

Terms relating to surgical implants —

Part 2: Glossary of terms relating to mechanics

UDC 615.461:616.61-74:001.4

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Surgical Instruments and Medical Equipment Standards Committee (SGC/-) to Technical Committee SGC/18 upon which the following bodies were represented:

- British Institute of Surgical Technologists
- British Medical Association
- British Orthopaedic Association
- British Steel Industry
- British Surgical Trades Association Incorporated
- Department of Health and Social Security
- National Association of Drop Forgers and Stampers
- Royal College of Surgeons of England
- Royal Veterinary College
- Society of Thoracic and Cardiovascular Surgeons

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Ministry of Defence
- Scottish Health Services
- Coopted members

This British Standard, having been prepared under the direction of the Surgical Instruments and Medical Equipment Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1984

© BSI 10-1999

The following BSI references relate to the work on this standard:
Committee reference SGC/18
Draft for comment 79/60409 DC

ISBN 0 580 131831

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Section 201. Basic mechanical terms	1
Section 202. Mechanics of materials	3
Alphabetical index	11
Figure 1 — Shear strain diagram	8
Figure 2 — Typical stress/strain curve from a tensile test	8
Figure 3 — Diagram illustrating Poisson's ratio	9
Figure 4 — Typical creep curve	10
Publications referred to	Inside back cover

Foreword

This British Standard has been prepared under the direction of the Surgical Instruments and Medical Equipment Standards Committee.

Advancements in the field of implant surgery proceed by the collaborative efforts of those skilled in a number of diverse activities, each having a specialized language. Definitions of terms relating to surgical implants were prepared with two main purposes in view, namely:

- a) to promote precision and uniformity in the use of terms relating to the various aspects of surgical implants;
- b) to enable workers in different fields to understand one another.

The intention has been to provide information on terms used in the biological, medical, engineering and materials science aspects of surgical implants. It is emphasized that many of the terms included in this Part of BS 6324 will be found in British Standards directly concerned with particular disciplines, as well as in many text books. The wording of these definitions has in some instances been modified to facilitate understanding of the concepts by readers who are not specialists in these particular disciplines; the definitions are not otherwise incompatible with the general definitions as used and understood in the relevant industries. Every attempt has been made to align the terms and definitions with modern practice. This glossary does not purport to be a comprehensive list of all terms used in connection with surgical implants and has been restricted to those terms most frequently used. Where terms are considered to be deprecated, this has been stated.

The glossary has been prepared in four Parts as follows:

- *Part 1: Glossary of general medical terms;*
- *Part 2: Glossary of terms relating to mechanics;*
- *Part 3: Glossary of terms relating to materials;*
- *Part 4: Glossary of orthopaedic surgical terms.*

Further consideration is being given to the preparation of other Parts covering such fields as cardiovascular, neuro-surgical and genito-urinary implant surgery.

Attention is also drawn to the Parts of BS 3531 dealing with surgical implants.

Each term in the glossary has been allocated a number of the type 20101 where the first three digits indicate the section number and the first digit of that group indicates the Part of the glossary. The remaining two digits give the term number within the section.

Where two or more terms have the same meaning, the preferred term is given in bold type and the other terms are given in medium type and, if deprecated, are so indicated.

An alphabetical index of the terms contained in each Part of the glossary is given at the end of that Part. Those terms given in italic typeface in the definitions are themselves defined elsewhere in the same Part and are included in the index for ease of reference.

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 and ii, pages 1 to 12, 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.

Section 201. Basic mechanical terms

NOTE Unless otherwise qualified, the definitions contained in this Part of BS 6324 use the term “body” in an engineering sense.

No.	Term	Definition
20101	force	That which, acting on a body, tends to cause it to undertake linear acceleration. NOTE The SI unit of force is the newton (N).
20102	couple	Two equal and opposite <i>forces</i> acting along parallel lines of action and tending to cause rotation of the body to which they are applied. NOTE The value of the couple is given by the magnitude of one force multiplied by the perpendicular distance between the lines of action of the forces. The SI unit of couple is the newton metre (N m).
20103	mass	The quantity of matter in a body. NOTE The SI unit of mass is the kilogram (kg).
20104	weight	That <i>force</i> which is exerted on a body by the mutual attraction (gravity) between it and the earth. NOTE The SI unit of weight is the newton (N).
20105	load	Any system of <i>forces</i> and/or <i>couples</i> applied to a body.
20106	free body diagram	An illustration of all the loads acting on a body or a part of a body allowing analysis of the loading on each body part. NOTE When the loading on a body component is analysed, a single part or any group of parts may be studied and the equations of equilibrium are satisfied for each part or group of parts. Attention should be paid to all the loads transmitted by the external environment and by the remainder of the body at the section joining this part or group of parts to the rest of the body.
20107	pressure	The <i>force</i> divided by the area of the surface on which the force acts. NOTE The SI unit of pressure is the pascal (Pa); $1 \text{ Pa} = 1 \text{ N/m}^2$.
20108	moment	The turning effect of a <i>force</i> about an axis. NOTE The value of a moment is given by the product of the force and the distance measured perpendicularly from the axis to the line of action of the force. The SI unit of moment is the newton metre (N m).
20109	torque	A <i>moment</i> , generally about the long axis of a body, that tends to produce twisting (<i>torsion</i>). NOTE The SI unit of torque is the newton metre (N m).
20110	torsion	The twisting rotation of one end of a body relative to the other, generally about the long axis, caused by <i>torque</i> .
20111	bending moment	The <i>moment</i> acting about an axis perpendicular to the long axis of a body and generally producing lateral deflection. NOTE It is usually applied to a body with one long axis (i.e. with ratio of length to width greater than 6 : 1). The unit of bending moment is the newton metre (N m).
20112	resultant force and couple	The single <i>force</i> and single <i>couple</i> representing the total effect of a system of forces and couples that are acting on a body or part of a body. NOTE The resultant force will produce the same linear acceleration of the body as the system of forces.
20113	cross-sectional area	That area which is exposed when a section is taken perpendicular to the longitudinal axis of the body. NOTE The SI unit of cross-sectional area is the square metre (m^2).
20114	centroid	The effective geometric centre of an area.

No.	Term	Definition
20115	centre of gravity	The point at which the <i>mass</i> of all parts of the body may be considered to be concentrated for calculations relating to gravitational and inertial <i>forces</i> .
20116	second moment of area	A property of a <i>cross-section</i> related to its area and the distribution of the area relative to its <i>centroid</i> . NOTE It is used in the calculation of <i>stresses</i> due to bending in the elastic region and is not to be confused with <i>second moment of mass</i> . The SI unit of second moment of area is the metre to the fourth power (m^4).
20117	second moment of mass moment of inertia	A property of a body related to its <i>mass</i> and the distribution of mass relative to the <i>centre of gravity</i> . NOTE It is used in the calculation of angular acceleration due to <i>torque</i> and is not to be confused with <i>second moment of area</i> . The unit of second moment of mass is the kilogram metre squared (kg m^2).
20118	polar moment of area	A property of the <i>cross-section</i> of a circular bar and the distribution of area relative to the <i>centroid</i> . NOTE It is used in the calculation of <i>shear stress</i> due to <i>torsion</i> of a bar of circular cross-section. The unit of polar moment of area is the metre to the fourth power (m^4).
20119	axial force normal force	The <i>force</i> whose line of action coincides with the line joining the <i>centroids</i> of successive <i>cross-sections</i> of a part of a body.
20120	tensile force extensional force	A <i>force</i> tending to increase the length of a part of a body.
20121	compressive force	A <i>force</i> tending to produce shortening of the length of a part of a body.
20122	shear force	That component of the <i>resultant force</i> acting on a cross-section of a body and having a line of action perpendicular to the axis of that body, or acting on the surface of a body and having a line of action tangential to the surface.
20123	work	The product of a <i>force</i> and the distance moved by the point of application of the force along the line of action of the force. NOTE Similarly, work is done when a <i>couple</i> produces an angular displacement. The SI unit of work is the joule (J); $1 \text{ J} = 1 \text{ N m}$.
20124	energy	The capacity for doing <i>work</i> . NOTE In mechanical systems this will be in the form of potential energy (relating to the possibility of <i>work</i> being done by gravity); kinetic energy (corresponding to the instantaneous linear and/or angular velocity of the body) or strain energy corresponding to the energy stored and available for release in a deformed body. The SI unit of energy is the joule (J); $1 \text{ kW h} = 3.6 \times 10^6 \text{ J}$.
20125	power	The rate of doing <i>work</i> or supplying <i>energy</i> . NOTE The SI unit of power is the watt (W); $1 \text{ W} = 1 \text{ J/s}$.
20126	instantaneous centre	The imaginary point, not necessarily in the body, about which a body having general motion may, at a given instant, be considered to be rotating or moving, relative to another body. NOTE The principle is exemplified by the human knee joint in which the tibial and femoral condyles slide in relation to one another during flexion. The instantaneous centre thus traces a path around a selected condyle.
20127	fluid	A substance that flows and that differs from a solid in that it can offer no permanent resistance to change of shape.
20128	gas	The state of matter in which molecules move freely, thereby expanding indefinitely and occupying the total volume of any vessel in which the matter is contained.