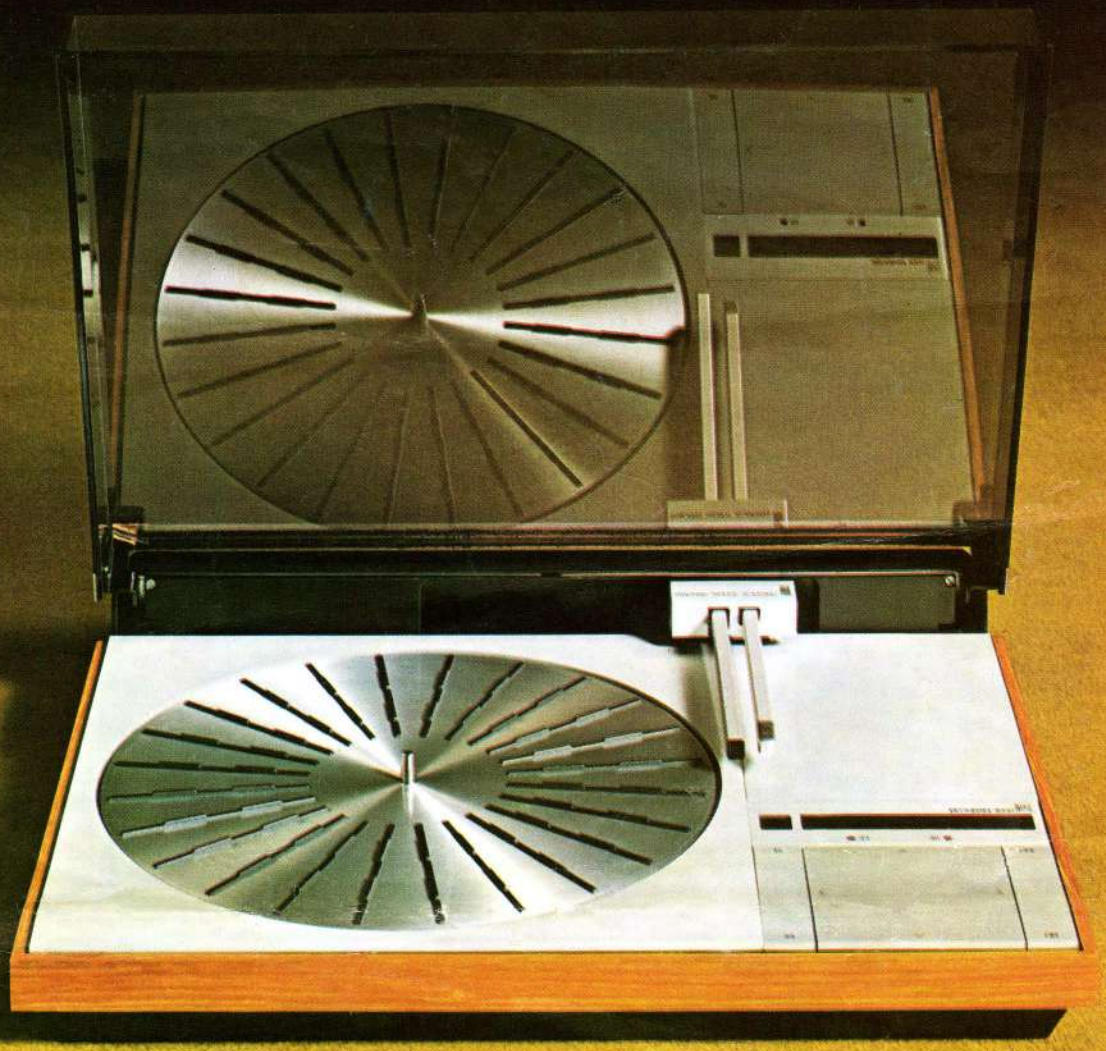


# Beautiful Bang & Olufsen

A fresh view of the gramophone as a functional machine.
Bang & Olufsen has gone back to beyond its origins and started again.
Beogram 4000 – serene and serious, one step nearer to perfection.
Beogram 4000 – the gramophone reborn.

# THE GRAMOPHONE REBORN

A gramophone has three basic functions to perform. It must rotate the record ; it must transfer the signals carried on the record into electrical currents ; it must have some method of controlling these two operations. Until now, there has been an accepted way of doing all these things, and although every "new model" which is launched onto the market may have minor improvements over its predecessors, these always take the form of refinements to the accepted principles. It is rarely that we hear of a major advance in engineering or a break away from traditional methods.

**The problem**
It is the job of the technician and the designer to continue the search for perfection, and in recent years the "traditional" gramophone has reached a standard of performance which is difficult to improve upon. We are therefore faced with the problem of further perfecting the virtually perfect, without increasing its cost unduly, and without overstepping the very fine line between genuine improvement and "gimmickery". Within the limitations imposed by the very nature of traditional principles, a successful solution is simply not practicable.

**The solution**
For people who will not accept the word "impossible", there is always another answer. If you cannot improve on traditional principles, then you must break with tradition. This is exactly what happened when the Beogram 4000 was created. The Beogram 4000 is the result of disregarding all antecedents and starting again from the beginning. The three basic functions of the gramophone cannot be changed, but the way of performing them can. In the Beogram 4000, the functions of rotating, tracking and controlling have been entirely rethought, redesigned, and remoulded into a perfect whole – a unit which bears only a faint resemblance to the gramophone as we know it.

**The motor**
The rotation of the turntable is governed by the motor, and there are two vital requirements to be met if the motor is to perform correctly – it must be silent and its speed must be absolutely constant. Most gramophone motors operate from the mains supply, so their speed accuracy can be dependent upon the mains frequency and voltage, either of which could vary. In the Beogram 4000, a synchronous motor receives its power via a stabilised oscillator, so it is unaffected by power line variations. It is a slow running motor, operating at as little as 315 rpm to give a turntable speed of 33⅓ rpm, and its accuracy is further ensured by dynamic balancing during manufacture.

**The arm**
There is no real reason for a tone arm to be pivoted at a fixed point, describing an arc as the pick-up travels towards the centre of a record – except that it is easier and cheaper to make. There are in fact some very strong reasons against such an arrangement. The foremost of these is that, when a master disc is being cut a tangential arm is used to carry the cutting stylus, so to play a tangentially cut record with a pivotal arm is, at best, a compromise. Also, a pivotal arm has no power of its own and no matter how delicately mounted it may be, there must always be a certain amount of friction at the pivot as the pick-up travels through its arc. The Beogram 4000 has a tangential arm which carries the pick-up in a straight line inwards. The arm is "driven" across the record by a tiny servo-motor, so that the drag friction and skating effect which are inherent with pivotal arms are entirely eliminated.

**The control circuits**
Such delicately engineered equipment requires a gentle and fool-proof method of control. The Beogram 4000 is controlled by a computer-like data unit, which is brought into operation by an "easy-touch" control panel. The data unit, on receiving instructions via the control panel, is able to "sense" the presence of a record on the turntable, and recognise its size and the speed at which it should be played. It does this by means of a photocell mounted in a tangential detector arm which scans the record a centimetre or so ahead of the playing arm. It is

therefore impossible to operate the Beogram incorrectly. If you make a mistake on the control panel, or give conflicting instructions, the data unit will realise the error and refuse the instructions. The safety of both record and stylus is assured. The "easy-touch" control panel is completely noise-free and very pleasant to use. Light finger-pressure on the panel starts the tangential arm scanning towards the record. It will locate the first groove and lower the cartridge gently into position. The Beogram 4000 is fully automatic in an entirely new, advanced way. Its ability to "think for itself", to locate the record, judge size and necessary speed and to refuse incorrect instructions gives a real meaning to the word "automatic" for the first time in the life of the gramophone. Naturally, it is possible to use manual operation if desired, or to select a particular track on a record – a function which is facilitated by an illuminated scale showing numerically the point on the record at which the pick-up has arrived. The control panel also carries indicator lights to show which speed is being used, an illuminated strobe for both speeds, and individual fine speed adjustment controls.

**The complete concept**
To incorporate so many new techniques into one gramophone is an achievement in itself. To incorporate them into a unit as slim and beautiful as the Beogram 4000 is a mark of genius. The technical problems involved in such a design are both immense and intricate, but every detail has been thoroughly planned so that the complex combination of electronics and mechanics has become far more simple to use than the orthodox methods. The only "traditional" aspect of the Beogram 4000 is the Bang & Olufsen tradition of quality and fine workmanship. The deck itself is of brushed aluminium alloy, and the wooden plinth is craftsman built and finished in natural teak or rosewood. The hinged, detachable lid is of smoked ABS plastics and aluminium. The complete concept is Bang & Olufsen.

**Specification for Beogram 4000 Type 5215**

***Dimensions***
3·94″ high × 19·31″ wide × 14·97″ deep.

***Weight***
12 kg.

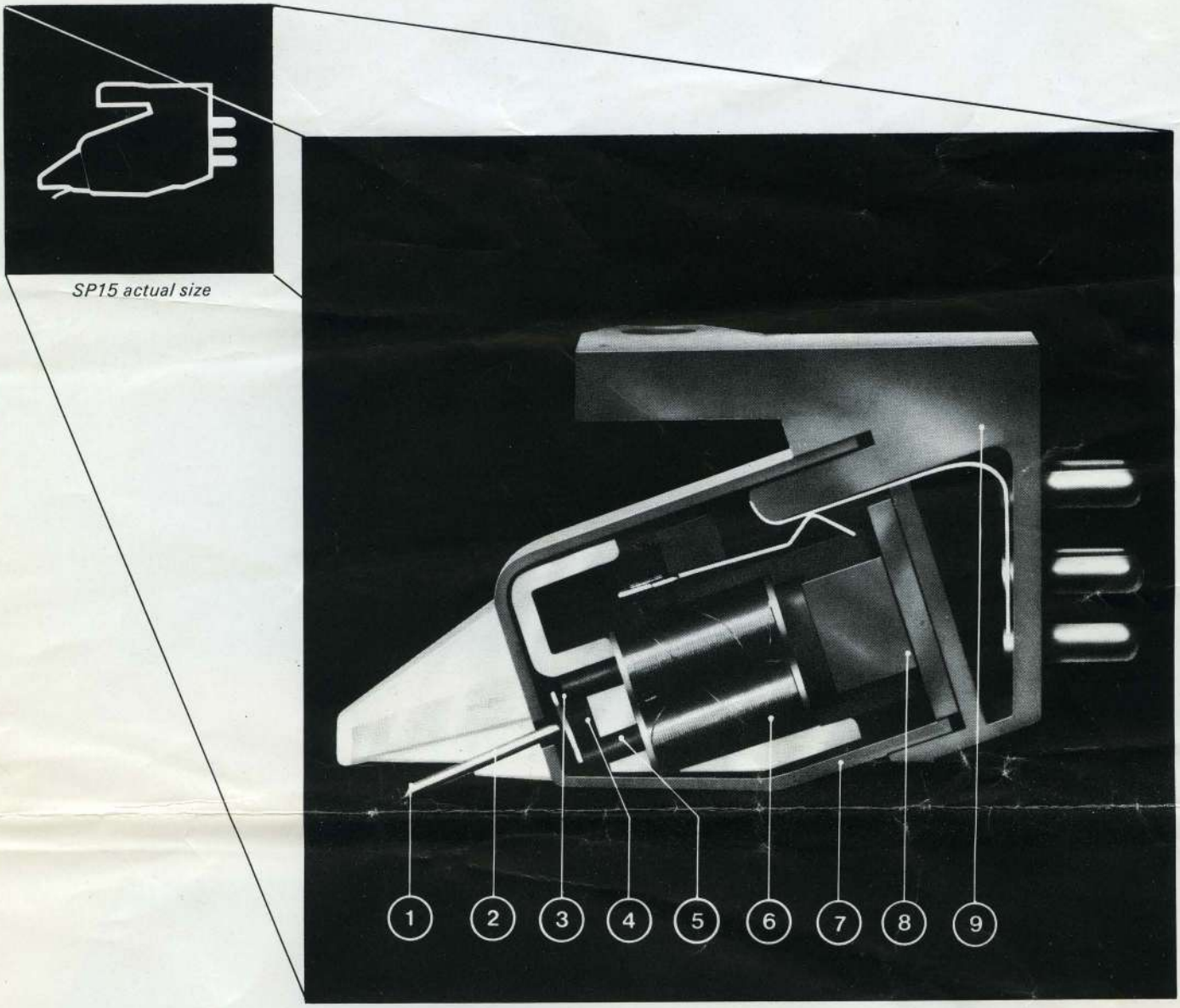
***Power supply***
110–130–220–240V AC, 50–60Hz.

***Power consumption***
40W

***Speeds***
45 and 33⅓ rpm. (Individual fine speed adjustment up to 6%. Illuminated stroboscope. Individual indicator lights.)

***Rumble***
at 45 rpm better than 42 dB
at 33⅓ rpm better than 65 dB.

***Wow and flutter***
Better than ±0·05% – ±0·025% RMS.




*SP15 actual size*

**The pick-up cartridge**
The new principles employed in the Beogram 4000 demand a new standard from the pick-up cartridge. Therefore, concurrent with the development of the Beogram, Bang & Olufsen have also been developing a new cartridge – the SP15. Although the SP15 is built on the Bang & Olufsen patented MMC (moving microcross) principle, it differs from other Bang & Olufsen cartridges in that it is designed as an integrated unit.

**Why "integrated unit"?**
The problem with many high quality cartridges – that is cartridges of such a high standard that relatively small manufacturing tolerances can affect their performance – is that although the stylus originally fitted at the factory can be adjusted and matched to the particular cartridge which carries it, subsequent styli purchased as replacements cannot be individually matched. Expensive methods can ensure that performance comes within acceptable limits in most cases, but there can be no guarantee that the replacement performance is within the stringent limits set for a new, factory tested cartridge. The integrated design of the SP15 eliminates the possibility of a deterioration in performance after stylus replacement. The stylus is not "replaceable" in the normal sense as it is fitted and tested during manufacture and sealed into the cartridge body. When a replacement becomes desirable, either through wear or through accidental damage, a new sealed unit can be obtained for 50% cost of the original.

**Guaranteed performance**
Every SP15 is accompanied by an individually calibrated frequency response graph and an insurance card. This card means that the cartridge is not only guaranteed for twelve months in the normal way, but is also insured against wear and accidental damage throughout its entire life. Each time a new sealed unit is bought as a replacement, its performance has been factory checked and factory calibrated. There is no possibility of a mis-match, however slight, between a new stylus and an existing cartridge. This is the sort of quality demanded by the Beogram 4000, and by any discerning music-lover to whom only the best is good enough.

**Specification for SP15**
**Type 8905428**
***Stylus***
Naked elliptical diamond.
***Radius of curvature***
$(5 \times 17)\mu$ or $(0{\cdot}2 \times 0{\cdot}7)\ 10^{-6}$ in.
***Frequency response***
20–30 000 Hz ± 2·5 dB
50–20 000 Hz ± 1·5 dB.
***Channel separation***
Better than 25 dB at 1000 Hz
Better than 20 dB at 500–10 000 Hz.
***Channel difference***
Less than 1·5 dB.
***Compliance***
$30 \times 10^{-6}$ cm/dyne.
***Stylus pressure***
0·7–1·5 g.
(1 g. recommended for normal use)
***Output voltage***
0·6 mV/cm/sec. (min).
***Load***
47 KΩ
***Vertical tracking angle***
15°.
***Effective tip mass***
0·5 mg.
***Weight***
4 g.

**Key to illustration**
1 Elliptical naked diamon
2 Ultra light aluminium cantilever.
3 Moving micro cross (MMC patent).
4 Block suspension.
5 Pole piece (4 in total).
6 Induction coil (4 in total).
7 Mu-metal screen.
8 Hycomax magnet.
9 ½" mounting bracket (required for use with arms having ½" standard fixing).

# The complete high fidelity system

Some people prefer to buy their Hi-Fi equipment piece-meal and to build up a system of their own. Providing you really know your subject well, this can be an interesting and rewarding hobby, but there are many pitfalls for the unwary. The arguments in favour of buying a completely matched and matching system should not be ignored. With a recommended system from one manufacturer, you can be sure that the individual units are technically matched to give their optimum performance when used together. The units also match physically and are more convenient to place and to operate. There are no problems of inter-connection, no need to make up special cables, no worries about earth-loops or changing plugs.

The Beogram 4000 is recommended as part of the Beosystem 4000. The high-fidelity FM tuner/amplifier, Beomaster 4000, has every facility you are ever likely to need and superb standards matching those of the Beogram. The Beomaster 4000, in addition to its normal stereo speaker outputs of 60 W RMS per channel, has a pair of ambiophonic outputs for side-speakers. This enables the listener, by means of an additional pair of speakers placed at each side of the room, to experience a considerably enhanced sense of ambience or "presence" from his stereo records. The loudspeakers recommended for this system are the Beovox 5702 – speakers of monitor quality which use the Auxilliary Bass Radiator principle.

Further information from Bang & Olufsen U.K. Limited
Consumer Advisory Service (7290) Mercia Road Gloucester GL1 2SQ 0452 31491