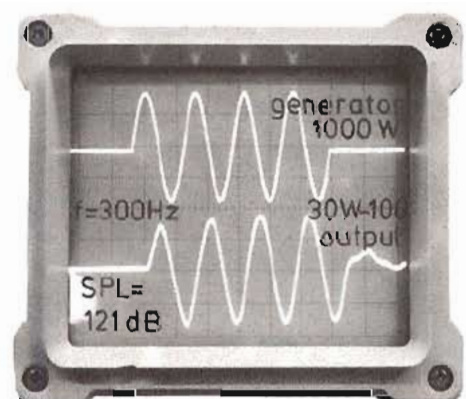
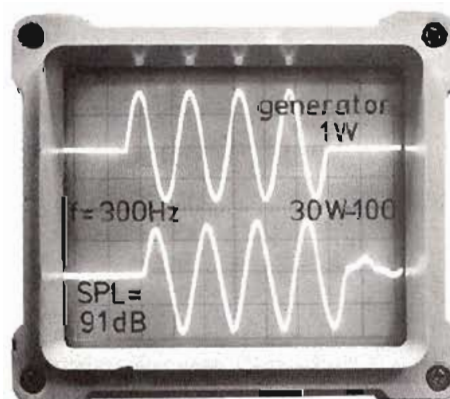


When using a STEP-FUNKTION judgement of the slope is most important. The ideal would be if the slope rolls off in an e-funktion. The size of area below the slope indicates the low end. Short jumps of the slope show misbehaviors of the speaker. Dome tweeters i.e. have the ideal slope but even slopes of very good cone speakers are a little weavy. These waves indicate coloration of response. The shown step of 30 W-100 has no wave of this kind.

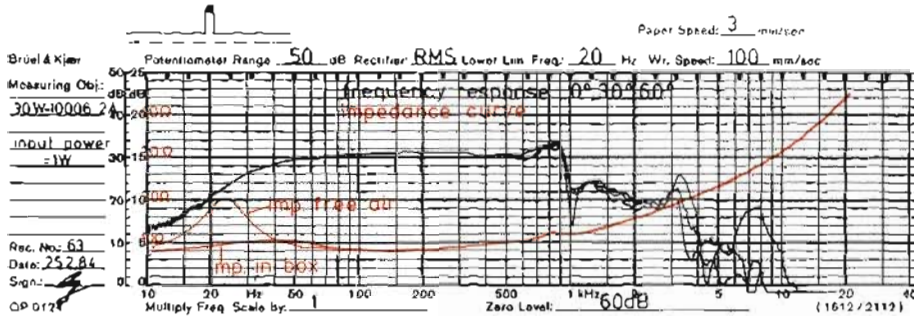


Tone bursts are the best way to obtain an accurate picture of overall acoustic performance. Regrettably they are mostly used only to test rise-time and ringing - which shows much more clearly with a step funktion test! With a tone burst, all the moving parts of a speaker can be loaded without burning the voice coil. With a given frequency the SPL should be 30dB higher at 1000 W input when compared with a 1 W input, if the output is linear. This test shows the driver's ability to reproduce the transients without compression. The right picture shows that even a 1000 W input is not the limit: the dynamic response is absolutely linear. Data given in catalogues (and even test reports) normally are calculated figures and not measured values.

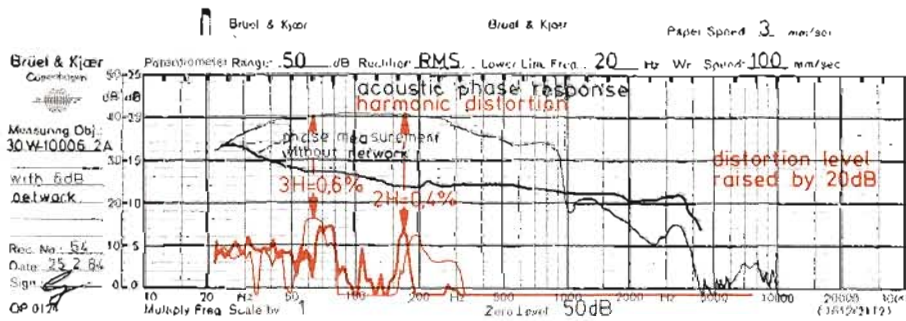
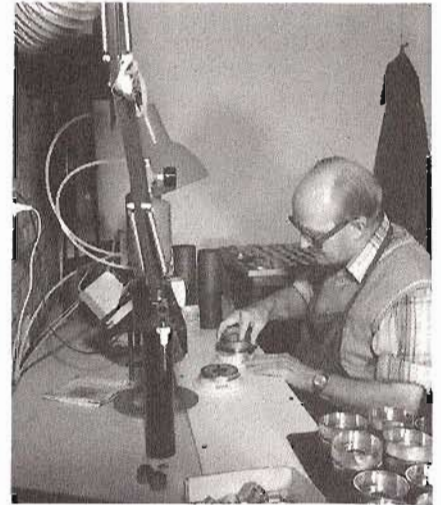
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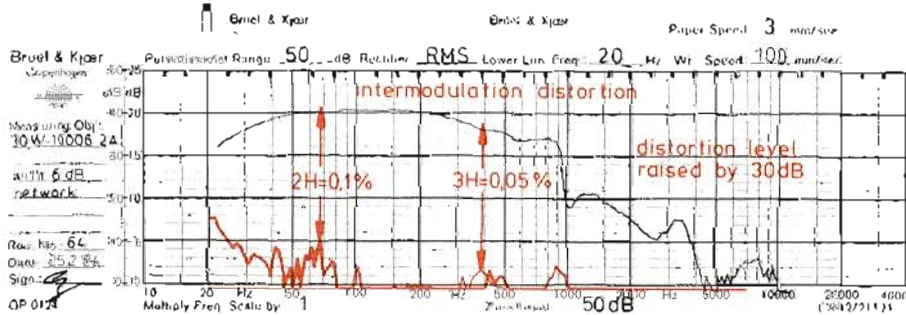


The radiation of sound is equal at all position (0°, 30°, 60°) and allows ideal employment up to 500Hz. Used in enclosure the impedance does not exceed 10 Ohms.



DYNAUDIO products are famous for flat phase response. Extremely low distortion, below 0.8% totally

Today even complicated high technology products may be produced in large quantities. Some of these products have limited markets which in return limits the use of automatic tools. In these small series the precision, know how and skilled labour decide the quality of the ready product. About one third of the DYNAUDIO staff works together for more than 10 years.

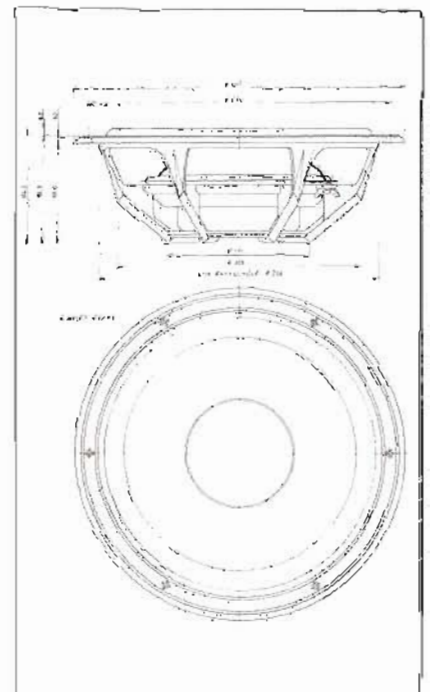


The maximum is below 0.5%, even at 20Hz. (!). Level is raised by 30 dB.

Compliance:			Overall dimensions:		
suspension	C <sub>ms</sub>	1,21 · 10 <sup>-3</sup> m/N	300 x 104,5 mm		
acoustic	C <sub>as</sub>	1,94 · 10 <sup>-6</sup> m <sup>5</sup> /N	Power handling	DIN	450 W
equivalent volume	V <sub>as</sub>	269 l	nominal	DIN	600 W
Cone:			music	DIN	1000 W
eff. cone area	S <sub>D</sub>	400 cm <sup>2</sup>	transient	10 ms	1000 W
moving mass	M <sub>ms</sub>	35,2 g	Q-factor		
lin. volume displacement	V <sub>d</sub>	320 cm <sup>3</sup>	mechanical	Q <sub>ms</sub>	2,70
mech. resistance	R <sub>ms</sub>	1,98 kg/s	electrical	Q <sub>es</sub>	0,803
lin. excursion P-P	X <sub>max</sub>	8 mm	total	Q <sub>ts</sub>	0,619
max. excursion P-P			Resonance frequency free air	f <sub>s</sub>	24 Hz
Frequency response:	22-900 Hz		Rise time	89 μs	
Harmonic distortion:	< 0,8%		Sensitivity:	1W/1m 91 dB	
Intermodulation distortion:	< 0,6%		Voice coil		
Magnetsystem:			diameter	d	100 mm
total gap flux	1300 μ Wb		length	h	16 mm
flux density	0,51 Tesla		layers	n	2
gap energy	445 mWs		inductance (1 kHz)	L <sub>e</sub>	0,73 mH
force factor	6,26 Tm		nom. impedance	Z <sub>vc</sub>	8 Ω
air gap volume	B x L	4,27 cm <sup>3</sup>	min. impedance	Z <sub>min</sub>	6,4 Ω
air gap height	V <sub>g</sub>	8 mm	DC resistance	R <sub>e</sub>	5,85 Ω
air gap width	1,68 mm		Data given are as after 30 hours of running		
Net weight:	2,1 kg		*Depends on cabinet construction		

\* Thiele/Small parameters are measured not statically but dynamically.

All specifications subject to change without notice



93.06.21.

PARAMETERS: 30 W 100 XL

Measured in free air and with imp.corr. (5R6/33uF)  
(6R8/33uF)

P R E L I M I N A R Y   S H E E T

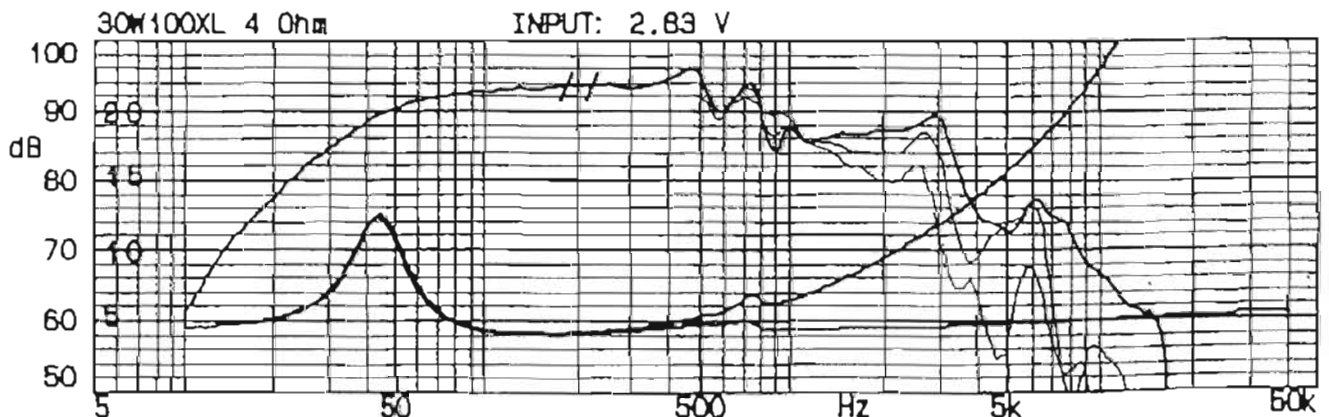
		4 Ohms	8 Ohms
Q, mechanical	Qm	2.3	2.4
Q, electrical	Qe	0.5	0.5
Q, total	Qt	0.4	0.4
Resonance frequency	Fs	22 Hz	22 Hz
Maximum impedance	Zmax	21 Ohms	30 Ohms
Moving mass	Mms	48 g	48 g
Force factor	BL	7.1 Tm	8.2 Tm
Equiv. volume	Vas	248 l	248 l
Effective cone area	Sd	400 cm <sup>2</sup>	400 cm <sup>2</sup>
Lin. excursion (p-p)	Xmax	9 mm	9 mm
Max. excursion (p-p)		28 mm	28 mm

VOICE COIL:

Diameter	d	100 mm	100 mm
Length	h	17 mm	17 mm
Layers	n	2	2
Inductance (10kHz)	Le	0.45 mH	0.65 mH
Nom. impedance	Zvc	4 Ohms	8 Ohms
DC resistance	Re	3.75 Ohms	5.35 Ohms
Sensitivity	2.83V	see curve	

POWER HANDLING:

Nominal (long term)	IEC	130 W	130 W
Transient	10ms	1000 W	1000 W
Net weight		2.3 kg	2.3 kg
Overall dimensions		Ø300x105 mm	Ø300x105 mm



Measured in a 70 l variovent cabinet.



# DYNAUDIO®

TECHNOLOGY UNLIMITED

VARIOVENT

THE VARIOVENT IS AN OPENING IN THE LOUDSPEAKER-BOX WHICH IS PADDED WITH DAMPING MATERIAL. IT CONSISTS OF AN OPEN PLASTIC CABINET, IN WHICH THE AMOUNT AND THICKNESS OF THE DAMPING MATERIAL MAY BE ADJUSTED TO THE INDIVIDUAL CONSTRUCTION OF THE LOUDSPEAKER.

Physically, the VARIOVENT is a flowresistance, damping the resonance like a DC-resistance in the oscillating circuit which results in a more precise bass response (excellent transient response) and better woofer quality.

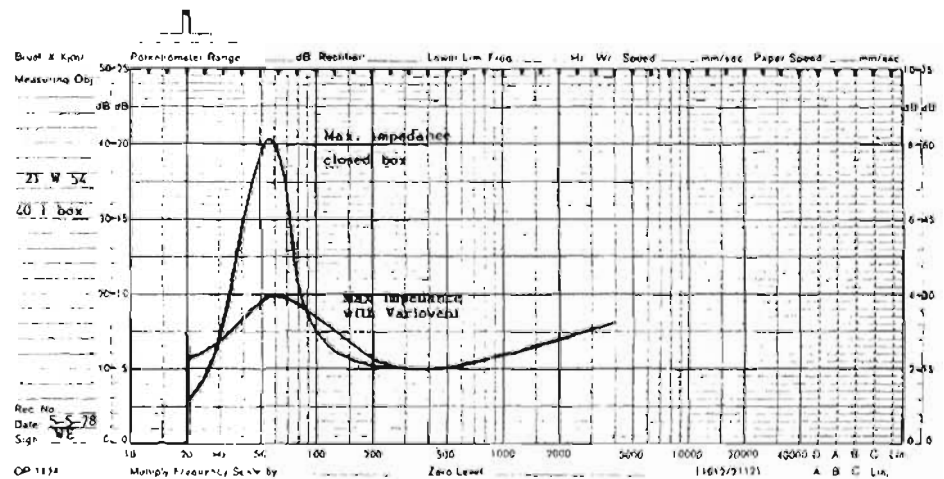
The impedance maximum at the resonance point will be reduced by at least 50% compared to a sealed cabinet (fig. 2). Consequently, the amplifier is able to give more power in the lower range. The oscillation of the cone after a strong pulse is aperiodically damped (fig. 3 and 4). A cabinet construction with VARIOVENT must not be mistaken for a bass-reflex box. This often is inclined to a voluminous and inaccurate bass response. To the contrary, the VARIOVENT causes a more clear and well defined bass response.



Fig. 1



Fig. 2



The use of a VARIOVENT is rather unproblematic, as no delicate tuning is necessary, compared to transmissionline or bass-reflex boxes. Therefore, it is also to be recommended for do-it-yourself use. In any case, an improvement of the woofer characteristics in the above-mentioned sense will be obtained. The best way of mounting the VARIOVENT will be the backside of the cabinet (fig. 1). The diameter of the hole is 110 mm. About 2/3 of the cabinet volume ought to be filled with damping material, by which a channel between the back of the woofer and the VARIOVENT must be left free. For cabinet volumes up to 50 litres, 1 VARIOVENT is necessary. For cabinet volumes up to 80 litres, 2 VARIOVENTS, and for cabinet volumes of more than 80 litres, 3 VARIOVENTS are necessary.

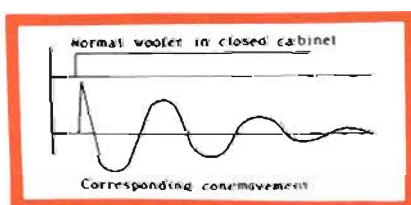
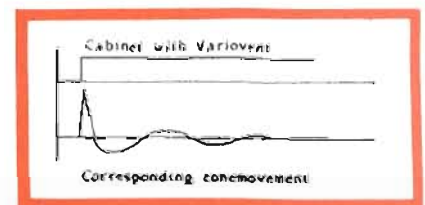


Fig. 3

Fig. 4





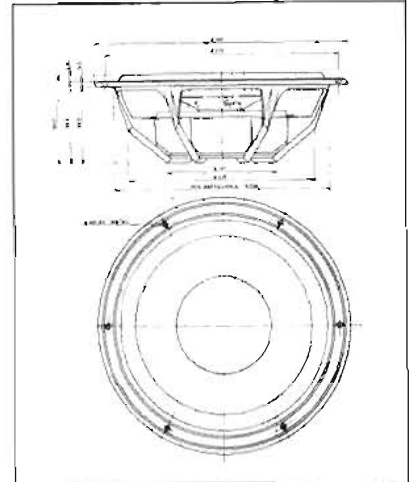
For lovers of breathtaking deep bass response the passive radiator gives the possibility to boost the low frequencies. The resonance of the cabinet is tuned down and then used to amplify the low end. 21 W-SL and 30 W-SL are perfectly for this purpose. The professional magnesium die cast frames are stiff and have

nearly no own resonance. The PHA cone is rigid and has a high internal damping. The resonance of the system is adjustable by enlarging the weight of the moving system by means of screwing washers of different mass to the center point.



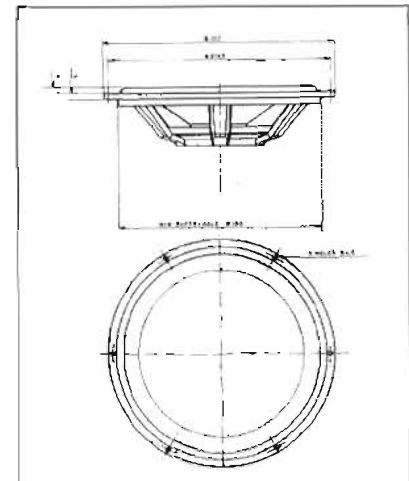
30 W-SL

To obtain a lower resonance of the cabinet the cone area of the passiv radiator should be bigger than that of the driver. You may combine the 30 W-SL with a 21 W-54 or take two 30 W-SL with a 30 W-54 (or 30 W-100)

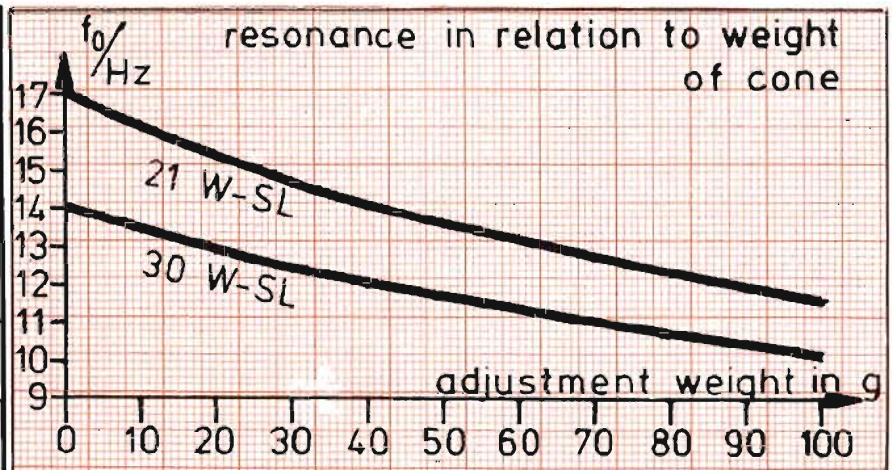


21 W-SL

The 21 W-SL preferably is for very small enclosures i. e. in combination with a 17 W-75. The resonance of the passiv radiator always should be lower than that of the driver.



Bass Speaker	Passiv Radiator	Enclosure Volume in l.
17 W-75	21 W-SL	19
21 W-54	30 W-SL	64
24 W-75	30 W-SL	47
30 W-54	2x30 W-SL	98



The additional resonance peak when using a passiv radiator adds an extra of low frequencies to the signal. With electronic based music it often is an enrichment. With normal and especially classic music it will be up to the users taste.