
Symbols for machine tools

Part 2. Specification for numerical control symbols

Symboles pour les machines-outils

Partie 2. Spécification des symboles relatifs à la commande numérique

Symbole für Werkzeugmaschinen

Teil 2. Spezifikation für Symbole für numerische Steuerung

Confirmed December 2011

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Foreword

This revision of this British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and implements agreements of the International Organization for Standardization (ISO). It extends the range of symbols specified in Part 1 of this standard. This revision supersedes BS 3641 : Part 2 : 1972, which is now withdrawn.

This Part of this standard is generally in accordance with ISO 2972-1979 'Numerical control of machines — Symbols'. The United Kingdom, however, voted against ISO 2979-1979 and this standard differs from it in the following respects.

Clauses **3.1, 3.2, 3.3, 3.4.3, 3.4.4, 3.4.5** (paragraph 1) and **3.5** have been added.

Symbols **3.6.8** 'Reset (basic symbol)', **3.6.9** 'Cancel, delete (basic symbol)', **3.6.10** 'Do not (basic symbol)' and **3.6.12** 'Modify, amend, edit (basic symbol)' have been added.

In symbols **4.10** 'Programmed stop' and **4.11** 'Programmed optional stop' the qualification 'with machine functions' has been added to correct an omission.

In symbol **4.24** 'Manual data input' the form and position of the hand have been improved.

In symbols **4.25** 'Axis control, normal (machine follows program)' and **4.26** 'Axis control in mirror image mode (machine mirrors program)' the drawing has been amended so that the symbol and its mirror image are the same size.

In symbol **4.54** 'Pre-warning storage overflow' the caution sign has been reshaped slightly to align with BS 3641 : Part 1.

In symbols **4.57** 'Program storage' and **4.60** 'Modify, amend, edit' the remark 'basic symbol' has been deleted as superfluous.

Clause **5** and appendix **A** have been added.



Amendment No. 1
published and effective from 30 June 1982
to BS 3641 : Part 2 : 1980

Symbols for machine tools
Part 2. Specification for numerical control symbols

Revised text

AMD 3975
June 1982

Foreword

Insert the following new paragraph after the existing paragraph 1:

'This standard was amended in 1982 to take account of the requirements of BS 5378 : Part 1 : 1980 and the Safety Signs Regulations, 1980 (S.I. 1980, No. 1471), because machine tools are used in places of work where the requirements of these regulations apply. Symbols in this standard are intended primarily for purposes of operator information but where a symbol is used for safety reasons attention is also drawn to BS 5378 : Part 1.'

AMD 3975
June 1982

Symbol 5.14 Restart after optional stop

In the remarks column, delete the existing text and substitute the following:

'Ring shaped symbol is red in accordance with BS 381C/537 signal red matt.

The vertical bar is green in accordance with BS 381C/228 emerald green, in a matt finish.'

AMD 3975
June 1982

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In the list of standards publications referred to, delete 'BS 4800 Paint colours for building purposes' and substitute the following two entries in the correct numerical sequence:

'BS 381C Specification for colours for identification, coding and special purposes';

'BS 5378 Safety signs and colours

*Part 1 Specification for colour and design'.

Insert the following footnote immediately below the list of standards publications referred to:

'*Referred to in the foreword only.'

British Standard

Symbols for machine tools

Part 2. Specification for numerical control symbols

1. Scope

This British Standard specifies basic designs for symbols intended for use on indicator plates of numerically controlled (N.C.) machine tools.

Drawings in this standard indicate the form of symbols only, and not their absolute dimensions.

The standard gives recommendations for proportions to be used in the design of symbols, independent of actual dimensions, and provides for the grouping together of symbols selected according to individual requirements.

Examples of groupings of symbols are given in appendix A for guidance.

NOTE. An index to BS 3641 : Parts 1, 2 and 3 is given in PD 6490.

2. References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3. Basic symbols

3.1 Classification scheme. To facilitate cross reference with ISO 2972-1979, the classification scheme used in other Parts of this standard has not been applied to the listing of symbols in this Part.

3.2 Numbering of symbols. In this Part of this standard, the symbols specified in 3.6 are not given the same number as corresponding symbols in ISO 2972-1979. The symbols specified in clause 4 are given the same number as corresponding symbols in ISO 2972-1979. The symbols specified in clause 5 have no counterpart in ISO 2972-1979.

3.3 Sizes and proportions. The symbols shown in this standard indicate form only. Where it is necessary to establish actual sizes, the symbols shown may be measured. The absolute size of symbol is at the designer's discretion and indeed it may be desirable to have symbols in two different basic sizes to achieve proper display balance.

3.4 The use of the arrow

3.4.1 General. The arrow shape is a unique symbol in relation to all of the symbols in this standard. It rarely appears as an isolated element, but is frequently used as the basis for a symbol, or qualifies another symbol to give it additional meaning.

There are four different applications of the arrow shape and it is desirable to use a different form in each instance, as shown in 3.4.2 to 3.4.5.

3.4.2 Directional information arrows.

The recommended form of a directional arrow is shown on the right, the important dimensions being the shape and proportion of the head and the associated width of the shaft. Overall length is not crucial and may be varied to accommodate situations where the arrow is graphically combined with other symbol parts. The curved form is for rotational information, the perspective view being superimposed on a shaft representation.



3.4.3 Relative motion information arrows.

Where it is not possible to define exactly the direction in space, it is often useful to define relative motion between two machine parts; in this case the truncated arrow heads are used in pairs to define 'in' (or towards) and 'out' (or away from).



3.4.4 Dimension arrows. For symbols where dimensional concepts are required, an open headed arrow with no shaft is used.



3.4.5 Functional arrows. Many symbols require a functional dynamic in the form of an arrow to improve their ease of interpretation. It is inappropriate to use the same arrow form as is used to define spatial directions, as the arrow shown on functional symbols need not imply a specific direction. A heavier, bolder form of arrow is used in these cases.



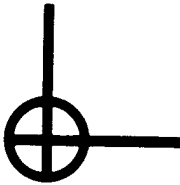
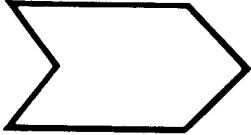
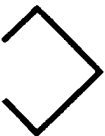
The functional arrow is particularly useful and important for building N.C. symbols to identify the various control modes. When used with the 'program' symbols (3.6.4 and 3.6.5) it indicates program direction. For 'forward' program direction, the functional arrow points the same way as the 'program' symbol. For 'backward' program direction, the functional arrow points the opposite way to the 'program' symbol.

3.5 Grouping of symbols. It is comparatively rare for a single symbol to be used in isolation. The grouping of symbols on displays is implicit in their application. These groupings generally fall into one of three types of association.

(a) *Hierarchical arrangements.* One symbol serves as a general label or heading for a further more detailed group of symbols, e.g.

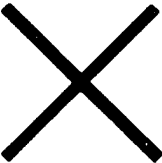
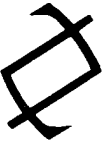
data axis tool magazine
transfer execute handwheel lock index
(b) *Pairing of symbols* to build more complex symbols, e.g. feed rate over-ride; end of block; end of program.
(c) *Association of symbol with value or quantity*, e.g. per cent maximum feed rate; full length tool offset.

3.6 Basic symbols. Many symbols are derived from the basic symbol shapes shown below. *

No.	Designation	Symbol	Remarks
3.6.1	Compensation (basic symbol)		A relative distance that is applied to one or more axes of a machine for a given program and causes a displacement in these axes only in the direction determined by the sign of the offset value. Used to identify the function of compensation — namely, the appropriate offsetting of all the machine data values by fixed amounts to allow for tool size differences.
3.6.2	Origin/datum (basic symbol)		Used as a basic unified shape for all functions related to the datum. This symbol is subject to variations depending on the particular datum to which it relates.
3.6.3	Data carrier (basic symbol)		Used to designate the actual data medium (paper tape, magnetic tape, magnetic disc, etc.) as opposed to the program or data itself.
3.6.4	Program without machine functions (basic symbol)		Used as a basis for symbols designating the program to identify modes or operations of the system where the actual slide motions and machining operations are not implemented.
3.6.5	Program with machine functions (basic symbol)		Used as a basis for symbols designating the program to identify modes or functions where the slide motions and machining functions are fully operational.
3.6.6	Store (basic symbol)		Used to identify functions where elements or data are held pending access or execution by the machine system. The symbol can apply equally to data, components or cutting tools.

*Symbols in this clause are merely numbered for reference. When calling up any of these basic symbols, use their reference number given in clause 4.

3.6 Basic symbols (concluded)

No.	Designation	Symbol	Remarks
3.6.7	Block (basic symbol)		Used to identify and qualify functions which relate specifically to program blocks.
3.6.8	Reset (basic symbol)		Used to acknowledge a particular condition or the return to a known condition e.g. (1) Reset a failure warning indicator (2) Data or event reset Used only in conjunction with identifying symbols.
3.6.9	Cancel, delete (basic symbol)		Used to cancel a function or data. Used in conjunction with identifying symbols
3.6.10	Do not (basic symbol)		Used to negate an action. Only used in conjunction with other symbols.
3.6.11	Interchange (basic symbol)		Used with symbols indicating the elements to be interchanged.
3.6.12	Modify, amend, edit (basic symbol)		Used in conjunction with identifying symbols for a permanent change to data or information. Used in isolation to identify the edit mode of operation.