B&W DM4

Instruction manual test certificate and guarantee

B&W electronics

B&W

DM4

Contents

B&W electronics
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1 General description and introduction

Throughout the world, both in the home and in the professional studio there is an established need for a small monitor loudspeaker designed and built to the highest possible standard.

In 1968 we launched the DM1 and described this as a precision three unit miniature — designed to an ultimate standard rather than down to a price. This approach was contrary to the established practice at that time, and still existing with many manufacturers, that because a loudspeaker is small it must be cheap. When we released the DM1 its price was some 50% higher than our competitors products of a similar size but its success soon vindicated our policy of producing a better than average product both in terms of value for money and performance. The DM1 has been acclaimed throughout the world both by reviewers and users alike, is used by leading Broadcasting Authorities for quality monitoring in small studios and in the last three years production has exceeded 15,000.

The success of the DM1 provided our design team with obvious enthusiasm to translate and extend the DM1 design and take advantage of new materials and improved design and measuring facilities which were not available some four years ago. To site a single example, the mid-range harmonic distortion (overtones) on the prototype DM4s was so low that an additional laboratory instrument only introduced by Messrs. Bruel & Kjoer some twelve months ago was purchased to finalise the design of the Bass/Mid-Range Unit — This instrument type 2010 costs some Two Thousand Pounds and was used to finally determine the contour of the cone on the DW200/4. Without these measuring facilities, production to the final standard would not have been possible.

The loudspeaker designer has but one goal and that is to produce a system which approaches closer than previous designs to recreating the original sound in the home or studio, and the design brief laid down for the DM4 set five areas of improvement which should be investigated.

(1) Even greater mid-frequency linearity.
(2) Twice the acoustical output for an equivalent distortion factor.
(3) Three times the output from 30Hz to 60Hz provided by the DM1.
(4) Increased sensitivity or, expressed in different terms, the requirement of a less powerful amplifier to give an equivalent volume of sound.

(5) Increased power handling capacity to conform with higher powered amplifiers now in use.

The DM4 was released at the International Audio Fair, October 1972 in the firm belief that the design aims have been achieved, and from extensive comparison with other systems currently available we believe the DM4 may well out-perform competitive loudspeaker systems of three times the size and twice the price.

The DM4 is a three unit monitor loudspeaker comprising highly developed Bextrene coned Bass/Mid-range unit (designed and produced in our own factory), type HF1300 Mk. II lower high frequency unit and a 19mm. plastic domed upper high frequency unit. Third order Butterworth filters are used throughout and the crossover unit closely integrates the optimum performance of the three units to give an exceptionally smooth response extending from 30 Hz to above 25 kHz.

The DM4 monitor is individually pen tested in our production anechoic chamber and supplied with automatic pen plot showing frequency response.

Provided the instructions are followed your loudspeaker should give you many years of completely trouble free service. In the event of any query we would ask you to adopt the following procedure if service is required :—

England, Scotland & Wales :
Contact the dealer from whom you purchased the loudspeakers.

All other Countries :
Contact our distributor for your country—name and address supplied from our factory if in doubt.

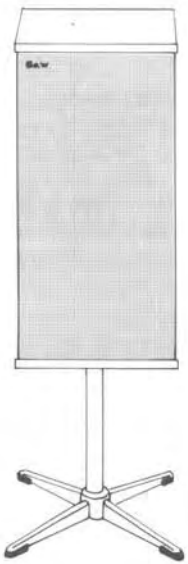
B&W have appointed agents throughout the world, selected with great care to give you the best possible service. Should you have any reason to feel dissatisfied or if any queries arise, we will be pleased to assist wherever possible.

2 Accessories

The DM4 is ideally suited to bookshelf mounting and the contour of the response in the bottom two octaves (30 Hz — 120 Hz) has been optimised on this assumption.

Where a bookshelf or suitable piece of furniture is not available we manufacture a mounting bracket kit (type WMK4) complete with screws and plugs to allow concealed fixing to the wall.

STA/4
For those who wish the loudspeaker to be free-standing, this accessory provides proper support at the correct height.



3 The listening room

Most people have relatively little control over their listening room in terms of size or shape, but as the environment in which the loudspeaker is used plays such a big part in the quality of sound we hear, some comments on room characteristics may be helpful before we proceed in section 4.

There are two aspects of listening rooms which will most widely influence sound reproduction : The basic dimensions of the room and large items of furniture controlling the lower frequencies; and items of soft furnishing together with wall and other coverings affecting the middle and upper frequencies.

All rooms have resonances, and so indeed does the concert hall, but in the case of the latter these are so low in frequency, and by design, so well spaced that they add ambience rather than colouration: The worst example in a listening room or studio would be the unlikely event of all dimensions being the same and the room forming a cube. The best case being a relatively large room where all dimensions are different. Fortunately the worst example is rarely, if ever, encountered but where a choice is possible as between a square or rectangular room the latter is to be preferred as the room resonances — known as eigentones — occur at spaced frequencies and are therefore of lower amplitude.

The most pronounced eigentones occur at low frequencies below approximately 200Hz. In addition to these eigentones there is another important influence the room has over the lower octaves of reproduced sound. Due to the relatively small dimensions of the loudspeaker compared with wavelengths of sound in the lower octaves, the radiation pattern or distribution of sound at these frequencies is effectively spherical. When operating a loudspeaker in a room, this sphere of sound is contained, to a greater or lesser degree, depending on position, within a series of plain surfaces formed by the walls, floor and ceiling. This produces a factor known as 'room gain' and does in fact make the lower frequencies considerably louder than if, for instance, the loudspeaker were operated in the open air.

In the design of the DM4 detailed basic research has been carried out in evaluating room gain and, taking into account the size of this unit the response of the lower two octaves is appropriate for wall or bookshelf mounting.

Before leaving the way in which the room affects the low frequency

The ideal is a solidly built ground floor room with a concrete floor. In rooms where there is a board and joist floor this will play a part in both adding to bass gain and room colouration. The suspended floor acts as a supplementary bass radiator operating at the main resonance of the room. If your listening room has other than a solid floor and you are troubled by excessive or resonant bass response, positioning the loudspeakers away from the corners of the room will assist. In an extreme case the DM4s may of course be operated away from the wall surface and free standing.

The subject of positioning your loudspeakers is dealt with in section 4, but before leaving the listening room we will mention its effect on middle and high frequencies.

The soft furnishings — chairs, curtains and carpet, together with wall and ceiling coverings are the main factors governing the performance of a room at middle and upper frequencies. Position of cupboards, bookshelves and other items of wall furniture also play an important role in these parts of the spectrum.

A room with insufficient soft furnishing will give a hard or steely tonal quality to middle and upper frequencies, with strings suffering especially. A room with too many soft furnishings — an over-damped room — will sound dull and lifeless, a somewhat similar effect to putting 'top cut' on your amplifier tone control.

The ideal mid/high frequency reverberation times (a measure of acoustic 'brilliance' or 'dullness') are somewhat subjective, but generally a good balance can be obtained by opposing a reflective surface with an absorbent one. As an example ceilings are usually bare and reflective and this can be well balanced by a fitted carpet. An unbroken wall facing large window areas can be broken by a bookcase on the opposite wall.

When furnishing a new room which is to be used for listening to reproduced music, it is usually wise initially to underdamp the room and then add absorbent articles after the correct balance has been determined.

4 Siting your loudspeakers

The position of loudspeakers is usually determined by the layout and size of existing furniture and the DM4 design has kept this fact firmly in mind, being optimised to allow correct loading when placed on a bookshelf or closely coupled to a main wall of the listening room. It was felt that designs which necessarily demand for a marked free-standing condition — with the loudspeaker removed a considerable distance from the boundaries of the room — place severe and often unpractical restrictions on the user.

To obtain the best results, certain basic simple rules must be observed. The subject of room acoustics and placement of loudspeakers is, if dealt with in depth, both long and technically advanced. We will therefore confine our comments to a few simple rules.

Simplified instructions for loudspeaker positioning.

1. It is suggested that in initial wiring a flexible lead is used and the position of loudspeakers experimented with on familiar music until a natural balance is obtained. Permanent fixing may then be undertaken after the exact position of the loudspeakers has been determined.

2. Bass response within the bottom two octaves (30Hz to 120Hz) will vary with the position of the loudspeaker relative to any plane surface. Minimum Bass will occur in the unlikely event of the loudspeaker being placed away from the floor in the middle of the room. Conversely maximum Bass will occur should the loudspeaker be tightly coupled to the corner of the room.

3. The height of the loudspeaker from the floor will be governed to some extent by listening position but assuming normal seating we would suggest that the bottom of the loudspeaker should be between 20 and 40 inches (50 and 100 cms.) from the floor.

4. Due to the wide and balanced polar response of the DM4 their horizontal position will not be critical. We would normally suggest that they be not closer than eight feet (2.5 metres) or wider apart than 15 feet (4.5 metres) to give an even and solid stereo image.

5. The penultimate point for consideration is whether to place the loudspeakers parallel with the wall or surface or to angle them towards the listening area. The governing factors are the distance between the loudspeakers and the listening distance from them. Considerable latitude is given by the wide dispersion of the DM4, but as a general rule the angle by which they should be turned is increased the further they are apart and the closer you are seated to them.

6. Finally there is no objection to the DM4 being mounted horizontally although it should be kept in mind that the dispersion of middle and upper frequencies will be somewhat less broad with this method of operation.
   Reference to Figs. 3 & 4 illustrate this point but in practice this only means that the degree of angle away from the wall and towards the listening area may well be more critical and the stereo listening area somewhat more restricted.

Figs 3 & 4.
Dispersion characteristics of the DM4, showing the slight deterioration occurring when the unit is mounted horizontally.

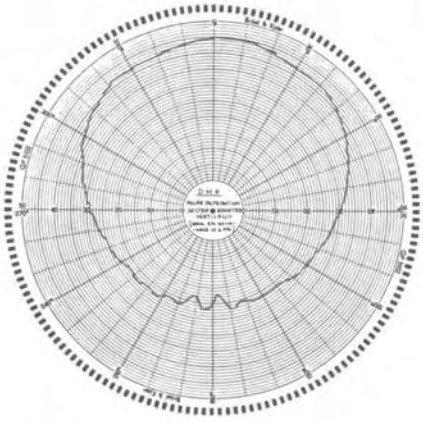


Fig 3
Horizontal dispersion of the DM4 around crossover frequency, when mounted vertically.

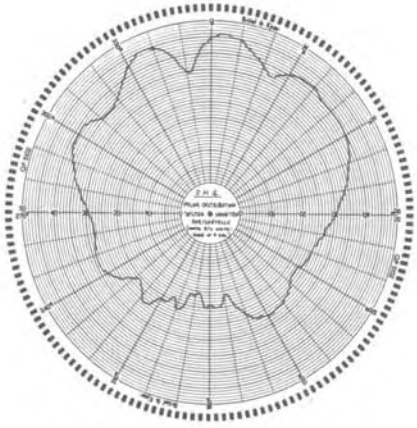


Fig 4
Horizontal dispersion of the DM4 around crossover frequency when mounted horizontally.

5 Electrical installation and connection

For stereophonic operation twin connecting leads will be required from the outputs of your amplifier to each loudspeaker. The terminals at the rear of the loudspeakers are colour-coded red and black and these are connected to the positive and negative terminals of your amplifier.

It is advisable to keep the series resistance of connecting cables as low as possible by using reasonably heavy guage cables. Our recommendations are as follows :

Under 10 metres : 16/0.2 mm. Over 10 metres : 24/0.2 mm.

PHASING

The centre image in stereophonic reproduction relies on 'in phase' components of equal amplitude and it is important to check that your loudspeakers and other items in the reproducing chain are correctly connected. If other items in the chain such as pick-up cartridge etc. are correctly connected the method of connection of loudspeakers outlined at the beginning of this section will be correct. However, there is a simple test which is worthwhile carrying out.

Feed both channels with monophonic source — e.g. mono radio, a mono record, or a stereophonic record with the control unit function switch turned to 'A+B' or 'Duo.mono.' If phasing is correct, when listening from a centre position between the loudspeakers, the sound will appear to originate from a relatively small area between the loudspeakers. If incorrect the sound image will be broader and spread across the area from the two loudspeaker boundaries.

If phasing of any item of equipment is incorrect reversal of any one item will correct the fault.

6 Ancillary equipment

Because of its exceptionally good frequency linearity and relative freedom from distortion and colouration the DM4 is capable of extremely natural and faithful reproduction, provided the signal fed to the loudspeaker is of the highest quality. A monitor loudspeaker — and the DM4 fully meets the critical specification — is therefore analytical and will reveal faults in ancillary equipment and programme material which could well be masked by an inferior loudspeaker.

It is not the purpose of this instruction book to recommend specific items of ancillary equipment and fortunately there is a wide range of top quality equipment available. In general terms however it is wise to match the quality of the various items in the reproducing chain. A good guide being to spend approximately equal amounts of money on the pick-up, arm and motor forming group one, the amplifier or tuner/amplifier forming group two and the loudspeakers forming group three.

The power rating of the amplifier will depend on the size of your listening room and the sound level of listening. True RMS outputs of between 10 watts and 30 watts per channel will meet all requirements.

VOLUME & TONE CONTROL SETTINGS

The correct operation of these controls is important if realistic reproduction is to be obtained. Dealing firstly with volume control settings. It is important to set the volume control of your amplifier at such a level as to recreate the original level of sound that would be heard in the concert hall or place of original live performance. The full symphony orchestra should therefore be reproduced at a higher level than say a small chamber orchestra or the spoken voice. If levels of sound differ from the original, tonal balance will be seriously affected. Should the reproduced level be lower than the original then bass, and to a lesser degree treble, will be deficient. If louder than the original the reverse will be the case.

For many reasons it may not always be possible to listen at original sound levels. For this and other reasons, tone controls are provided. The actual tone control settings will depend on a number of factors too numerous to detail. As a general guide, orchestral music will require some bass lift and little, if any, treble control when played below natural level, speech will require bass cut and slight treble cut when played above natural level. Between these two extremes there

7 Specification

DETAILED SPECIFICATION

Drive Units

DW200/4 Bass/Mid range, consists of 143mm piston diameter critically contoured Bextrene cone driven from a 26mm voice coil on an aluminium former. The entire voice coil is coated with bonding agent and heat cured to ensure long term stability at high operating temperatures. A long throw rear suspension with a specially flexible PVC front suspension (Vitrone – a trade name of Messrs. Stanley Smith & Co.) is used to ensure both a continuation of the long throw linear characteristic provided by the rear suspension and an excellent mid-frequency termination. The winding length of coil enables the long throw characteristic to be held within its travel and accounts for the low distortion characteristic of this unit at low frequencies. A pressure die-cast chassis of alloy construction is employed with a high Flux ceramic magnet assembly. All units are individually hand assembled; cones treated with critical damping compounds and frequent quality control response curves and distortion measurement taken on Bruel and Kjaer equipment.

HF1300 Mk II upper mid frequency unit is as used in BBC monitor type LS3/6 and offering wide dispersion from a virtual point source.

High Frequency Unit

A 19mm low diaphragm-mass plastic dome type unit extending the response above 25 kHz.

Crossover & Filter network

Third order Butterworth with close tolerance components are used giving stop band attenuation of 18db per octave. Series LF inductors on Bass Unit are of low distortion Ferrite construction to reduce DC resistance and ensure maximum amplifier damping of voice coil. All condensers are close tolerance Polyester dielectric (not electrolytic). Crossover frequencies chosen to optimise performance of each unit.

Cabinet

Constructed of 19mm 750 density chipboard throughout with inside balancing veneers. All battens pinned and glued. Choice of Teak, Walnut or Rosewood veneers plus a satin white finish.

Acoustic Loading.

L.F. loading is by means of a very dense critically damped enclosure with a small controlling vent to optimise the response between 60Hz and 120Hz and provide considerable reduction in cone excursion from 30Hz to 60Hz. Inner surfaces of cabinet are absorbent lined, with the addition of long fibre natural wool, reducing standing waves, reflections and colouration from the enclosure to a minimum.

Sensitivity

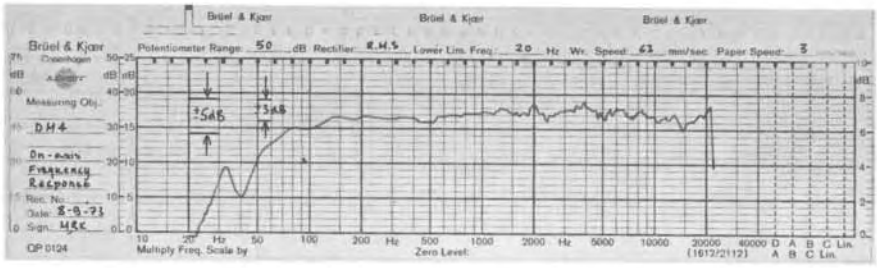
3.6 watts nominal 8 ohms to produce a sound pressure level of 95 db at one metre, at 400Hz.

Power Handling

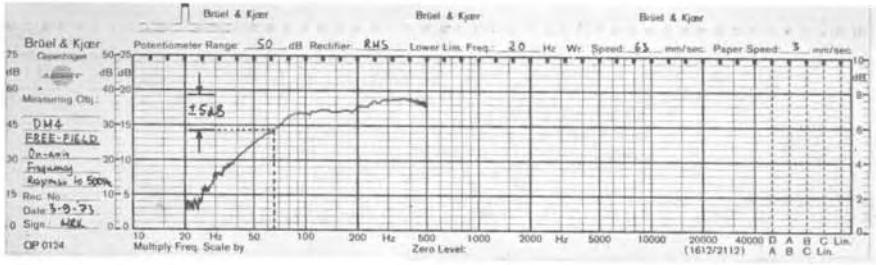
Entirely suitable for all high quality amplifiers with true RMS output of between 10 watts and 30 watts.

Dimensions

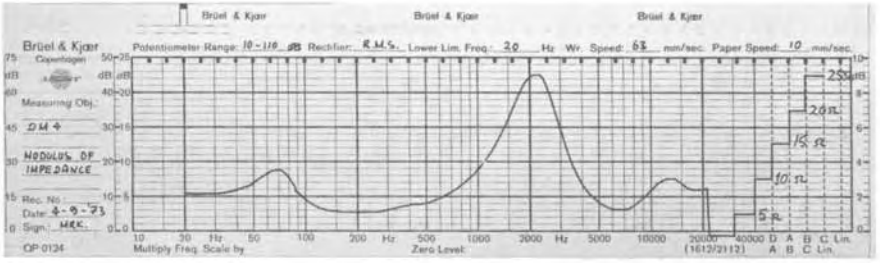
Height 531mm (21"): Width 254mm (10"): Depth 255mm (10"): Weight 11.1 kgs. (24lbs 6oz).



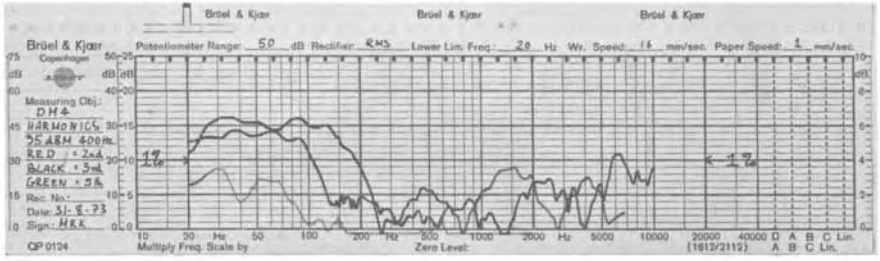
Frequency Response. On axis ± 5 dB 80 Hz to 20 kHz, ± 3 dB 140 Hz to 14 kHz. On axis response of a production sample DM4 in R & D Anechoic Chamber. B & K equipment used throughout, with type 4133 microphone at one metre



Free-field Frequency Response. Frequency response up to 500 Hz taken on 5 metre tower in open. Comparison with above plot shows limitation of Anechoic Chamber at very low frequencies only.

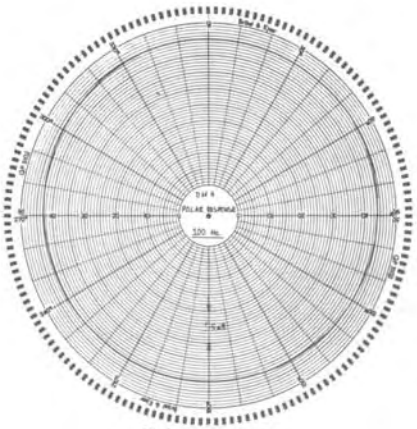


Impedance. Nominal 8 Ohms. Not falling below 6 Ohms, or rising above 25 Ohms throughout entire frequency range 20 Hz to 20 kHz.

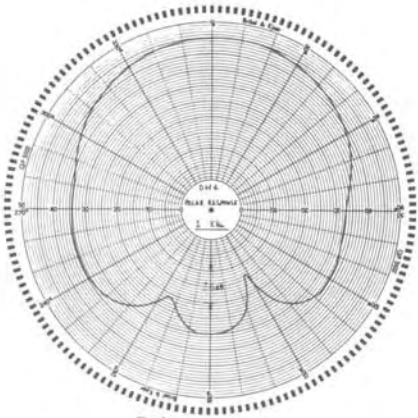


Harmonic Distortion. Harmonic analysis plotted with frequency, reference level of 95 dB at one metre at 400 Hz. B & K Heterodyne Analyser and Tracking Multiplier used.

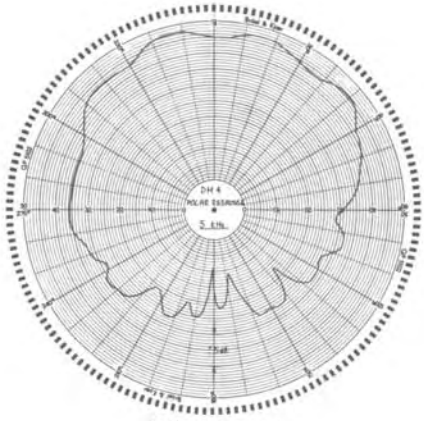
Transient response. Tone Burst Oscillograms taken at one-third octave intervals in our Research Anechoic Chamber. Microphone type 4133 at one metre.



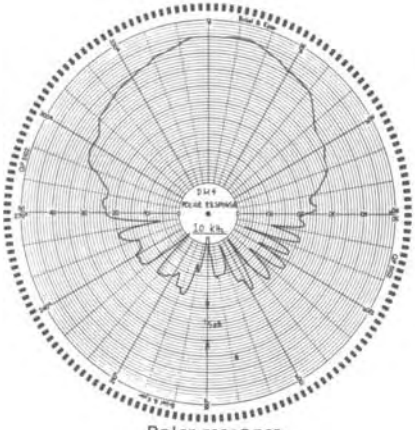
Polar response
100 Hz



Polar response
1 k.Hz.



Polar response
5 k Hz.



Polar response
10 k.Hz.

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INSPECTION CERTIFICATE

Bass Phase		Pwr. & Distortion	
White Noise		Pen Test	
Programme		Appearance	

B&W DM4

Guarantee

The above apparatus is Guaranteed against faulty material and workmanship for a period of one year from the date of purchase subject to the following conditions:

(1) The attached guarantee registration card must be completed and posted to B. & W. Electronics within 14 days from the date of purchase.

(2) Any claim arising under this guarantee should be made either direct to B. & W. Electronics, or to the authorised dealer from whom the equipment was purchased and whose name appears on the registration card.

(3) In the event of service being required from B. & W. Electronics the equipment must be securely packed and despatched to the address below, prepaid and if desired insured by the owner.

(4) Defective component parts (excluding valves, transistors and fuses — which are covered separately by the manufacturers of these components) will be replaced free of charge but labour and cost of transit may be charged at the discretion of B. & W. Electronics.

(5) This Guarantee expressly excludes:
(a) Damage caused by incorrect use of the apparatus.
(b) Loss or damage in transit in either direction.
(c) Contingent and third party liability.

(6) Any service modification or alteration carried out by any other person than the authorised representative of B. & W. Electronics or their appointed agents renders this guarantee invalid.

(7) No alteration or variation of the Guarantee will be recognized.

(8) This Guarantee is not transferable.

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MEADOW ROAD · WORTHING · ENGLAND · BN13 1QA Telephone 0903 205611

B&W electronics

Guarantee Registration Card

Customer's Name and Address:

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Date purchased .....

Model No. .....

Serial No. .....

Supplied by:

I accept the terms and conditions of your guarantee and wish you to register details given above.