

# Symbolic representation for process measurement control functions and instrumentation —

## Part 3: Specification for detailed symbols for instrument interconnection diagrams

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# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Industrial-process Measurement and Control Standards Committee (PCL/-) to Technical Committee PCL/4 upon which the following bodies were represented:

- Association of Consulting Engineers
- Beama Transmission and Distribution Association
- British Industrial Measuring and Control Apparatus Manufacturers' Association (BEAMA)
- Energy Industries Council
- Institute of Measurement and Control
- Institution of Gas Engineers
- Ministry of Defence

This British Standard, having been prepared under the direction of the Industrial-process Measurement and Control Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1984

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The following BSI references relate to the work on this standard:  
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# Foreword

This British Standard has been prepared under the direction of the Industrial-process Measurement and Control Standards Committee and is technically equivalent to the international Organization for Standardization (ISO) draft international standard ISO/DIS 3511/3 “*Process measurement control functions and instrumentation — Symbolic representation — Part 3: Detailed symbols for instrument interconnection diagrams*”.

The decision to publish now rather than await the publication of the corresponding ISO standard, recognises the urgent need of the industry for a standard with world-wide application based on an international text. It is anticipated that any differences with the finally published ISO version will be of a minor nature. The standard incorporates minor editorial and drawing changes which have been submitted to the ISO technical committee in order to correct errors in the draft international standard.

For ease of production the text of the draft international standard has been used for this British Standard; some terminology and certain conventions are not identical with those used in British Standards.

### Cross-references

| International standard | Corresponding British Standard                                                                                            |
|------------------------|---------------------------------------------------------------------------------------------------------------------------|
| IEC 117 <sup>a</sup>   | BS 3939 <i>Graphic symbols for electrical power, telecommunications and electronics diagrams (Technically equivalent)</i> |

<sup>a</sup> Undated in the text

The Technical Committee has reviewed the provisions of IEC 113-5, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

The logic elements in accordance with IEC 117-15, referred to in **3.13**, are identical with those given in BS 3939-21.

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 20, 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.

## 0 Introduction

This British Standard has been devised to provide a universal means of communication among the various interests involved in the design, manufacture, installation and operation of measurement and control equipment used in the process industries.

Requirements within the industries vary considerably; in recognition of this, this British Standard is presented in three parts as follows:

- *Part 1: Basic requirements (directed towards the needs of those employing comparatively simple measurements and control means);*
- *Part 2: Extension of basic requirements;*
- *Part 3: Detailed symbols for instrument interconnection diagrams.*

The three parts together are intended to:

- a) meet the requirements of those who, possibly employing more sophisticated measurement and control means, may wish to depict such aspects as the measurement techniques embodied in a particular instrument, or the means — hydraulic, pneumatic, electrical, mechanical — used for its actuation;
- b) provide standard symbolic representation for process measurement control functions and instrumentation. These symbols are not intended to replace graphic symbols for electrical equipment as contained in IEC Publication 117.

## 1 Scope and field of application

This part of BS 1646 specifies instrument symbols for use on interconnection diagrams used for the design, installation, and maintenance of process measurement and control systems.

These detailed symbols are not normally intended for drawings that use the functional symbols given in BS 1646-1 and BS 1646-2. However, the symbols specified in this part of BS 1646 show, by detailing the components, the external connections between units of equipment.

Information on the internal connections in units is not normally included, but references to the appropriate circuit or wiring diagrams may be provided.

When an instrument is composed of more than one functional part, the different symbols may be combined, for example, recorder controller.

The dimensions of the symbols are unspecified, provided the ratio of the side lengths is maintained according to this part of BS 1646<sup>1)</sup>.

If not otherwise stated, contact symbols should be shown open.

The diagrams may employ single line or multi-line representation and may be combined with, or replaced by tables, providing clarity is maintained.

For further assistance see IEC 113-5, *Preparation of interconnection diagrams and tables*.

## 2 Definitions

The following definitions are used solely for the purposes of this part of BS 1646, to assist in the application and understanding of the symbol system.

### 2.1

#### point of measurement

the point in a process at which a measurement is or may be made

### 2.2

#### instrument

a device or combination of devices used directly or indirectly to measure, display and/or control a variable. This term does not apply to internal components of the instruments, for example resistor or receiver bellows

<sup>1)</sup> This rule has been adopted provisionally until such time as technical committee ISO/TC 10 prepares an International Standard for the representation of graphical symbols used on technical drawings.

**2.3**

**panel-mounted instrument**

an instrument that is mounted in a group normally accessible to the operator

**2.4**

**locally mounted instrument**

an instrument that is not panel-mounted

**2.5**

**correcting unit**

the unit comprising those elements (actuating and correcting) which adjust the correcting conditions, in response to a signal from the controller

**2.6**

**actuating element**

that part of the correcting unit which adjusts the correcting element, for example a response to a signal from the controller

**2.7**

**correcting element**

that part of the correcting unit which directly adjusts the value of the correcting conditions

**2.8**

**alarm**

a device which is intended to attract attention to a defined abnormal condition by means of a discrete audible and/or visible signal, but which does not itself institute corrective action

**2.9**

**set value**

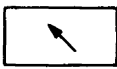
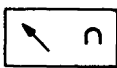
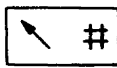
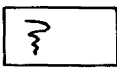
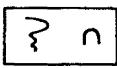
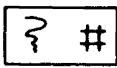
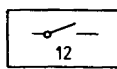
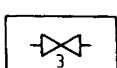
the value of the controlled condition to which the controller is set

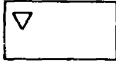
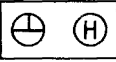
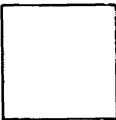
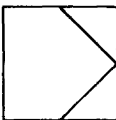
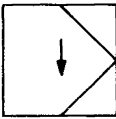
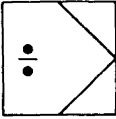
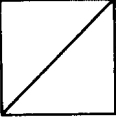
**2.10**

**interconnection diagram**

diagram representing the connections between the different units of an installation

### 3 Symbols

| Number           | Description                                     | Use of equipment or explanation of symbol                 | Symbol                                                                                |
|------------------|-------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>3.1</b>       | Instruments                                     |                                                           |                                                                                       |
| <b>3.1.1</b>     | Non-converting instruments                      | Examples: indicators, recorders, counters                 |                                                                                       |
| <b>3.1.1.1</b>   | Basic symbol                                    | Preferred ratio of sides 1 : 2                            |    |
| <b>3.1.1.1.1</b> | Basic symbol with connections                   | Terminals may be placed on any basic symbol               |    |
| <b>3.1.1.2</b>   | Indicator                                       | Arrow points upwards to left                              |    |
| <b>3.1.1.2.1</b> | Analogue indicator                              |                                                           |    |
| <b>3.1.1.2.2</b> | Digital Indicator                               |                                                           |   |
| <b>3.1.1.3</b>   | Recorder                                        | State number of records if more than one                  |  |
| <b>3.1.1.3.1</b> | Analogue recorder                               |                                                           |  |
| <b>3.1.1.3.2</b> | Digital recorder                                |                                                           |  |
| <b>3.1.1.4</b>   | Counter                                         |                                                           |  |
| <b>3.1.1.5</b>   | Measuring point selection switch (electrical)   | State number of measuring points (for example, 12 points) |  |
| <b>3.1.1.6</b>   | Measuring point selection valve (gas or liquid) | State number of measuring points (for example, 3 points)  |  |

| Number    | Description                                                             | Use of equipment or explanation of symbol                                                                                                              | Symbol                                                                                |
|-----------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 3.1.1.7   | Switch for alarm signal or initiator                                    | <b>Position</b><br>Left = minimum<br>Right = maximum<br>If symbol is turned 90°,<br>Lower = minimum<br>Upper = maximum                                 |    |
| 3.1.1.8   | Manual control station                                                  |                                                                                                                                                        |    |
| 3.1.1.9   | Manual control station with hand/auto or remote/local switch            |                                                                                                                                                        |    |
| 3.1.2     | Converting instruments                                                  | Examples: transmitters, controllers, relays                                                                                                            |                                                                                       |
| 3.1.2.1   | Basic symbol                                                            | Preferred ratio of sides 1 : 1                                                                                                                         |   |
| 3.1.2.1.1 | Basic symbol with connections                                           | Terminals may be placed on any basic symbol                                                                                                            |  |
| 3.1.2.2   | Controller, closed-loop                                                 | The apex of the inscribed V is on the output-signal side. The apex angle shall be 90°.                                                                 |  |
| 3.1.2.3   | Controller with increasing input signal giving increasing output signal | When symbol is turned, the arrow indicating the direction of output action shall remain in the vertical up position                                    |  |
| 3.1.2.4   | Controller with increasing input signal giving decreasing output signal | When symbol is turned, the arrow indicating the direction of output action shall remain in the vertical down position.                                 |  |
| 3.1.2.5   | Ratio controller                                                        |                                                                                                                                                        |  |
| 3.1.2.6   | Converter, transmitter, transducer, etc.                                | State type and range of input and output signals                                                                                                       |  |
| 3.1.2.7   | Computing relay                                                         | State computing function:<br>$+$ , $-$ , $\times$ , $\times^n$ , $\int$ , $\frac{d}{dt}$ , $\sqrt{\quad}$ , etc.<br>For example, square root extractor |  |