

Specification for

Railway vacuum brake cylinders —

Rolling ring type

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Admiralty	Gas Council
Air Ministry	High Commission of India*
Associated Offices' Technical Committee	Institute of Marine Engineers
Association of Consulting Engineers	Institute of Petroleum
(Incorporated)*	Institution of Civil Engineers
Association of Mining Electrical and	Institution of Gas Engineers
Mechanical Engineers	Institution of Heating and Ventilating Engineers
British Chemical Plant Manufacturers'	Institution of Mechanical Engineers*
Association	Institution of Mechanical Engineers (Automobile
British Compressed Air Society	Division)
British Electrical and Allied Manufacturers'	Institution of Production Engineers
Association	Locomotive and Allied Manufacturers'
British Gear Manufacturers' Association	Association of Great Britain*
British Internal Combustion Engine	London Transport Board
Manufacturers' Association	Machine Tool Trades Association
British Iron and Steel Federation*	Ministry of Labour (H.M. Factory Inspectorate)
British Mechanical Engineering Federation*	Ministry of Power
British Railways Board*	Ministry of Public Buildings and Works
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D.S.I.R. National Engineering Laboratory*	National Physical Laboratory (D.S.I.R.)
Electricity Council, the Generating Board and	Radio Industry Council
the Area Boards in England and Wales	War Office
Engineering Equipment Users' Association	

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following were directly represented on the Committee entrusted with the preparation of this standard:

Association of British Railway Carriage and	Laminated Railway Spring Manufacturers'
Wagon Manufacturers	Association
British Mechanical Rubber Manufacturers'	National Association of Drop Forgers and
Association	Stampers
Embassy of the Republic of South Africa	Office of the High Commissioner for Australia
Federation of British Rubber and Allied	Office of the High Commissioner for New Zealand
Manufacturers	Individual manufacturers

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Foreword

This standard makes reference to the following British Standards:

BS 24, *Railway rolling stock material.*

BS 24-4, *Steel billets, blooms, bars and forgings.*

BS 24-6, *Steel slabs, plates, sections, bars and rivets for locomotive boilers, locomotives, carriages and wagons.*

BS 218, *Leaded brass (58 per cent copper, 2 per cent lead) forging stock and forgings.*

BS 250, *Wrought high tensile brass rods and sections (other than forging stock).*

BS 251, *Naval brass rods, sections, forging stock and forgings.*

BS 903, *Methods of testing vulcanized rubber.*

BS 903-A2, *Determination of tensile stress-strain properties.*

BS 903-A6, *Determination of compression set.*

BS 903-A7, *Determination of hardness.*

BS 916, *Black bolts, screws and nuts.*

BS 970, *Wrought steels in the form of bars, billets, and forgings, up to 6 in ruling section, for automobile and general engineering purposes. En series.*

BS 1083, *Precision hexagon bolts, screws and nuts.*

BS 1103, *Cotton fabrics for the reinforcement of rubber hose.*

BS 1134, *Centre-line-average height method for the assessment of surface texture.*

BS 1154, *Vulcanized natural rubber compounds.*

BS 1400, *Schedule of copper alloy ingots and copper and copper alloy castings.*

BS 1449, *Steel plate, sheet and strip.*

BS 1452, *Grey iron castings.*

BS 1490, *Aluminium and aluminium alloy ingots and castings for general engineering purposes.*

BS 1775, *Steel tubes for mechanical, structural and general engineering purposes.*

BS 1802, *Steel spring washers for general engineering and automobile purposes.*

BS 1806, *Dimensions of toroidal sealing rings ("O" seals and their housings).*

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee.

Leading and fixing dimensions for recommended types of vacuum brake cylinder are given for the guidance of vehicle designers. These types include separate and combined cylinders. Details for operational testing are included and materials are specified.

For the purposes of this British Standard, the "purchaser" shall be the Railway or private owner who is to use the cylinders or parts concerned. In the case of the private owner, the approval of the Railway concerned must also be obtained.

NOTE 1 Where metric equivalents are stated, the figures in British units are to be regarded as the standard. The metric conversions in Appendix A are approximate. More accurate conversions should be based on tables in BS 350, "Conversion factors and tables".

NOTE 2 In place of the customary, but incorrect, use of the pound as a unit of force, the unit called a ton-force (abbreviation tonf) has been used in this standard. It is that force which, when acting on a body of mass one pound, gives it an acceleration equal to that of standard gravity.

Obsolescent (by Amendment No. 3).

The need for the product covered by this British Standard has been reviewed and it has been decided that, in the interests of rationalization, it should be regarded as obsolescent and not therefore used for new designs. The standard will be withdrawn in due course.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 26 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.

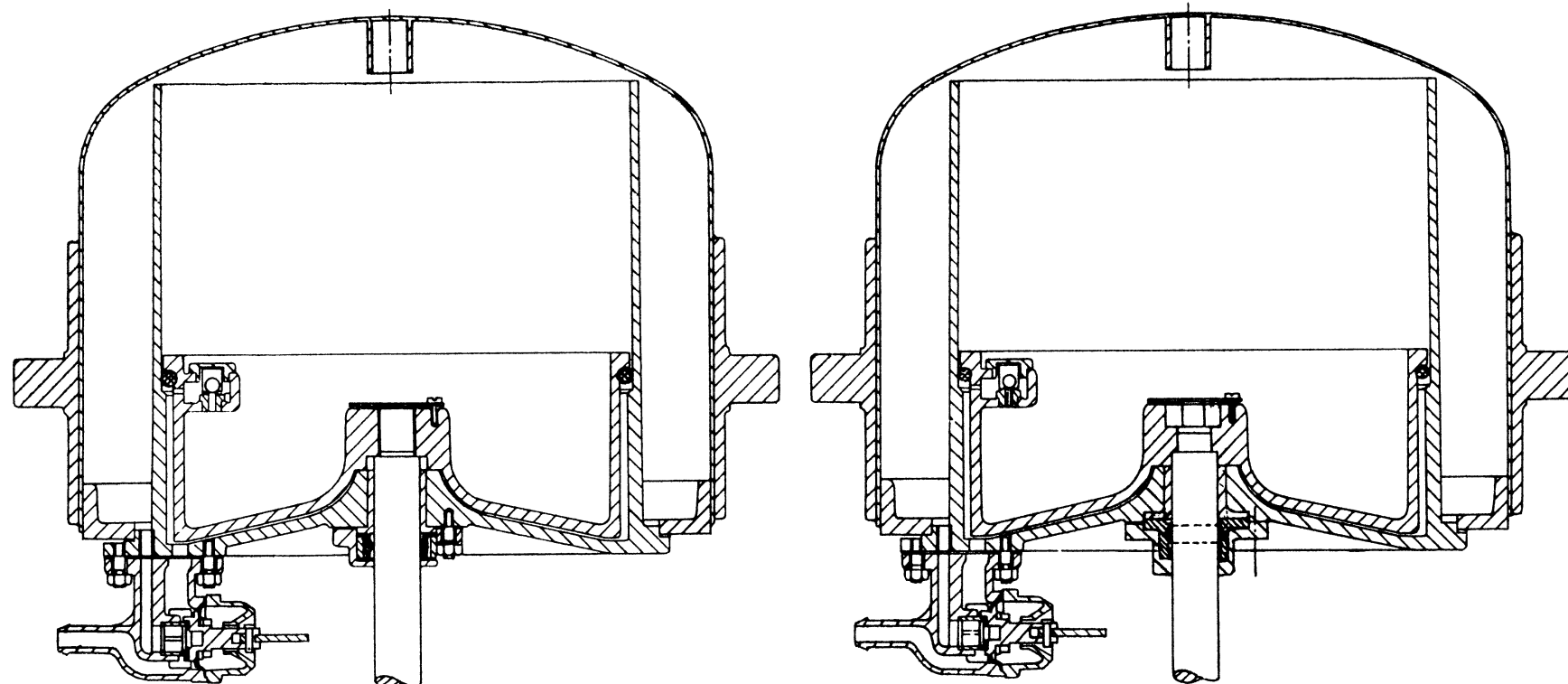
1 Scope

This British Standard specifies requirements for brake cylinders classified as follows in accordance with current nomenclature as shown in Table 1.

Table 1 — Classification

Nomenclature	Type	Table No.	Fig. No.	Range of cylinder diameters
E	Combined	2	1 <i>a</i> and 2	12–21
E ₁	Combined	3	1 <i>b</i> and 2	15–21
E	Separate	4	1 <i>c</i> and 3	12–24
F	Separate	5	1 <i>d</i> and 3	12–24

The essential differences between the types included are shown in Figure 1.

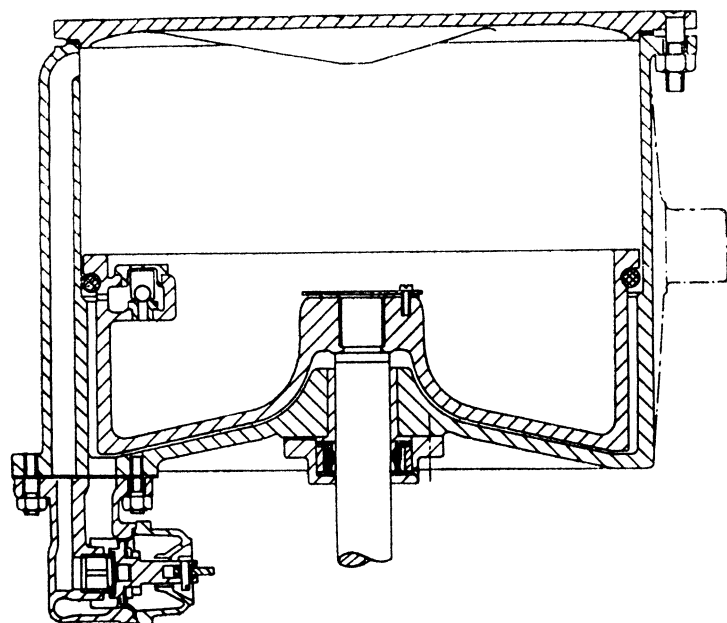


a. Type E combined cylinder (reservoir integral)

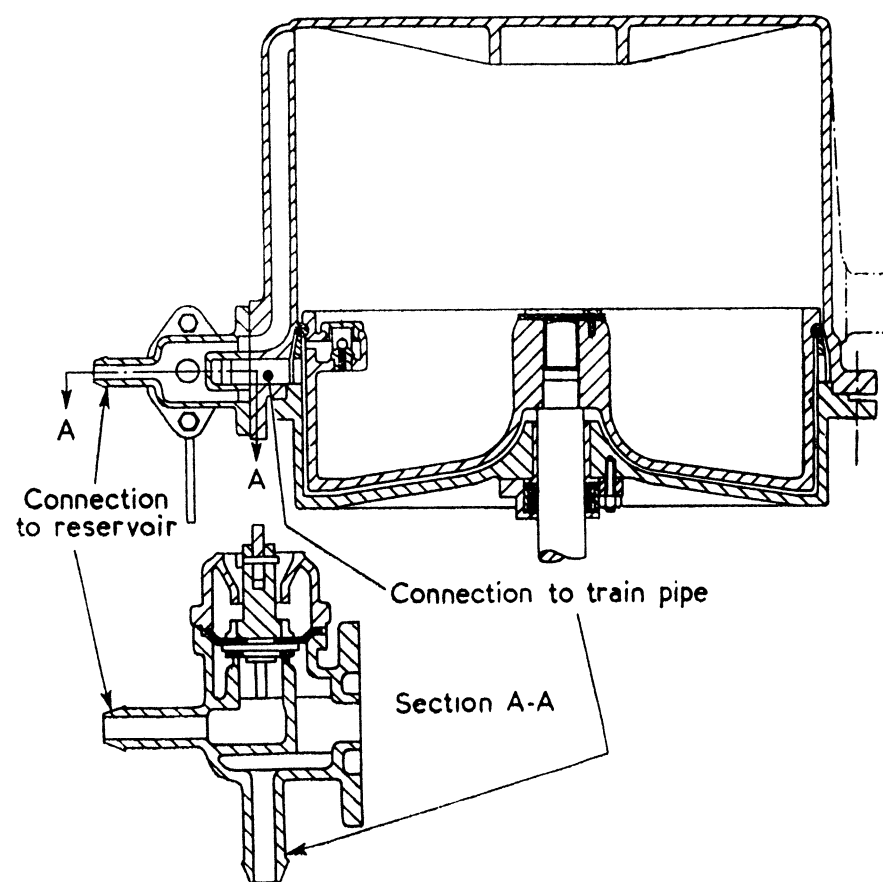
b. Type E₁ combined cylinder (reservoir integral)

NOTE The diagrams of combined cylinders show angle iron foundation rings for the casing, but flat foundation rings are also acceptable.

Figure 1 — Diagrams of cylinder types (see Clause 1)



c. Type E separate cylinder



d. Type F separate cylinder

Figure 1 — Diagrams of cylinder types (see Clause 1)

Section 1. General and metallic parts

2 Materials

The component parts shall be made from one or other of the following materials:

Ball. $\frac{1}{2}$ inch.

a. Stainless steel. Containing 12 per cent Cr and 0.45 per cent C hardened to 600–700 HB.

or

b. phosphor bronze. 95 per cent Copper and 5 per cent Tin.

Ball valve seat. Brass to BS 251¹⁾ or BS 250²⁾.

Ball valve cage. Brass to BS 218³⁾.

Casing. Steel to BS 24⁴⁾-6:Grade 622 (cold flanging) or BS 1449,⁵⁾ BS 970⁶⁾ En 2A.

Cylinder. Cast iron to BS 1452⁷⁾:Grade 12.

Foundation ring. Steel to BS 24⁴⁾-6:Grade 621.

Gland cover or packing box.

a. Aluminium alloy to BS 1490⁸⁾: LM6 M.

b. Cast iron to BS 1452⁷⁾:Grade 12.

Nylon insert. (Nylon or other material approved by the purchaser).

Nuts, black. Steel to BS 916⁹⁾ (Medium fit).

Nuts, bright. Steel to BS 1083¹⁰⁾ (Medium fit).

Piston. Cast iron to BS 1452⁷⁾:Grade 12.

Piston rod. Steel to BS 24⁴⁾-4.1:Class C¹¹⁾.

Piston rod sleeve (when specified).

a. Bronze	Copper	90.35 per cent.
	Zinc	6.05 per cent.
	Tin	2.75 per cent.
	Lead or tellurium	0.85 per cent.

b. Stainless steel to BS 970⁶⁾ En 56A or B.

¹⁾ BS 251, "Naval brass rods, sections, forging stock and forgings".

²⁾ BS 250, "Wrought high tensile brass rods and sections (other than forging stock)".

³⁾ BS 218, "Leaded brass (58 per cent copper, 2 per cent lead) forging stock and forgings".

⁴⁾ BS 24, "Railway rolling stock material", Part 6, "Steel slabs, plates, sections, bars and rivets for locomotive boilers, locomotives, carriages and wagons".

⁵⁾ BS 1449, "Steel plate sheet and strip".

⁶⁾ BS 970, "Wrought steels in the form of bars, billets and forgings, up to 6 in ruling section, for automobile and general engineering purposes. En series".

⁷⁾ BS 1452, "Grey iron castings".

⁸⁾ BS 1490, "Aluminium and aluminium alloy ingots and castings for general engineering purposes".

⁹⁾ BS 916, "Black bolts, screws and nuts".

¹⁰⁾ BS 1083, "Precision hexagon bolts, screws and nuts".

¹¹⁾ When required may be hard chromium or nickel deposited by agreement between purchaser and manufacturer.

Piston rod nut. Steel to BS 970¹²⁾ En 1A, 3A or 3B.

Piston rod bush. Bronze to BS 1400¹³⁾ LG3 — C.

Piston head washer. Steel to BS 24¹⁴⁾-6:Grade 621.

Stop for piston. Steel to BS 1775¹⁵⁾ HFW Grade 13.

Screws, cold formed hex. head. Steel to BS 916¹⁶⁾.

Stud. Steel to BS 970¹²⁾ En 3A or 3B.

Trunnions. Steel to a. BS 24¹⁴⁾-4.1:Class F.

or b. BS 970¹²⁾ En 3A.

Washers, spring. Steel to BS 1802¹⁷⁾.

3 Dimensions

The leading dimensions for vacuum brake cylinders and metallic components shall be as shown in Table 2 to Table 5 (Figure 2 to Figure 7 inclusive). The periphery of the piston shall be parallel to the axis of the piston rod and shall be concentric to within 0.008 in (total reading on dial gauge when rotated on centres). The cylinder wall shall be concentric to within 0.008 in. No taper seating shall be used for the piston rod end.

4 Cylinder capacity

In all cases separate type cylinders shall be piped to a vacuum chamber to give the necessary volume above the piston. It is recommended that, in the case of combined type cylinders, the initial volume provided above the piston when it is at the bottom of its stroke, shall be not less than five times the displacement of the piston at half stroke. In the case of separate cylinders for vehicles operating on long continuous grades, the total vacuum chamber capacity above the piston should be a maximum of ten times the displacement of the piston at half stroke. In no case should the displaced volume be more than one-fifth of the total capacity.

5 Test requirements

All vacuum brake cylinders shall be subjected to operational tests in one of the following groups, full details of which are given in Appendix B:

either a. *Group A tests.*

- i) Operational test.
- ii) Creepage test.
- iii) Vacuum retaining capacity test.

or b. *Group B tests.*

- i) Operational test.
- ii) Creepage test with weight added.
- iii) Vacuum retaining capacity test with restricted travel.

¹²⁾ BS 970, "Wrought steels in the form of bars, billets and forgings, up to 6 in ruling section, for automobile and general engineering purposes. En series.

¹³⁾ BS 1400, "Schedule of copper alloy ingots and copper and copper alloy castings".

¹⁴⁾ BS 24, "Railway rolling stock material", Part 4, "Steel billets, blooms, bars and forgings", and Part 6, "Steel slabs, plates, sections, bars and rivets for locomotive boilers, locomotives, carriages and wagons".

¹⁵⁾ BS 1775, "Steel tubes for mechanical, structural and general engineering purposes".

¹⁶⁾ BS 916, "Black bolts, screws and nuts".

¹⁷⁾ BS 1802, "Steel spring washers for general engineering and automobile purposes".