

Terms relating to surgical implants —

Part 3: Glossary of terms relating to materials

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- 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

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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, neurosurgical 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 30101 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.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 18, 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 301. General

No.	Term	Definition
30101	phase	A region in a material differing from another in composition or structure or both.
30102	phase diagram	A diagram showing the <i>phases</i> present in a material, their compositions and their relative amounts as functions of temperature, pressure and overall composition. When each phase is at equilibrium with its surroundings the diagram is known as an equilibrium phase diagram.
30103	matrix	The major structural constituent of a material, i.e. the enveloping <i>phase</i> in which another phase is embedded. NOTE Contrast with intercellular substance (see Part 1 of this standard).
30104	grain	a) The crystalline structure of a material. b) One of the individual crystals in a polycrystalline material.
30105	grain boundary crystal boundary	The transition zone between crystalline alignments in two adjacent <i>grains</i> .
30106	grain growth	The coarsening of crystal structure, i.e. an increase in <i>grain</i> size, under certain conditions of heating.
30107	inclusions	Particles of impurities contained in a material.
30108	extrusion	The process of forcing material through a die, e.g. to form cylindrical pipes.
30109	sintering	The process by which a material in powder form is consolidated by raising the temperature to an appropriate value without producing a general liquid <i>phase</i> . NOTE Sintering of metals and plastics materials usually requires the application of pressure.
30110	casting	a) (verb). The process of forming a solid component by allowing a solution, solid-in-liquid suspension or molten material to solidify in a <i>mould</i> without the use of external pressure. b) (noun). The component formed during the casting process.
30111	mould die	An assembly of parts enclosing the space (cavity) from which the moulding takes its form.
30112	compression moulding	The process of moulding a material in a confined cavity by applying pressure and usually heat.
30113	injection moulding	The process of moulding a material by injection under pressure from a heated cylinder through a <i>sprue</i> (runner, gate) into the cavity of a closed <i>mould</i> .
30114	sprue	a) <i>In injection moulding</i> . That part of the feed immediately adjacent to the nozzle of the injection cylinder and connecting the nozzle to the runner. b) The primary feed channel that runs from the outer face of an <i>injection</i> or <i>transfer mould</i> to the mould gate in a single cavity mould or the runners in a multi-cavity mould. c) Moulding material in the primary feed channel.
30115	flash	a) That portion of a charge which escapes from the moulding cavity during moulding. b) Excess material that is formed between mating <i>mould</i> surfaces.

No.	Term	Definition
30116	flash line	The raised line appearing on the surface of a moulding and formed at the junction of <i>mould</i> parts.
30117	moulding shrinkage	The difference in linear dimensions between a moulding and the <i>mould</i> cavity in which it was moulded, both the mould and the moulding being at normal room temperature when measured.
30118	isostatic pressing	The compaction of a powder, enclosed in a flexible container, by means of a liquid under pressure.
30119	hot isostatic pressing	<i>Isostatic pressing</i> by means of a gas at high temperature.
30120	electrophoretic deposition electrodeposition	Surface coating from a dispersion by applying an electric charge to the surface to be coated to make it the electrode in a suitable cell.
30121	bar	A product of rectangular, circular, hexagonal or other section, usually rolled but also produced by <i>forging</i> , <i>casting</i> or machining.
30122	sheet	A cold-rolled flat product supplied in flat lengths.
30123	strip	A cold-rolled flat product supplied in long lengths in the coiled condition.
30124	plate	A hot-or cold-rolled flat product, of thickness greater than 3 mm, supplied in flat lengths.
30125	welding	That joining operation involving the melting of the materials at the interface between them.
30126	wear	The removal or transfer of material from contacting surfaces due to their relative movement under load. NOTE Wear may be measured by mass change, volume measurement or by the depth of wear tracks.
30127	corrosion	<i>Wear</i> caused by chemical attack.
30128	abrasion	The <i>wearing</i> of a surface by the mechanical action of solids. NOTE Contrast with the definition given in Part 1 of this standard.
30129	erosion	Surface <i>wear</i> caused by the mechanical action of a fluid, whether containing solid materials or not.
30130	corrosion resistance	The ability of a material to withstand chemical or electrochemical attack under specified environmental conditions.
30131	intergranular corrosion intercrystalline corrosion; grain boundary corrosion	<i>Corrosion</i> that occurs along <i>grain boundaries</i> between adjacent <i>grains</i> ; resulting from differences between atoms in the boundaries and in the grains.
30132	fretting corrosion	Simultaneous action of the processes of fretting (see Part 2 of this standard) and <i>corrosion</i> .
30133	stress corrosion	Enhancement of the effect of a corrosive environment on a material by stress (see Part 2 of this standard).
30134	stress corrosion cracking	Brittle (see Part 2 of this standard) or quasi-brittle rupture of a material under the joint effect of static stress (see Part 2 of this standard) and corrosive attack, neither of which would have caused cracking whilst acting alone.
30135	corrosion fatigue	The failure due to repeated cycles of load (see Part 2 of this standard) in a corrosive environment. NOTE Generally in a corrosive environment, the number of load cycles to failure at a given stress (see Part 2 of this standard) is reduced, and there is no fatigue limit stress (see Part 2 of this standard).
30136	crazing	A network of surface cracks.
30137	dimensional stability	The capacity to retain original dimensions.

No.	Term	Definition
30138	shrinkage	A change in the dimensions of a product between initial solid forming and conclusion of the fabrication process.
30139	plastic	(adjective). The susceptibility of a material to plastic deformation (see Part 2 of this standard). NOTE Contrast with <i>plastics material</i>
30140	permeability	The ability to permit passage of gases or of small molecules in solution.
30141	porous	a) The condition of a material that contains pores or voids that may or may not be interconnected. b) The ability to permit passage of fluids by means of pores or voids in a material.
30142	porosity	The percentage ratio between the volume of space (void) within a material and the total volume occupied by the material including the spaces. NOTE This meaning of the term is related particularly to the materials used for synthetic vascular prostheses. Contrast with the definition given in 30324.
30143	non-thrombogenic material	Material which provides a non-clotting, non-haemolysing (see Part 1 of this standard) interface with blood.

Section 302. Metals: general

30201	metal	Material usually possessing the properties of electrical and thermal conductivity, opacity, lustre, hardness, ductility, malleability, and high melting and boiling points.
30202	alloy	a) Any <i>metal</i> other than a pure metallic element. b) A metal prepared by adding <i>alloying elements</i> to a basic metal to secure desirable properties.
30203	alloying element	A metallic or non-metallic element deliberately added for the purpose of modifying the properties of a <i>metal</i> .
30204	alloying	The addition of one or more <i>alloying elements</i> to a metallic product to form an <i>alloy</i> .
30205	eutectic	That mixture of two or more constituents which has the lowest freezing and melting points.
30206	eutectic point	That point in the <i>equilibrium phase diagram</i> indicating the composition of the <i>eutectic</i> and its freezing temperature.
30207	eutectic structure	The structure, frequently lamellar, produced by the simultaneous solidification of the components of the <i>eutectic</i> .
30208	eutectoid	That mixture of two or more constituents which forms on cooling from a solid solution and transforms on heating at a constant minimum temperature.
30209	eutectoid point	That point in the <i>equilibrium phase diagram</i> indicating the composition of the <i>eutectoid</i> and its temperature of transformation.
30210	eutectoid structure	The structure, frequently lamellar, produced by the simultaneous precipitation of the components of the <i>eutectoid</i> from the solid solution.

No.	Term	Definition
30211	eutectoid steel	Steel that consists entirely of <i>eutectoid</i> . NOTE In the iron/carbon system, the eutectoid occurs at approximately 0.9 % carbon and, after cooling at a suitable rate, consists entirely of <i>pearlite</i> .
30212	transformation range	That temperature range over which a significant change in <i>phase</i> structure occurs.
30213	grain refining	The process of diminution of <i>grain</i> size, involving heating at the <i>recrystallization temperature</i> (i.e. above the <i>transformation range</i>) followed by cooling at a suitable rate. NOTE <i>Hot working</i> and <i>cold working</i> , followed by <i>annealing</i> , are used for grain refining.
30214	recrystallization temperature	The temperature at which recrystallization takes place to a more stable strainfree crystal form. NOTE See <i>annealing</i> .
30215	ferrite alpha iron; α — iron	The crystal structure of iron stable at room temperature, having a body-centred cubic crystal lattice and being soft and ductile (see Part 2 of this standard). NOTE Solubility of carbon is very low in ferrite (below 0.02 %). Carbon steels up to 0.8 % carbon have ferrite as the <i>matrix phase</i> .
30216	delta ferrite δ — ferrite	The crystal form of iron stable above 1390 °C and having a body-centred cubic lattice. NOTE <i>Alloying</i> with certain elements (e.g. chromium) can modify the temperature range of stability of delta ferrite which can, under some circumstances, persist to normal ambient temperature and below.
30217	austenite gamma iron; γ — iron	The crystal form of iron stable between 910 °C and 1390 °C and in which the unit cell has a face-centred cubic form. NOTE The range of stability can be changed markedly by <i>alloying</i> , and in <i>austenitic stainless steel</i> stability is maintained at normal ambient temperature.
30218	iron carbide cementite; carbide	The <i>phase</i> formed when carbon is present in excess of solubility limits and having an orthorhombic lattice with a 3 : 1 iron to carbon ratio.
30219	pearlite	A mixture of two <i>phases</i> formed by transforming <i>austenite</i> of <i>eutectoid</i> composition to <i>ferrite</i> and <i>iron carbide</i> by heat treatment. NOTE Microscopically, pearlite has a lamellar structure. Transformation begins at <i>grain boundaries</i> .
30220	pearlitic steel	Carbon steel containing 0.02 % to 0.9 % carbon. NOTE <i>Pearlite</i> is present in small quantities in low-carbon steels and increases in quantity as the level of carbon is increased until, in a plain carbon steel containing about 0.83 % carbon, the structure consists entirely of pearlite.
30221	bainite	Steel in crystal form produced when <i>austenite</i> is <i>quenched</i> to a temperature between 200 °C and 400 °C.
30222	martensite	Steel in crystal form produced when <i>austenite</i> is <i>quenched</i> below the temperature for <i>bainite</i> formation. NOTE The face-centred lattice changes to a body-centred lattice, but since the carbon remains in solution it is a tetragonal structure rather than cubic. With sufficient time, transformation to <i>ferrite</i> plus <i>iron carbide</i> occurs at low temperatures, but not to a <i>pearlite</i> structure.
30223	dendrite	A crystal with a fir-tree-like structure formed from a nucleus where first solidification occurred (adjective: dendritic.)