COMMISSION OF THE EUROPEAN COMMUNITIES

COM (78) 387 final

Brussels, 13 December 1978

Proposal for a
COUNCIL DIRECTIVE
on the approximation of the laws of the Member States relating to
noise emitted by lawn mowers

(Submitted to the Council by the Commission)

COM (78) 387 final

EXPLANATORY MEMORANDUM

A - Introduction

The Community market in lawn mowers is by no means negligible and industrial development in this sector is forging ahead. Every year three million lawn mowers are manufactured in the Community and consumers in the Community spend approximately 270 million EUA on these machines. At the moment, 28 million householders own a lawn mower. The industry, which is growing rapidly, employs approximately 10,000 workers in a total of some 60 firms. The Community exports 15 % of lawn-mower production and the external trade balance, which relates mainly to the EFTA countries, is in the Community's favour. Intra-Community trade accounts for 16 % of lawn mowers manufactured.
This is therefore an expanding sector whose interests are closely bound up with export trade.

At present intra-Community trade is adversely affected by barriers which result from national legislation.

On 5 September 1974, the Government of the Federal Republic of Germany, concerned about the problems caused by excessively noisy lawn mowers, notified the Commission, pursuant to the agreement of 5 March 1973 covering the exchange of information relating to the environment (1), of its intention to adopt measures laying down limit values for noise emitted by lawn mowers.

These measures were adopted on 28 July 1976 and entered into force on 1 September 1976.

In the same connection, the French Government likewise communicated to the Commission on 22 January 1975 a draft decree on noise emissions from household appliances and machinery, including lawn mowers.

On 15 December 1976, under the agreement providing for standstill and notification to the Commission (2) concerning the elimination of technical barriers to trade, the French Government further communicated to the Commission a draft order on conditions of approval, permissible

.../...

(1) OJ No. C 9, 15.3.1973
(2) OJ No. C 76, 17.6.1969.

noise levels and their method of measurement for lawn mowers.

On 23 August 1978,under the same agreement, the Danish Government likewise communicated a draft regulation on noise from lawn mowers.

Other Governments are in the process of preparing outline decrees concerning, amongst other things, noise emissions from appliances used in the open air.

As a result of these measures, manufacturers are faced with differing regulations that lead to a marked increase in costs, which is then passed on to the consumer.

The market-compartmentalization arising out of these unilateral decisions on the part of Member State Governments, by preventing manufacturers from benefiting from the economies of scale that should result from the creation of a single Community market, are endangering the development of a dynamic branch of this industry.

This trend in national legislation rendered it imperative for the Commission to fulfil its task of removing technical barriers to trade, in accordance with the General Programme for the Removal of Technical Barriers to Trade adopted by the Council on 28 May 1969 (1), as supplemented on 22 March 1973 (2). The Commission was thus acting in accordance with the concern expressed by the industry.

In the fulfilment of this task the Commission had to take account of environmental protection aspects on the basis of the national measures adopted.

.../...

---

(1) OJ No C 76, 17.6.1969
(2) OJ No C 38, 5.6.1973.

Furthermore, in the programme which it adopted on 22 November 1973 (1), the Council requested the Commission to study this problem and to propose measures to limit and reduce noise emission from lawn mowers.

B - The working procedure

As in all cases where there has been a need to harmonize Community legislation, the Commission first made a careful study of the relevant national laws in the Member States. Since technical legislation was involved, it was necessary to establish contact with government experts, experts from the industry and consumer representatives, as well as with standardization institutions both in the Member States and at international level.

Initially, the industry in the Community was represented by the European Committee of Associations of Manufacturers of Agricultural Machinery (CEMA), which also plays an active part in helping the Commission with the preparation of proposals on agricultural tractors.

Once a specific association (the European Lawn Mower Manufacturers' Federation - ELMF) had been set up at the end of 1976, it became an active participant in the work.

ISO was consulted through its two technical committees ISO TC 23 (Tractors and Equipment used in Agriculture and Sylviculture) and ISO TC 43 (Acoustics), since one of the first concerns of the Commission was to reach agreement at Community level on a method of measuring the noise emitted by lawn mowers.

C - Results obtained

I - General considerations and basis of the proposal

The Commission proposal is based on the following principle:

.../...

(1) OJ No C 112, 20.12.1973 and OJ No C 139, 13.6.1977.

to halt forthwith the development of increasingly noisy mowers by using all the resources of present-day technology so as to enable limits to be set upon the permissible noise level; to provide for a further reduction of these limits as soon as new techniques have been developed.

The first stage, once it has been implemented by the Member States, will immediately eliminate the few particularly noisy models while enabling the majority of mowers manufacturered to remain on the market.

It should be stressed, however, that this is only a first stage in the reduction of noise levels. The Commission recommends that the Council should take action before 31 December 1983 concerning a further reduction of the permissible noise levels for lawn mowers. From the lengthy discussions which have taken place with all the parties concerned it has emerged that the available knowledge regarding the necessary conditions for the second reduction is not yet sufficiently advanced to enable this further reduction to be provided for by the directive under discussion. It is clear that a research effort is required in order that the objective set may be attained under the best possible conditions. In other words, the lowering of noise levels must not result either in an excessive increase in the purchase price or in a deterioration of technical performance. The Community's industry has been invited to concentrate its effort on finding the most suitable technical solutions.

II - Legal problems

- Type of harmonization

The environmental protection aspect, which, together with the removal of barriers, is one of the aims of this directive, has prompted the Commission to propose the solution of "total harmonization". In other

.../...

words, the harmonized requirements would replace all existing legislation and would be in force throughout the Community to the exclusion of all others. Any manufacturer, whether he intends to sell his lawn mowers on the national or on the Community market, will therefore have to abide by the provisions of the directive. In this way, protection of the environment will be uniformly guaranteed, while barriers to trade can be removed.

- Self-certification

The proposal recommends a system of self-certification. By means of a certificate which must accompany every mower, the manufacturer certifies that the mowers complies with the provisions of the directive. Some of the French experts would have preferred an approval procedure as recommended in the French draft order. Upon reflection, however, it emerged that this procedure, whereby government departments carry out checks on production models, would be too complex and cumbersome in the case of mowers. Since it will be possible to carry out conformity checks at any time, there are sufficient guarantees to ensure that mowers comply with the directive.

- Use of mowers

This directive concerns only the design of lawn mowers. The Commission considered that the conditions of use, whereby the noise level in relation to time can be kept within an acceptable range, was fundamentally the responsibility of the Member States, insofar as those decisions do not affect the lawn-mower design in such a way as to be likely to create new barriers.

- Adaptation to technical progress

The directive, in the form proposed, takes account of the need to be able to adapt its technical content by an adequately flexible and rapid procedure. This procedure, which is set out in the Council Resolution

.../...

of 28 May 1969 (1) on adaptation to technical progress, was incorporated in Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type approval of wheeled agricultural or forestry tractors (2). It did not seem advisable to set up a Committee specifically for lawn mowers and it has therefore been proposed that, for the adaptation to technical progress of these appliances, recourse be had to the procedure provided for in Article 13 of the above-mentioned Directive.

III. Comments on the Articles

Article 1 first specifies the scope of the Directive, i.e. the limiting of noise emissions from lawn mowers, and then defines what a lawn mower is. Agricultural and forestry equipment is excluded from the scope of this directive since it is covered by other legislation.

Article 2 lays down the permissible noise emission levels for three cutting widths.

Article 3 provides an undertaking by the Council to act, before 31 December 1983, on the Commission's proposal for the subsequent reduction of the limits. These measures must enter into force on 1 January 1986.

Article 4 establishes the self-certification procedure. The manufacturer or importer is required to vouch for the mowers' compliance with the provisions of the directive by drawing up a certificate of conformity.

Article 5 lays down that manufacturers must indicate the noise level on every mower that they manufacture. However, this does not apply to

.../...

(1) OJ No C 76, 17.6.1969, p. 9
(2) OJ No L 84, 28.3.1974, p. 10.

electric mowers with a cutting width of less than 30 cm.

Article 6 provides for the free movement of lawn mowers within the Community by prohibiting Member States from preventing the marketing of mowers on grounds relating to their noise levels where such mowers comply with the provisions of the Directive.

Articles 7, 8, 9 and 10 lay down the measures for conformity checks and the procedure for cases where non-conformity is established or contested.

Article 11 specifies that the provisions of the Annexes may be amended in order to adapt them to technical progress on the basis of the procedure laid down in Article 13 of Council Directive 74/150/EEC of 4 March 1974 on the type approval of wheeled agricultural or forestry tractors.

Article 12 lays down the dates for entry into force of the Directive and imposes upon Member States the obligation to inform the Commission of any draft provisions in the field covered by the Directive.

IV. Consultation of the European Parliament and of the Economic and Social Committee

In accordance with the second paragraph of Article 100 of the Treaty, the Opinion of these two bodies is necessary.

Implementation of the requirements laid down by the proposal for a directive will, in some Member States, necessitate amendment of their legislation.

PROPOSAL FOR A COUNCIL DIRECTIVE
ON THE APPROXIMATION OF THE LAWS OF THE MEMBER STATES RELATING TO
NOISE EMITTED BY LAWN MOWERS

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas the technical requirements with which lawn mowers must comply under the terms of the national laws concern, inter alia, their noise emis sion; whereas these requirements differ from one Member State to another;

whereas through their disparities they hamper trade within the European Community;

Whereas these obstacles to the establishment and operation of the common market can be reduced or even removed if the same requirements are adopted by all the Member States in place of their existing laws;

Whereas the main objective of the provisions of this Directive is to ensure the protection of man against nuisances due to noise by reducing the inconvenience caused by the noises emitted by lawn mowers;

Whereas it is therefore necessary to determine at Community level the permissible upper limits for noise emissions from lawn mowers and a common method for measuring such emissions;

Whereas it is necessary to provide for a subsequent reduction of the limits laid down, and whereas it is therefore advisable that the Council adopt by 31 December 1983 the noise limits which will be permissible from 1 January 1986;

.../...

Whereas it is desirable to bring to the attention of the consumer the acoustic quality of lawn mowers; whereas an effective method of informing the consumer is to require that each lawn mower should be marked with the level of its acoustic force; whereas it is, however, pointless to require this mark on lawn mowers which are not noisy by construction, such as electric lawn mowers with a small cutting-width;

Whereas the conformity of lawn mowers with this Directive may be presumed by virtue of the certificate of conformity issued by the manufacturer or importer resident in the Community, and whereas the Member States must, however, recognize such certificates as conclusive evidence, thus ensuring the free movement of lawn mowers throughout the Community;

Whereas, without prejudice to Articles 169 and 170 of the Treaty, it is advisable, within the framework of cooperation between the competent authorities of the Member States, to lay down provisions to help resolve disputes of a technical nature regarding the conformity of production models with the requirements of this Directive;

Whereas it should be expressly confirmed that those concerned must have available to them appropriate legal remedies in respect of decisions taken by the appropriate national authorities for purposes of implementing this Directive;

Whereas technical progress requires prompt adjustment of the technical requirements specified in this Directive; whereas, in order to facilitate implementation of the measures required for this purpose, a procedure should be prescribed for establishing close cooperation between the Member States and the Commission within the Committee established by Article 12 of Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestry tractors (1).

HAS ADOPTED THIS DIRECTIVE :

---

(1) OJ L 84, 28 March 1974, p.10

Article 1

1. The purpose of this Directive is to restrict noise emissions from powered lawn mowers by specifying upper limits and the methods for measuring such emissions.

2. For the purposes of this Directive, "lawn mower" means all motorized equipment specially designed for the upkeep by cutting, irrespective of the cutting technique, of areas under grass used for recreational, decorative or domestic purposes.

3. Agricultural and forestry equipment is excluded from this Directive.

Article 2

Member States shall take all appropriate measures to ensure that lawn mowers as defined in Article 1 may not be marketed unless their noise emission levels, as measured under the conditions specified in the Annex hereto, do not exceed the permissible noise level for the cutting width of the the appliance as shown in the following table :

Cutting width of lawn mower	Permissible noise level in dB (A - weighted, reference 1pW)
$L \leq 50$ cm	103
$50 < L \leq 120$ cm	106
$L > 120$ cm	111

Article 3

The Council, acting on a proposal of the Commission, shall by 31 October 1983 decide on a reduction of the permissible limits for the noise emission levels specified in Article 2, which are to enter into force on 1 January 1986.

Article 4

The compliance of a lawn mower with the requirements of this Directive shall be attested on his own responsibility, by the manufacturer or importer, being a person permanently resident in the Community, in a certificate which must accompany the machine. This certificate may be reproduced on the directions for use or the guarantee voucher.

.../...

Article 5

1. On every lawn-mower there must be affixed, in an indelible and durable manner, an inscription showing the sound-power level dB(A), referred to 1 pW, guaranteed by the manufacturer and determined under the conditions provided for in the Annex to this Directive and also the serial number.

2. This inscription is not required on electrically powered lawn mowers the cutting width of which is less than 30 cm.

Article 6

No Member State may on grounds relating to their noise emission levels refuse to permit, prohibit or restrict the marketing of lawn-mowers which are accompanied by the certificate of conformity referred to in Article 4 and which bear the inscription referred to in Article 5.

Article 7

The Member States shall take all necessary measures to verify that lawn-mowers conform with the requirements of this Directive. Such verification shall be confined to random samples carried out before marketing.

Article 8

If a Member State finds that lawn mowers of a particular type do not comply with the requirements of this Directive, it shall take the necessary measures to ensure that production models conform to the approved type. It shall inform the other Member States, within one month and stating the grounds therefor, of the measures taken, which may extend to a prohibition on marketing. If such a prohibition is imposed, this information shall also be sent to the

.../...

Commission. The Member States shall take like measures if they are informed by another Member State of such failure to conform.

Article 9

If a Member State disputes the failure to conform notified to it, the Member States concerned shall endeavour to settle the dispute. The Commission shall be kept informed and shall, where necessary, hold appropriate consultations for the purpose of reaching a settlement.

Article 10

Any decision under the provisions adopted pursuant to this Directive prohibiting a ban on marketing or utilization shall state the precise reasons therefor. It shall be communicated to the party concerned, together with particulars of the legal remedies open to him under the law in force in the Member States and of the time limits on such remedies.

Article 11

Any amendments which are necessary in order to adapt the Annex to this Directive to technical progress shall be adopted in accordance with the procedu laid down in Article 13 of Council Directive 74/150/EEC.

Article 12

1. The Member States shall adopt and publish the provisions necessary to comply with this Directive before 1 October 1980 and shall immediately inform the Commission thereof. They shall implement these provisions with effect from 1 October 1981.

.../...

2. As soon as this Directive has been notified, the Member States shall ensure that the Commission is informed, in sufficient time for it to submit its comments, of any draft laws, regulations or administrative provisions which they intend to adopt in the field covered by this Directive.

Article 13

This Directive is addressed to the Member States.

A N N E X

METHOD OF DETERMINING NOISE EMITTED BY LAWN-MOWERS

1. OBJECT

This method of measurement is intended to determine the A-weighted sound power level of a lawn-mower with a view to ensuring its conformity with the regulations (limit level L_{WAL}, level indicated).

2. DEFINITIONS

2.1. Sound pressure level L_{pA}

The sound pressure level L_{pA} is obtained by applying the weighting A to the sound pressure level L_p.

The sound pressure level L_p expressed in dB, of a noise is defined by

$$L_p = 20 \log_{10} \frac{P}{P_o}$$

where p is the effective sound pressure value measured at a particular point, expressed in Pa

p_o is the effective reference sound pressure, equal to 20 µPa.

The value L_{pA} of the A-weighted sound pressure level, expressed in dB, is obtained by applying the weighting A to the measuring system.

2.2. Measuring surface

The measuring surface of area S is a hypothetical surface surrounding the sound source and on which the measuring points are arranged (see 6.4.).

./.

2.3. Surface sound pressure level L_{pAm}

The surface sound pressure level L_{pAm} is the root mean square of the sound pressures recorded on the measuring surface, calculated in accordance with the method set out in 8.4.

2.4. Sound power level L_{WA}

The sound power level L_{WA} is obtained by applying the weighting A to the sound power level L_W.

The sound power level L_W, expressed in dB, of a sound source is defined by:

$$L_W = 10 \log_{10} \frac{W}{W_o}$$

where W is the total sound power generated by the sound source, expressed in watts

W_o is the reference sound power, equal to 10^{-12}W.

The value L_{WA} of the A-weighted sound power level, expressed in dB, is obtained by applying the weighting A to the measuring system.

2.5. Limit value of the sound power level L_{WAl}

The limit for sound power level L_{WA}, expressed in A-weighted dB is designated by L_{WAl}.

2.6. Background noise

Background noise means any noise recorded at the measuring points which is not generated by the sound source.

3. Measuring instruments

3.1. General

The instruments must be designed to measure the A-weighted level of the root mean square of the sound pressure. The level of the root mean square value in time for a measurement point is obtained either by direct reading of the instrument, or by calculation in accordance with section 11.

./.

3.2. Measuring instruments

The following instruments may be used to satisfy the preceding requirement:

(a) a sound level meter meeting the requirements of IEC publication 179, 1973, second edition. The meter shall be set at "slow" response.

(b) an integrator effecting analog or digital integration of the squared signal over a given time interval.

Note

If, for any measurement, instruments other than a precision sound level meter or combinations of instruments, such as integrators, are used, all the specifications of such instruments must comply with the relevant requirements of IEC publication 179, 1973, second edition.

3.3. Microphone with cable

Use shall be made of a microphone with cable complying with IEC publication 179, 1973, second edition, and calibrated for free-field measurement.

3.4. Weighting network

Use shall be made of an A-weighting network meeting the requirements of IEC publication 179, 1973, second edition.

3.5. Inspection of the measuring apparatus

3.5.1. Before the tests, the acoustic properties of the entire apparatus (measuring instruments including microphone and cable) must be checked by means of a calibrated sound source with an accuracy of at least 0.5 dB (e.g. a pistonphone); the apparatus shall be checked again immediately after each series of measurements.

3.5.2. These on-the-spot checks shall be supplemented by more thorough calibrations to be carried out at least once a year in a specially equipped laboratory.

./.

4. MEASURING CONDITIONS

4.1. General

The lawn-mower to be tested shall be equipped with such interchangeable attachments and devices as produce the maximum noise level. If the collecting device is attached to the mower it must be empty.

The cutting device shall be adjusted to a height of 0.06 m from the ground The artificial turf shall be of such a height that it is not cut.

Rotary cylinder mowers are to have their cylinder/fixed blade gap adjusted in accordance with the manufacturer's instructions and such that they can cut a standardized sheet of paper of 80 g/m^2 weight (KRAFT paper ISO/R66).

The rotary blades must be lubricated before and during the measurements.

4.2. Operation of the lawn-mower

Before the sound measurements the lawn-mower must have operated for at least two hours at its maximum speed, and during the sound measurements the mower must operate at a constant speed.

The sound measurements shall be carried out with the mower stationary if the self-propelling mechanism can be disengaged while allowing the cutter to be actuated. If this is not possible the measurements shall be carried out with the lawn-mower in motion.

During the sound measurements the engine and the cutter must operate at their maximum speed (controls against the stop). The speed of travel shall be limited to a maximum of 8 km/h with the controls set to the maximum speed of the engine and the maximum speed of rotation (or traverse) of the cutter. The operator shall only accompany the lawn-mower when measurements are carried out with this in motion.

4.2.1. Lawn-mowers with internal combustion engine

The engine oil used for operating the mower during the measurements shall be as specified by the manufacturer.

The fuel tank must not be more than half full.

4.2.2. Lawn-mowers with electric motor

The input voltage for the motor must be kept constant with a tolerance of 2%.

If more than one input voltage is provided for, the lawn-mower shall be tested at the distributed mains voltage closest to the maximum value specified.

./.

5. MEASURING SITE

The lawn-mower shall be placed on unyielding, flat ground having the following acoustic properties:

Absorption coefficient	Average frequency
$X \leq 0.06$	125
$0.007 < X \leq 0.12$	250
$0.15 < X \leq 0.27$	500
$0.28 < X \leq 0.34$	1000
$0.38 < X \leq 0.47$	2000
$0.40 < X \leq 0.62$	4000

determined in accordance with ISO recommendation R354.

The vicinity of the measuring site shall be free of sound-reflecting obstacles which might influence the results measured.

6. MEASURING SURFACE, LOCATION AND NUMBER OF MEASURING POINTS

6.1. Measuring surface

The measuring surface shall be a hypothetical hemisphere surrounding the grass-cutting machine; it shall be delimited by the ground on which the mower stands.

If none of the dimensions (length, width, height) of the grass-cutting machine exceeds 1.5 m, the radius of the hemisphere shall be 4 m.

In the case of machines with greater dimensions, the radius shall be 10 m.

6.2. Location and number of measuring points

6.2.1. Mower tested when stationary

Where possible, the origin of the system of measuring-point co-ordinates shall coincide with the projection onto the test area of the geometrical centre of the sound source.

./.

The measuring points on the hemisphere shall be:

- in the case of a hemisphere with a radius of 4m, the five points, 1, 2, 3, 4, 9, the co-ordinates of which are shown in Table I;
- in the case of a hemisphere with a radius of 10m, the eight points 1 - 8, the co-ordinates of which are shown in Table I.

TABLE I

	X/R	Y/R	2/R	Z
1	0.7	0.7	-	1.5
2	- 0.7	0.7	-	1.5
3	- 0.7	- 0.7	-	1.5
4	0.7	- 0.7	0.71	-
5	0.65	0.27	0.71	-
6	- 0.27	0.65	0.71	-
7	- 0.65	- 0.27	0.71	-
8	0.27	- 0.65	0.71	-
9	0	0	1	-

6.2.2. Lawn-mowers tested when in motion

The axis of movement of the lawn-mower is as shown in Figure 1.

The measuring points are located on a hemisphere with a 10m radius. The co-ordinates of the measuring points are shown in Table I, point 9 being omitted.

./.

7. MEASUREMENT

7.1. Measurement of the acoustic properties of the measuring site

The environmental conditions at the measuring site shall be checked before measurements are carried out. The following factors shall be checked:

(a) background noise;

(b) wind interference;

(c) operating conditions: such as vibrations, temperature, humidity, barometric pressure;

7.1.1. Measurement of background noise

This background noise shall be recorded at the measuring points with the motor of the lawn-mower switched off (no sound emission).

7.1.2. Wind speed and direction

The wind speed and direction are established at a point above the test area. Account must be taken of the provisions laid down in 8.5.3.

7.1.3. Measurement of temperature, humidity, barometric pressure and other other disturbances

Only disturbances likely to have a bearing on the acoustic measurements need be measured (see 8.5.2.).

7.2. Measurement of the sound pressure level L_{pA}

To measure the sound pressure level L_{pA}, use shall be made of an instrument as defined in 3.2.

7.2.1. Measurements with the mower stationary

The sound pressure level L_{pA} at a given measuring point is the root mean square value in time of the sound pressures. If a sound level meter is used, a number of readings shall be taken at this point and their mean value in time calculated in accordance with section 11.

In principle, the measuring time at each measuring point shall be 15 sec. If an integrator is used, the integrating time shall be equal to the measuring time.

./.

7.2.2. Measurements with the mower in motion

The sound pressure level L_{pA} at a given measuring point shall correspond to the level recorded when the lawn-mower passes through the centre of the hemisphere

8. USE OF RESULTS

8.1. Calculation of root mean square values

The level corresponding to the root mean square in space of the sound pressures at all the measuring points shall be calculated from the L_{pA} values.

8.2. Average level of background noise

The average level of background noise is equal to that recorded at a measuring point.

8.3. Calculation of sound pressure level at surface L_{pAm}

The sound pressure level at the surface shall be calculated in accordance with section 8.1. and corrected as indicated in sections 8.5.1., 8.5.2. and 8.5.3.

8.4. Calculation of the sound power level L_{WA}

The sound power level L_{WA} of the lawn-mower shall be calculated by means of the following relation:

$$L_{WA} = L_{pAm} + 10 \log_{10} \frac{S}{S_o}$$

where L_{WA} = sound power level of the lawn-mower expressed in dB

L_{pAm} = sound pressure level at surface expressed in dB

S = area of measuring surface in m^2

S_o = reference area of $1m^2$

Note

Where r = 4m, $10 \log_{10} \frac{S}{S_o} = 20$ dB

Where r = 10m, $10 \log_{10} \frac{S}{S_o} = 28$ dB

8.5. Corrections to be made to measurements

8.5.1. Background noise

The average sound pressure level over the measuring surface (8.1) must be corrected, if necessary, to take account of the background noise (8.2). The correction K_1, in dB, which must be subtracted from the average sound pressure level over the measuring surface is given in Table II .

./.

TABLE II

Difference (in dB) between the sound pressure level calculated when the sound source is operating and the sound pressure level due to extraneous noise alone	Correction K_1 in dB
less than 6	no valid measurement
6	1.0
7	1.0
8	1.0
9	0.5
10	0.5
more than 10	no correction

8.5.2. Disturbances: temperature, humidity, altitude of site etc.

- Measuring apparatus

The manufacturer's instructions should be followed in order to take account of any effects of all the disturbances mentioned by him, such as temperature, barometric pressure, humidity.

8.5.3. Wind interference

The maximum permissible wind speed is 8 m/sec.

Above the wind speed indicated by the manufacturer, microphones must be equipped with a wind-screen. Any corrections to be made to the calculations referred to in 8.1. are indicated by the wind-screen manufacturer.

./.

9. DATA TO BE RECORDED

In principle, the following information shall be compiled and recorded in a report concerning all measurements made in accordance with the specification for this method of measurement.

9.1. Sound source under test

(a) description of the sound source under test (including dimensions);

(b) operating conditions of the sound source during the tests;

(c) conditions for installation on the test area;

(d) location of sound source on measuring site;

9.2. Acoustic environment

(a) description of the measuring site, including physical characteristics of the test area; diagram showing the location of the sound source and any reflecting objects on the measuring site;

(b) meteorological conditions: weather (sunshine, cloud, rain, fog ...), air temperature, barometric pressure, wind speed and direction, humidity.

9.3. Instrumentation

(a) equipment used for the measuremnts, including the name of the equipment, type, serial number and name of manufacturer;

(b) method used to calibrate the measuring equipment in accordance with 3.5.1.;

(c) name of laboratory which carried out the calibration required in 3.5.2.

(d) date of last calibration.

9.4. Acoustic data

(a) dimensions of measuring surface, location of microphones. Numbers of measuring points and wind direction must be indicated in the diagram required under 9.2.(a);

./.

(b) area S of measuring surface in m^2 and value of $10 \log_{10} \frac{S}{S_o}$;

(c) sound pressure levels recorded at measuring points (see 7.2.4.)

(d) average sound pressure level over measuring surface (see 8.1);

(e) any dB corrections (see 8.5.1, 8.5.2 and 8.5.3);

(f) surface sound pressure level L_{pAm} (see 8.3);

(g) sound power level (see 8.4);

(h) date and time of measurements.

10. DATA TO BE INCLUDED IN THE REPORT LAID DOWN IN SECTION 9

The report shall state clearly that the sound power levels were obtained in full compliance with this measuringmethod. It shall specify that these sound power levels are given in A-weighted dB, reference 1 pW.

11. METHOD OF CALCULATING THE AVERAGE LEVEL CORRESPONDING TO THE ROOT MEAN SQUARE VALUE OF THE VARIOUS SOUND PRESSURE LEVELS

The root mean square value of the various sound pressure levels resulting either from a series of measurements made at a single point (root mean square in time) or from a series of measurements made at different points on the measuring surface (root mean square in space) can be determined by the following formula:

$$L_{pAm} = L_{pAo} + 10 \log_{10} \frac{1}{n} \sum_{i=1}^{i=n} g_i$$

where L_{pAi} equals the sound pressure level of the i-th measurement

L_{pAo} is an auxiliary soud pressure level to simplify the calculation (for example, the samllest of the L_{pAi} values)

g_i is the auxiliary variable for the i-th measurement:

$$g_i = 10^{0.1 (L_{pAi} - L_{pAo})}$$

g_m is the mean value of the g_i variables: $\frac{1}{n} \sum_{i=1}^{i=n} g_i$

./.

The quantity ΔL is defined by:

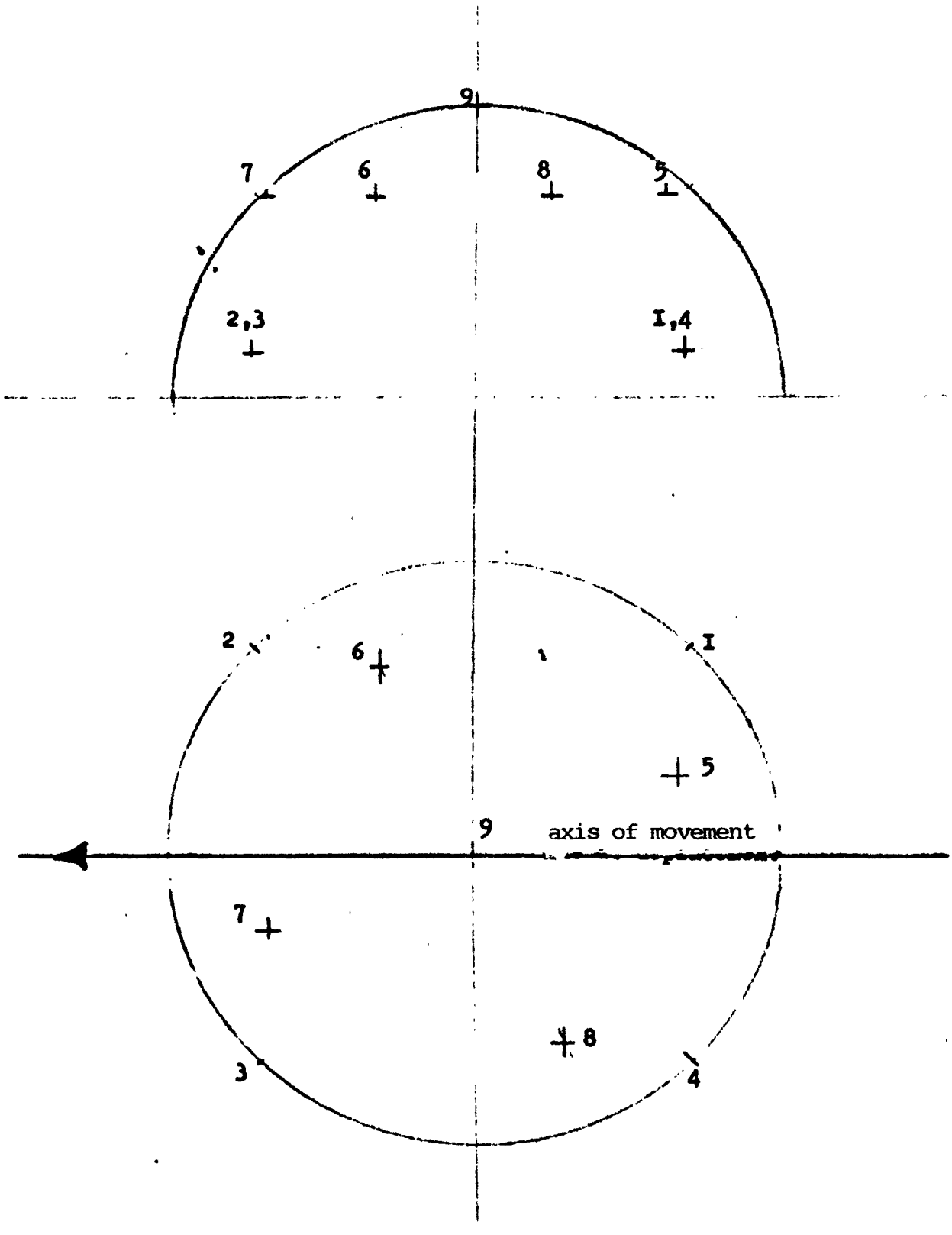
$$L = L_{pAi} - L_{pAo}$$

Table III gives the values of g for different values of ΔL.

TABLE III

ΔL dB	g	ΔL dB	g	ΔL dB	g
- 10.0	0.100	0.0	1.00	10.0	10.0
- 9.5	0.112	0.5	1.12	10.5	11.2
- 9.0	0.125	1.0	1.25	11.0	12.5
- 8.5	0.140	1.5	1.40	11.5	14.0
- 8.0	0.160	2.0	1.60	12.0	16.0
- 7.5	0.180	2.5	1.80	12.5	18.0
- 7.0	0.200	3.0	2.00	13.0	20.0
- 6.5	0.224	3.5	2.24	13.5	22.4
- 6.0	0.250	4.0	2.50	14.0	25.0
- 5.5	0.280	4.5	2.80	14.5	28.0
- 5.0	0.315	5.0	3.15	15.0	31.5
- 4.5	0.355	5.5	3.55	15.5	35.5
- 4.0	0.400	6.0	4.00	16.0	40.0
- 3.5	0.450	6.5	4.50	16.5	45.0
- 3.0	0.500	7.0	5.00	17.0	50.0
- 2.5	0.560	7.5	5.60	17.5	56.0
- 2.0	0.630	8.0	6.30	18.0	63.0
- 1.5	0.710	8.5	7.10	18.5	71.0
- 1.0	0.800	9.0	8.00	19.0	80.0
- 0.5	0.900	9.5	9.00	19.5	90.0
- 0.0	1.000	10.0	10.00	20.0	100.0

Fig.I



Position of measuring points and axis of movement