69QD4TA

Selenium Multi System 69QD4TA consists on a four-way 6x9" pair of speakers developed to reproduce the whole range of audio frequencies: low, midbass and high frequencies. This loudspeaker can be used at the original spots in some cars and on the rear window shelf . It presents the followings feautures :

- Polypropylene injected cones with the *vacuum plating* treatment to provide a bold appeareance like brushed steel.
- The rubber surround design, without a mechanical break, allowing a linear displacement in both directions assuring low distortion.
- Copper Clad Aluminum (CCAW) voice coil, with the aluminum bobbin for a better heat sink, as well as special resines to support high temperatures.
- Steel stamped frame/basket, with a reinforced design and black epoxy finishing.
- Dynamic tweeter with PEI (Polyeter imida) diaphragm/dome and barium ferrite magnet assure a high performance product.
- The Piezoelectric tweeters has high efficiency at high frequency reproduction.
- 120 W Max power is a big jump from the original low power speakers.

SPECIFICATIONS

Nominal diameter	152x228 (6x9)	mm (in)
Nominal impedance	4	Ω
Minimum impedance @ 225 Hz	3.82	Ω
Power handling		
MAX[1]	120	W
AES[2]	60	W
Sensitivity (2.0 V@1m) averaged from 40 to 20,000 Hz	88	dB SPL
Power compression @ 0 dB (nom. power)	2.9	dB
Power compression @ -3 dB (nom. power)/2	1.5	dB
Power compression @ -10 dB (nom. power)/10	0.8	dB
Frequency response @ -10 dB	40 to 20,000	Hz

[1] Power handling specifications refer to normal speech and/or music program material, reproduced by an amplifier producing no more than 5% distortion. Power is calculated as true RMS voltage squared divided by the nominal impedance of the loudspeaker.
[2] AES Standard (100 - 1000 Hz).

THIELE-SMALL PARAMETERS

Fs	54	Hz
Vas	22.73 (0.8)	l (ft³)
Qts	1.55	
Qes	2.17	
Qms	5.42	
ηo (half space)	0.16	%
Sd	0.0221 (34.25)	m² (in²)
Vd (Sd x Xmax)	38.83 (2.37)	cm³ (in³)
Xmax (max. excursion (peak) with 10% distortion)	1.75 (0.068)	mm (in)
Xlim (max.excursion (peak) before physical damage)	7.0 (0.27)	mm (in)

Atmospheric conditions at TS parameter measurements:

Temperature	24 (75.2)	°C (°F)
Atmospheric pressure	1,022	mb
Humidity	45	%

Thiele-Small parameters are measured after a 2-hour power test using half AES power . A variation of ± 17% is allowed.

ADDITIONAL PARAMETERS

βL	3.88	Tm
Flux density	0.87	T
Voice coil diameter	31.7 (1.24)	mm (in)
Voice coil winding length	6.0 (19.68)	m (ft)
Wire temperature coefficient of resistance (α25)	0.00372	1/°C
Maximum voice coil operation temperature	195 (383)	°C (°F)
θvc (max.voice coil operation temp./max.power)	1.62 (3.19)	°C/W(°F/W)
Hvc (voice coil winding depth)	7.5 (0.29)	mm (in)
Hag (air gap height)	4.0 (0.16)	mm (in)
Re	3.64	Ω
Mms	26.3 (0.058)	g (lb)
Cms	330.0	μm/N
Rms	1.65	kg/s

NON-LINEAR PARAMETERS

Le @ Fs (voice coil inductance @ Fs)	0.40	mH
Le @ 1 kHz (voice coil inductance @ 1 kHz)	0.16	mH
Le @ 20 kHz (voice coil inductance @ 20 kHz)	0.06	mH
Red @ Fs	0.058	Ω
Red @ 1 kHz	1.38	Ω
Red @ 20 kHz	36.15	Ω
Krm	0.1	mΩ
Kxm	2.6	mH
Erm	1.09	
Exm	0.68	

ADDITIONAL INFORMATION

Magnet material		Barium ferrite
Magnet weight	340 (12.0)	g (oz)
Magnet diameter x depth	85 x 15 (3.34 x 0.59)	mm (in)
Magnetic assembly weight	680 (1.5)	g (lb)
Frame material		Steel
Frame finish		Black epoxy
Voice coil material		Copper clad aluminum (CCAW)
Voice coil former material		Aluminum
Cone material		Polypropylene
Volume displaced by woofer	0.873 (0.030)	l (ft³)
Net weight	1,144 (2.52)	g (lb)
Gross weight	2,685 (5.91)	g (lb)
Carton dimensions (W x D x H)	43 x 29 x 12 (16.9 x 11.4 x 4.72)	cm (in)

MOUNTING INFORMATION

|		
Number of bolt-holes	4	
Bolt-hole dimension	8.9x5.6 (0.35x0.22)	mm (in)
Bolt-circle diameter	168x120 (6.61x4.72)	mm (in)
Baffle cutout diameter (front mount)	226x157 (8.9x6.18)	mm (in)
Baffle cutout diameter (rear mount)	221x152 (8.7x5.9)	mm (in)
Connectors		Push on terminals
Polarity		Positive voltage applied to the positive (+) terminal gives forward cone motion
Minimum clearance between the back of the magnetic assembly and the enclosure wall	N/A (-)	mm (in)
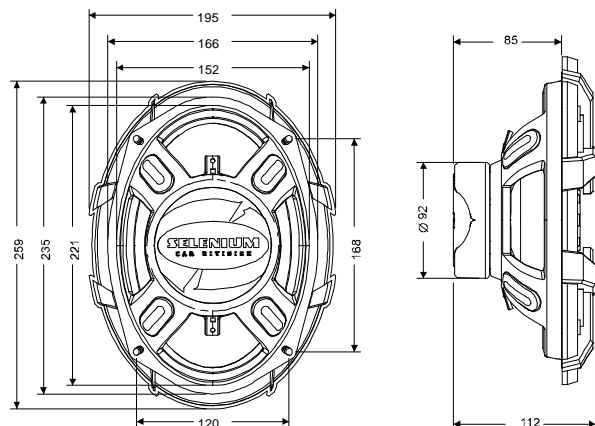
Dimensions in mm.

69QD4TA

RESPONSE CURVE (0° AND 45°) IN A TEST ENCLOSURE INSIDE ANECHOIC CHAMBER, 1W / 1 m

— Response Curve at 0°.
— Response Curve at 45°.
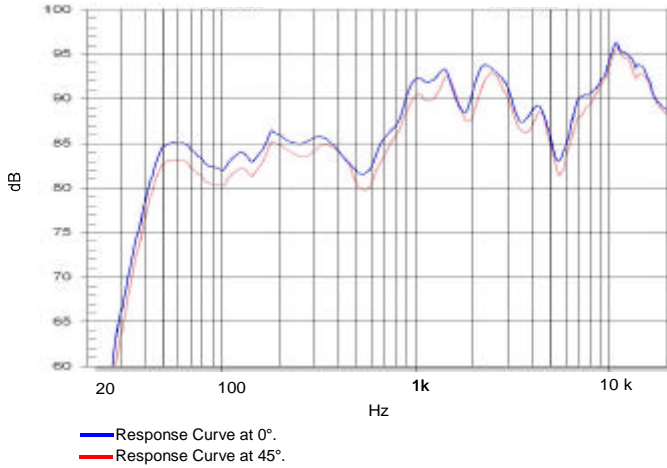
IMPEDANCE AND PHASE CURVE MEASURED IN FREE-AIR

— Impedance Curve.
— Phase Curve.
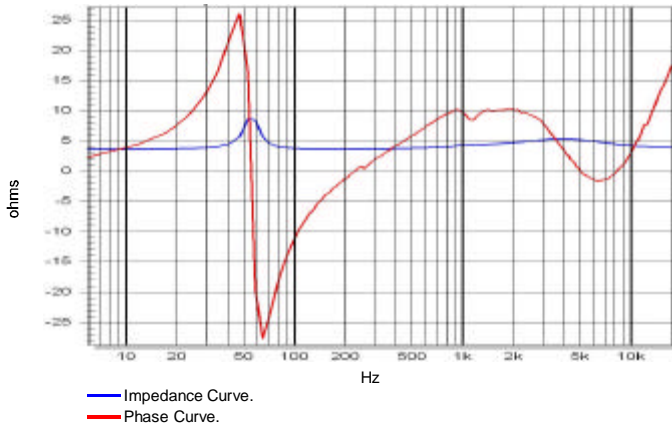
HARMONIC DISTORTION CURVES MEASURED AT 10% AES INPUT POWER , 1 m

— Response Curve.
— Distortion Curve, 2nd harmonic.
— Distortion Curve, 3rd harmonic.
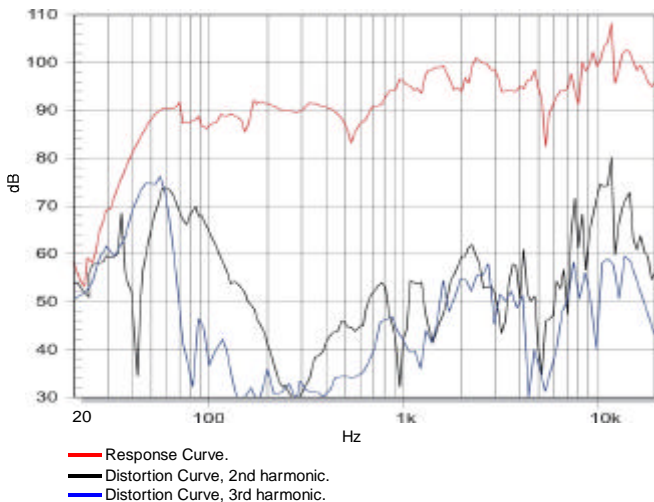
TEST ENCLOSURE
Closed box with 455 l .

HOW TO CHOOSE THE RIGHT AMPLIFIER

The power amplifier must be able to supply twice the RMS driver power. This 3 dB headroom is necessary to handle the peaks that are common to musical programs. When the amplifier clips those peaks, high distortion arises and this may damage the transducer due to excessive heat. The use of compressors is a good practice to reduce music dynamics to safe levels.

FINDING VOICE COIL TEMPERATURE

It is very important to avoid maximum voice coil temperature. Since moving coil resistance (R_E) varies with temperature according to a well known law, we can calculate the temperature inside the voice coil by measuring the voice coil DC resistance:

$$T_B = T_A + \left(\frac{R_B}{R_A} - 1\right)\left(T_A - 25 + \frac{1}{\alpha_{25}}\right)$$

T_A , T_B= voice coil temperatures in °C.
R_A , R_B= voice coil resistances at temperatures T_A and T_B, respectively.
α_{25}= voice coil wire temperature coefficient at 25 °C.

POWER COMPRESSION

Voice coil resistance rises with temperature, which leads to efficiency reduction. Therefore, if after doubling the applied electric power to the driver we get a 2 dB rise in SPL instead of the expected 3 dB, we can say that power compression equals 1 dB. An efficient cooling system to dissipate voice coil heat is very important to reduce power compression.

NON-LINEAR VOICE COIL PARAMETERS

Due to its close coupling with the magnetic assembly, the voice coil in electrodynamic loudspeakers is a very non-linear circuit. Using the non-linear modeling parameters Krm, Kxm, Erm and Exm from an empirical model, we can calculate voice coil impedance with good accuracy.