

Glossary of terms used in automatic controlling and regulating systems —

Part 1: Process and kinetic control

Confirmed
December 2011

Co-operating organizations

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

- British Clock and Watch Manufacturers' Association
- British Electrical and Allied Manufacturers' Association*
- British Industrial Measuring and Control Apparatus Manufacturers' Association*
- British Iron and Steel Federation*
- British Nautical Instrument Trade Association
- British Railways Board
- British Scientific Instrument Research Association*
- Council of British Manufacturers of Petroleum Equipment*
- Electrical Research Association
- Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
- Electronic Engineering Association
- Engineering Equipment Users' Association*
- Gauge and Tool Makers' Association
- Institution of Chemical Engineers*
- Institution of Electrical Engineers*
- Institution of Heating and Ventilating Engineers
- Institution of Mechanical Engineers
- Institution of Production Engineers
- Ministry of Defence, Air Force Department*
- Ministry of Defence, Army Department*
- Ministry of Health
- National Coal Board
- National Physical Laboratory (Ministry of Technology)*
- Oil Companies Materials Association*
- Scientific Instrument Manufacturers' Association*
- Society of Instrument Technology*
- Water Resources Board
- Water-tube Boilermakers' 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 British Standard:

- Institution of Gas Engineers
- Ministry of Defence (Navy Department)

This British Standard, having been approved by the Instrument Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 15 December 1967

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Committee reference INE/1,
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Foreword

This standard makes reference to the following British Standard:

BS 2643, *Terms relating to the performance of measuring instruments*.

This British Standard Glossary of terms has been prepared under the authority of the Instrument Industry Standards Committee and combines the definitions contained in BS 1523-2 and BS 1523-3 dealing with process control and kinetic control respectively which will be withdrawn upon publication of this glossary.

Section 4 of BS 1523 which would have covered terms relating to automatic regulators will not be separately published since this British Standard includes such terms in its contents.

In preparing this more general glossary of terms, certain definitions which were contained in Sections 2 and 3 have been slightly amended so as to render them applicable to the less specific fields covered by this publication.

During the preparation of this British Standard attention has been paid to similar glossaries which have been prepared in the U.S.A. and Europe, and more particularly to the International Electrotechnical Vocabulary, Group 37. Other terms and definitions incidental to the instruments used in automatic control systems will be found in BS 2643, *“Terms relating to the performance of measuring instruments”*.

Each term has assigned to it a four-digit number. The first digit represents the section, the second digit (with the first) represents the subsection and the last two digits represent the position of the term in the subsection, e.g. term 3102 is the second term of Subsection 31 which is in Section 3.

It is the intention to prepare a further part of this standard relating to components of automatic controlling systems at which stage Section 5 of the present BS 1523 which deals with components of servo-mechanisms will be incorporated.

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 30, 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 1. Basic definitions

No.	Term	Definition
1001	control system	An arrangement of elements (amplifiers, converters, human operators, etc.) interconnected and interacting in such a way as to maintain or to affect in a prescribed manner, some condition of a body, process or machine which forms part of the system.
1002	process	The act of physically or chemically changing, including combining, matter or of converting energy.
1003	kinetic control system DYNAMIC CONTROL SYSTEM, <i>deprecated</i> MECHANICAL CONTROL SYSTEM, <i>deprecated</i>	A control system, the purpose of which is to control the displacement, or the velocity, or the acceleration, or any higher time-derivative of the position of the controlled device. NOTE The displacement, velocity or acceleration of the input element can be made to control the displacement, velocity or acceleration (not necessarily respectively) of the controlled device. A rational classification of all such systems can be made by specifying the related functions of the input element and controlled device, the input signal being stated first, followed by the related output signal; this classification is used where necessary in this glossary.
1004	process control system	A control system, the purpose of which is to control some physical quantity or condition of a process.
1005	load	Of a kinetic control system. 1. The controlled device. 2. The properties (e.g. inertia, friction) of the controlled device that affect the operation of the system. On a process control or regulating system. The rate at which material or energy is fed into, or removed from, the plant. <i>Examples</i> a. The load on a milk pasteurizing plant is the output or throughput of treated milk. b. The load on a compressed air supply is the rate of air consumption at constant delivery pressure. c. The load on an electric generator is its power output.
1006	plant	Installation in which a process is carried out.
1007	controlled condition	The physical quantity or condition of the controlled body, process or machine which it is the purpose of the system to control. (Symbol γ_o .)
1008	regulating system	A control system, the purpose of which is to hold constant the value of the controlled condition or to vary it in a predetermined manner.
1009	controlled device	A body, process or machine, a particular condition of which is controlled by the system. NOTE In a kinetic control system the controlled device is usually termed the load.
1010	signal	A physical quantity used to transmit information between one element of a control system and another. NOTE The direction of its effect is shown by arrow heads in Figure 1, Figure 2, Figure 3, Figure 4 and Figure 5.
1011	signal processing	The processing of the information contained in a signal by modulating, demodulating, mixing, gating, computing or filtering.
1012	disturbance	A physical quantity other than the system command signal, generated independently of the closed loop itself, which affects the control system. Disturbance may be of two kinds, direct and indirect.
1013	direct disturbance	The injection into an element of the control system of a disturbing signal of the same physical kind as the input control signal to that element.

No.	Term	Definition
1014	indirect disturbance	A change of some physical quantity external to the control system itself that affects a physical parameter of any element of the control system. NOTE Where the parameters of the control element are changed intentionally e.g. in adaptive systems, this change is not regarded as a disturbance.
1015	sampling	The process of measuring a physical quantity at finite intervals, usually at equal intervals of time. NOTE Sampled data are often used in control systems.

Section 2. Classification of control systems

No.	Term	Definition
2001	open-loop control system UNMONITORED CONTROL SYSTEM	A control system without monitoring feedback.
2002	closed-loop control system MONITORED CONTROL SYSTEM	A control system possessing monitoring feedback, the deviation signal formed as a result of this feedback being used to control the action of a final control element in such a way as to tend to reduce the deviation to zero. (See Figure 1.)
2003	manual closed-loop control system MANUAL MONITORED CONTROL SYSTEM	A closed-loop control system which includes a human operator as an element of the closed loop.
2004	automatic closed-loop control system AUTOMATIC MONITORED CONTROL SYSTEM	A closed-loop control system which includes no human operator in the closed loop. (See Figure 2.)
2005	monitoring loop MAIN CLOSED LOOP	The closed loop formed by the elements and interconnections of the main forward, and monitoring feedback paths. (See Figure 1, Figure 2, Figure 3, Figure 4 and Figure 5). NOTE 1 There is always a supply of power into the loop but the power may be derived directly from the process. NOTE 2 The controlled device may or may not be included in the actual loop. NOTE 3 Many systems have additional subsidiary feedback loops for purposes other than monitoring.
2006	servo-mechanism	An automatic monitored kinetic control system which includes a power amplifier in the main forward path.
2007	automatic regulating system	An automatic closed-loop control system the purpose of which is to hold constant the value of the controlled condition or to vary it in a predetermined manner.
2008	compound regulating system	An automatic regulating system including compounding feedforward or feedback.
2009	self-aligning control system	A displacement-displacement control system in which the misalignment is automatically reduced to zero, or practically so, when an interconnection is re-established after a period of interruption during which the misalignment may have attained any value.
2010	step-by-step control system	A displacement-displacement control system in which the drive motor moves in discrete steps when the input element is moved continuously.
2011	cascade control system	A control system in which one controller provides the command signal to one or more other controllers.
2012	ratio control system	A control system which maintains two or more physical quantities or conditions at a predetermined ratio.
2013	sampling control system	A control system in which one or more of the command, deviation and monitoring feedback signals is in sampled form. (See term 1015.)
2014	scanning control system	A sampling control system in which one controller is used in sequence in two or more control loops.
2015	adaptive control system SELF-OPTIMIZING CONTROL SYSTEM	A system in which automatic means are used to change the system parameters in a way intended to achieve the best possible performance of the system at all times.

No.	Term	Definition
2016	linear control system	A control system in which the transfer function between the controlled condition and the command signal is independent of the amplitude of the command signal. NOTE The characteristics of a linear system may be described by a linear differential equation of the first degree, which remains true over the range being considered.
2017	continuous action servo-mechanism	A servo-mechanism in which the power supplied to the servo-motor changes in a continuous manner as the deviation changes continuously.
2018	discontinuous action servo-mechanism	A servo-mechanism in which the power supplied to the servo-motor changes in a discontinuous manner as the deviation changes continuously.
2019	on-off control servo-mechanism	A discontinuous action servo-mechanism in which the power supply to the servo-motor is taken through either an on-off switch or a reversing switch having a central “off” position. The switch operates at predetermined values of the deviation.
2020	multi-step control servo-mechanism	A discontinuous action servo-mechanism in which the power supply to the servo-motor is taken through a multi-contact switch.

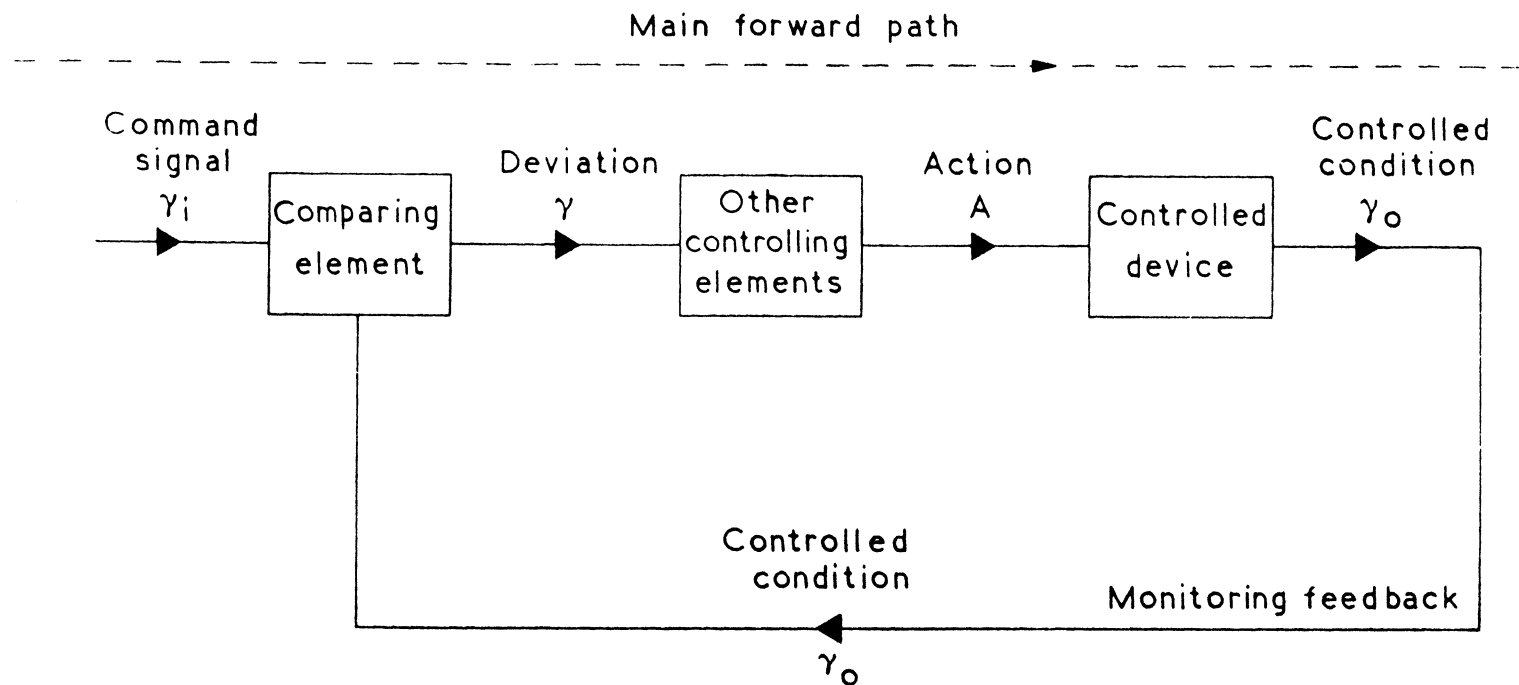


Figure 1 — Basic closed-loop control system

