BS 6353:1983

Specification for

Underground loudspeaker communication systems in coal mines

Confirmed
January 2011

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Committees responsible for this British Standard

This British Standard was published under the direction of the Mining and Quarrying Requisites Standards Committee MQE/-. Its preparation was entrusted to Technical Committee MQE/25 upon which the following bodies were represented:

Association of British Mining Equipment Companies
Council for Electrical Equipment for Flammable Atmospheres (BEAMA)
Health and Safety Executive
National Association of Colliery Overmen, Deputies and Shotfirers (NACODS)
National Coal Board
National Union of Mineworkers

This British Standard, having been prepared under the direction of the Mining and Quarrying Requisites Standards Committee, was published under the authority of the Board of BSI and comes into effect on 29 April 1983

The following BSI references relate to the work on this standard:
Committee reference MQE/25
Draft for comment 81/75758 DC

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This British Standard has been prepared under the direction of the Mining and Quarrying Requisites Standards Committee.

Underground loudspeaker communication systems provide local speech communication and broadcast alarm signals for the safe and efficient operation of associated machinery. The systems are generally fitted with facilities for communication with the surface and/or for interconnection with other underground communication systems.

It is envisaged that it will be necessary to interconnect systems made by different manufacturers and if problems arising from such interconnection are to be avoided, systems have to be compatible. The purpose of this standard is therefore to promote compatibility between loudspeaker communications systems of different manufacture.

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Compliance with a British Standard does not of itself confer immunity from legal obligations. Attention is drawn to the Health and Safety at Work etc. Act 1974, the Mines and Quarries Act 1954, the Regulations made under these Acts, and also any other appropriate statutory requirements or byelaws. These place responsibility for complying with certain specific safety requirements on the manufacturer and the user. The address of the recognized certification authority in the United Kingdom for Group 1 (coal mining) apparatus for intrinsic safety purposes is as follows:

Health and Safety Executive
HSE (M) Certification Support Unit
Harpur Hill
Buxton
Derbyshire
SK 17 9JN.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for underground loudspeaker communication systems that are equipped with the facility for connecting speech and other audio signals to another loudspeaker communication system and/or to an appropriate surface switchboard to form a loudspeaker communication network.

Electrical input and output characteristics of underground loudspeaker communication systems necessary to achieve operational compatibility when they are interconnected are specified.

The requirements for tone signals specified in clause **5** do not apply to signals that are not transmitted to another system.

This standard is applicable to underground loudspeaker communication systems that are intended to be certified intrinsically safe for use in coal mines in accordance with BS 5501-9 for group I category "ia" systems.

This standard is not applicable to mine telephone systems.

NOTE 1 Further requirements for intrinsic safety are specified in BS 1259 and BS 5501-7.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1
loudspeaker communication system

a system incorporating loudspeaker units enabling speech and other audio signals to be broadcast

NOTE A typical system is shown in Figure 1.

2.2
loudspeaker unit

a device normally comprising a loudspeaker, microphone, amplifying/signalling circuits, and an internal power source

2.3
surface switchboard

a manned control desk into which various separate underground loudspeaker communication systems may be extended to allow communication between underground and surface, and enable operator interconnection of separate systems

2.4
input impedance

the electrical impedance presented to a received signal measured at the interconnection between systems

2.5
output impedance

the electrical source impedance of a transmitted signal measured at the interconnection between systems

2.6
safety coupler and safety barrier

safety devices that are used to limit the transfer of electrical energy between interconnected systems

3 Electrical interface characteristics

The electrical interface characteristics of the loudspeaker communication system and the surface switchboard system shall be as given in Table 1.

4 Interconnection facilities

4.1 Each loudspeaker communication system shall include a safety coupler of the type specified in **A.1**, to allow the connection of audio signals to another loudspeaker communication system and/or to a surface switchboard.

NOTE The safety coupler should be incorporated within the enclosure of one of the units forming part of the loudspeaker communication system.

4.2 The surface switchboard shall include safety barriers of the type specified in **A.2** to allow the connection of audio signals to each underground loudspeaker communication system. If the surface switchboard is certified intrinsically safe, it shall include either safety barriers of the type specified in **A.2** or safety couplers of the type specified in **A.1**.

5 Tone signals

5.1 General. Each system shall be designed to prevent the transmission of unwanted signals between systems.

5.2 Call tone. The call tone, which is used for calling the surface switchboard from underground loudspeaker communication systems, shall meet the following requirements.

a) The amplitude shall be as given in Table 1.

b) The waveform shall be sinusoidal.

c) The frequency shall be either 194 Hz ± 3 % or 5 kHz ± 3 %.

The surface switchboard shall not respond to tones of less than 1.5 s duration and shall respond to tones of 3.0 s or more.

6 Transmission distance

The system shall be capable of meeting the requirements of this standard over a distance of 20 km when using a cable of the type specified in Appendix B.

Table 1 — Electrical interface characteristics

Electrical parameters (see Figure 2)	Underground loudspeaker communication system	Surface switchboard
Input impedance (Z_i) at 1 kHz	150 Ω minimum	150 Ω minimum
Output impedance (Z_o) at 1 kHz	150 Ω maximum	150 Ω maximum
Input voltage levels (V_i)		
Minimum input speech level	—	0.10 V peak to peak[a]
Minimum input call tone level:		
at 194 Hz	—	150 mV peak to peak
at 5 kHz	—	30 mV peak to peak
Input signal level to achieve nominal rated audio output	1 V peak to peak	—
Maximum input signal level	12 V peak to peak[b]	12 V peak to peak[b]
Output voltage levels (V_o)		
Minimum output speech level	—	1 V peak to peak into 150 Ω
Nominal output speech level[c]	1 V peak to peak into 150 Ω	—
Nominal output call tone level:		
at 194 Hz	6.5 V peak to peak	—
at 5 kHz	2 V peak to peak	—
Maximum output signal level	12 V peak to peak open circuit	12 V peak to peak open circuit

[a] The electrical characteristics relating to a surface switchboard need to differ from those of an underground loudspeaker system to take account of the considerable distance involved and consequent signal loss.
[b] It is essential that this level does not damage the system, although some distortion of the audio output is permissible.
[c] It is recognized that there will be a large variation in output levels from a particular system due to the indefinable speech input level to the system. The nominal level should be achievable under normal operation.

7 Marking

The apparatus providing network interconnection facilities shall be marked as specified in BS 5501-9 together with the number of this British Standard, i.e. BS 6353[1)].

8 Documentation

The supplier of the equipment shall produce and make available such information as is necessary for the safe and correct use of the equipment.

[1)] Marking BS 6353 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ, in the case of certification marks administered by BSI, or to the appropriate authority for other certification marks.

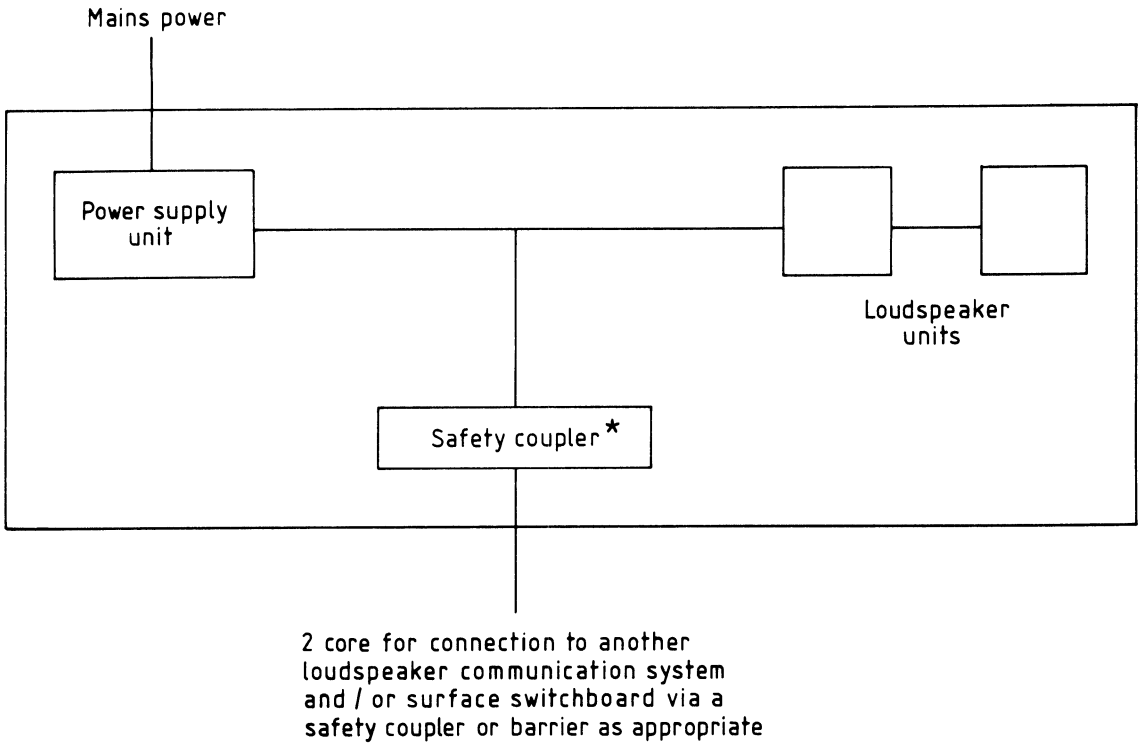

Figure 1 — Underground loudspeaker communication system

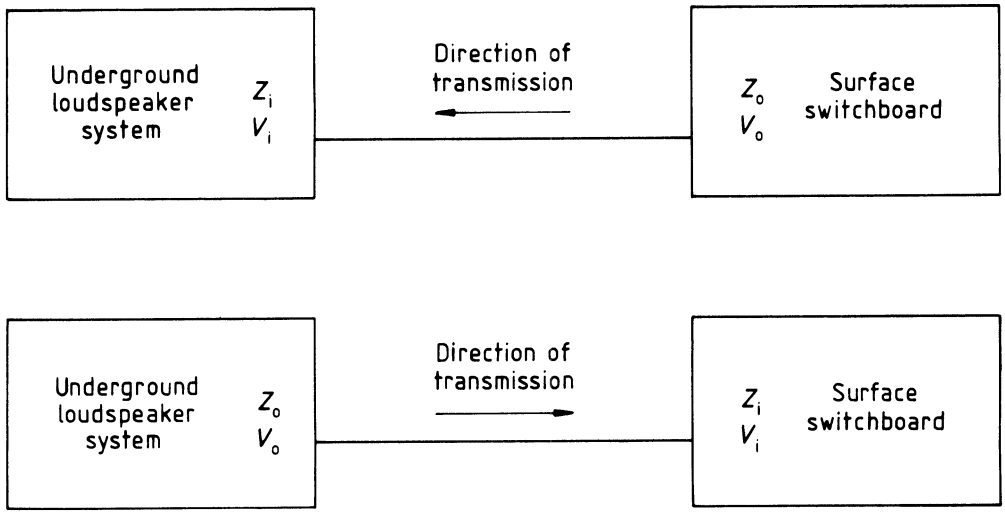

Figure 2 — System electrical parameters

Appendix A Design of safety couplers and barriers

A.1 Safety couplers

A.1.1 *General.* The safety coupler is intended to limit the voltage and current available in the interconnecting circuit between one loudspeaker communication system and another loudspeaker communication system or a certified surface switchboard under normal and fault conditions. It shall take the form shown in Figure 3 and be constructed in accordance with BS 5501-7 for group I category "ia" apparatus with the additional requirements specified in **A.1.2** to **A.1.4**.

A.1.2 *Transformer.* The transformer shall be designed to provide adequate transmission of the speech and call tone frequencies.

NOTE The unprotected winding connected to the loudspeaker system may require additional safety devices.

A.1.3 *Zener diodes.* The diodes shall be arranged back-to-back and there shall be three such assemblies in parallel. Each diode shall have a manufacturer's declared zener voltage of 5.6 V ± 5 %.

A.1.4 *Resistors.* Each resistor shall have a value not less than 5.0 Ω.

A.2 Safety barrier

A.2.1 *General.* The safety barrier is intended to limit the voltage and current available in the interconnecting circuits between an uncertified surface switchboard and one or more loudspeaker communication systems. It shall take the general form shown in Figure 3, and shall be designed and constructed in accordance with clause **8** of BS 5501-7 for group I category "ia" apparatus with the additional requirements specified in **A.2.2** to **A.2.4**.

A.2.2 *Transformer.* The transformer shall be designed to provide adequate transmission of speech and call frequencies.

A.2.3 *Zener diodes.* The diodes shall be arranged back to back and shall have a manufacturer's declared zener voltage of 5.6 V ± 5 % and shall be rated on the basis that no loss occurs in the transformer.

A.2.4 *Resistors.* Each resistor shall have a value of not less than 5.0 Ω.

Appendix B Cable

The cable to be used for assessment of system performance shall be a single twisted pair 1.5 mm^2 telephone cable suitable for use up to 110 V between cores.

The conductors shall consist of plain annealed copper wires which shall comply with BS 6360. Each conductor shall consist of seven wires of 0.50 mm diameter and shall be insulated with an extruded layer of PVC compound complying with BS 6746 for type 1 to give a minimum thickness of 0.38 mm at any point and an overall diameter of 2.36 mm minimum and 2.64 mm maximum.

The cable shall be bedded to a nominal thickness of 0.8 mm and be armoured.

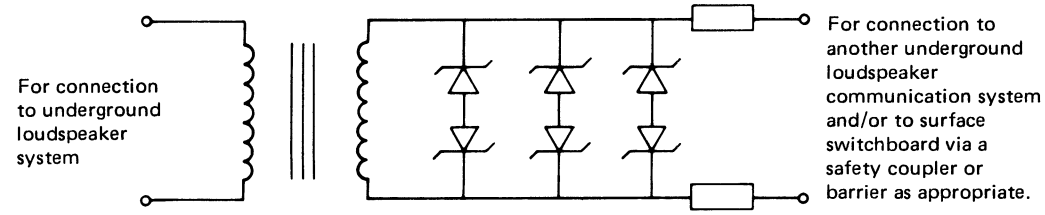

Figure 3 — Safety coupler

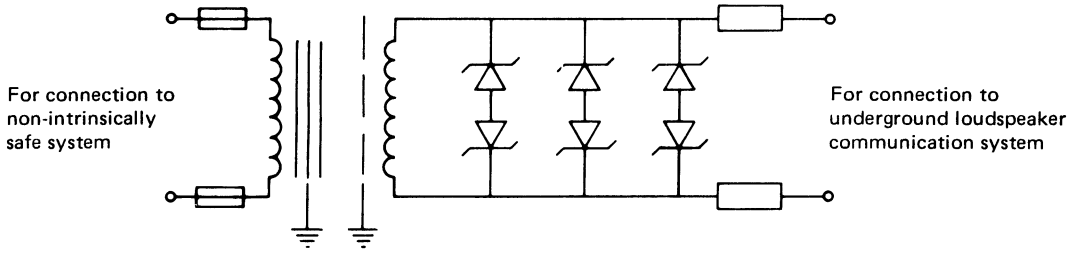

Figure 4 — Safety barrier

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Publications referred to

BS 1259, *Intrinsically safe electrical apparatus and circuits for use in explosive atmospheres.*
BS 5501, *Electrical apparatus for potentially explosive atmospheres.*
BS 5501-7, *Intrinsic safety "i".*
BS 5501-9, *Specification for intrinsically safe electrical systems "i".*
BS 6360, *Specification for conductors in insulated cables and cords.*
BS 6746, *PVC insulation and sheath of electrical cables.*

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