

# **SPECIFICATION FOR SURGICAL SUCTION APPARATUS**

**Part 2. Electrically operated surgical  
suction apparatus for continuous drainage**

**BS 4199 : Part 2 : 1968**

THIS BRITISH STANDARD, having been approved by the Surgical Instruments and Medical Appliances Industry Standards Committee and endorsed by the Chairman of the Chemical Divisional Council, was published under the authority of the General Council on 18th July, 1968.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 4000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price 15s. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- BS 1780. Bourdon tube pressure and vacuum gauges.
- BS 2050. Electrical resistance of conductive and anti-static products made from flexible polymeric material.
- BS 2520. Barometer conventions and tables.
- BS 2831. Methods of test for air filters used in air-conditioning and general ventilation.
- BS 2951. Glossary of terms used in high vacuum technology.
- BS 3489. Sound level meters (industrial grade).
- BS 3928. Method of test for low-penetration air filters (other than for air supply to i.c. engines and compressors).

*British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.*

The following BSI references relate to the work on this standard:  
Committee reference SGC/24                      Draft for comment D 64/1696

## CO-OPERATING ORGANIZATIONS

The Surgical Instruments and Medical Appliances Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and profession and industrial organizations:

Association of Hospital Matrons

British Dental Association

\*British Medical Association

\*British Surgical Trades Association (Incorporated)

Federation of British Rubber and Allied Manufacturers

\*Institute of British Surgical Technicians

\*Medical Defence Union

\*Medical and Dental Defence Union of Scotland

\*Medical Protection Society

Ministry of Agriculture, Fisheries and Food

Ministry of Defence, Air Force Department

Ministry of Defence, Army Department

\*Ministry of Defence, Navy Department

\*Ministry of Health

Queen's Institute of District Nursing

Royal College of Midwives

Royal College of Nursing

Royal College of Obstetricians and Gynaecologists

Royal College of Physicians and Surgeons of Glasgow

Royal College of Physicians of London

Royal College of Surgeons of Edinburgh

\*Royal College of Surgeons of England

Royal College of Veterinary Surgeons

Royal Institute of Public Health & Hygiene

The Government departments and professional 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 British Standard:

Association of Anaesthetists of Great Britain and Ireland

Association of Clinical Pathologists

Electrical Research Association

Institute of Hospital Engineering

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**FOREWORD**

There is a wide field of surgical practice in which the continuous drainage of wounds and body cavities is required for periods of several days with the minimum of supervision. The purpose of Part 2 of this British Standard is to state the basic requirements for the performance, together with the essential safety requirements, of apparatus used for continuous drainage. As in Part 1\* of this British Standard, the specification applies only to electrically operated mobile apparatus.

To remove vomit, blood and secretions rapidly, a suction pump must be capable of producing a high vacuum and have a relatively high air displacement; the basic requirements for such electrically-operated machines for use in the operating theatre and wards are published in Part 1 of this British Standard.

Suction for continuous drainage is usually required to remove only small quantities of secretions or air from the body. The vacuum applied must not be excessive otherwise tissues may be damaged; therefore it is important to regulate the vacuum accurately. If this is done so that the determined pressure can never be exceeded in the patient's body, it is unnecessary to regulate the flow; no harm can result with a high air flow apparatus as long as the vacuum is regulated in this way. However, such high air flow apparatus is only necessary when there are large air leaks, as for example during drainage of the pleural cavity when there are alveolar or bronchial leaks. In most situations where continuous drainage of a body cavity is required, apparatus providing low air flow will suffice.

Part 2 deals with suction apparatus designed for body drainage, and is principally concerned with the regulation of the degree of vacuum. Two main types of apparatus are considered: (1) low air flow (e.g. for drainage of closed cavities), and (2) high air flow (e.g. for use with broncho-pleura fistulae).

Apparatus conforming to Part 1 of this British Standard (dealing with high vacuum—high air flow equipment) should never be used directly for continuous drainage of body cavities because of the risk of applying a dangerously high degree of vacuum. This hazard would also exist in the use of a dual purpose machine capable of providing both 'high' (Part 1) and 'low' (Part 2) vacuum and such equipment is therefore not specified in this British Standard

\* BS 4199, 'Surgical suction apparatus', Part 1, 'Electrically operated surgical suction apparatus of high vacuum and high air displacement type'.

as it was considered impracticable to specify requirements for non-interchangeable connections for separate ' high ' and ' low ' vacuum ports.

This does not preclude a continuous drainage controller unit and pressure gauge (both complying with the relevant requirements of BS 4199, Part 2), being connected into the inlet of a ' high vacuum ' apparatus (Part 1) or into a suction service point of a hospital vacuum (medical) pipeline system.

Apart from the performance characteristics, there is an important point of difference from Part 1 concerning the electrical safety requirements for use in zones where flammable gases, such as anaesthetics, may be present. Continuous drainage apparatus is not used frequently in the presence of flammable gases, although occasionally this may be necessary. For this reason, in the interests of economy, two types of equipment are specified. Each type of apparatus is to be clearly marked as to whether it is safe, or not, for use in the presence of flammable gases.

Vacuum control valves of the air leak type may be satisfactory for the high air displacement machines specified in Part 1 of this British Standard, but existing types of air leak needle valves have not proved sensitive enough to adjust the vacuum during body drainage. Control valves of the bellows or diaphragm type are usually preferred for apparatus of this type. However, it would be too restrictive for future development to exclude needle valves altogether from this specification.

Most vacuum control valves are set by reference to a pressure gauge, when limiting the maximum vacuum applied to the patient. If this gauge is connected on the patient side of the control valve then it always indicates the vacuum applied to the patient. It only shows the **maximum** vacuum (i.e. the degree of vacuum set by the control) when the inlet tube is occluded and there is, therefore, no flow into the system. If the valve is set with the apparatus open to air then the negative pressure increases after the patient is attached, and may well greatly exceed that intended. The inlet tube **must therefore always be occluded** when such a valve is adjusted. Other types of valves have a gauge or indicator enabling the maximum vacuum to be adjusted without occluding the suction inlet. It is essential that whatever the type of control, each must have clear instruction how to set the vacuum. Each location for the gauge has different advantages, but a pressure gauge on the patient side of the control valve is mandatory in the specification.

When infective material is being aspirated, the inevitable bubbling and splashing in the collecting bottle create a bacterial aerosol which passes into the pump and often from its exhaust outlet into the air of the room. Although the problem of frothing is less severe with low vacuum apparatus, it is nevertheless important. Frothing may be reduced by the addition of a suitable anti-foaming agent to the suction jar. Such substances are readily available and their use is recommended.