इंटरनेट मानक

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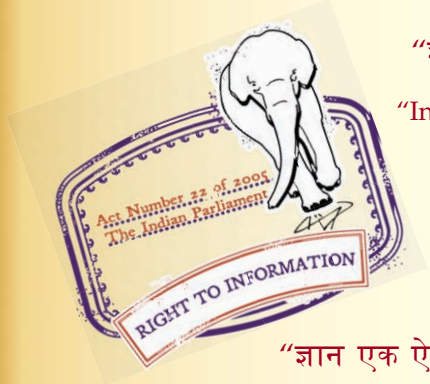
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 13635 (1993): Numerical control of machines - Symbols [PGD 3: Machine Tools]



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Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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ISO 2972 : 1979
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भारतीय मानक

मशीनी औजारों के संख्यात्मक नियंत्रण — प्रतीक

Indian Standard

NUMERICAL CONTROL OF MACHINES — SYMBOLS

UDC 621·9·503·55 : 681·323 : 003·62

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 1993

Price Group 7

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 2972 : 1979 'Numerical control of machines — Symbols', issued by the International Organization for Standardization (ISO) was adoped by the Bureau of Indian Standards on the recommendations of the Machine Tool Basics and Modular Units Sectional Committee (PE 03) and approval of the Production Engineering Division Council.

There are certain symbols which are not given in the ISO Standard, but these symbols find their extensive use in the machine tool industries. Such symbols have been given in the National Annex of this Indian Standard. These symbols are in alignment with the symbols as given in BS 3641 (Part 2) : 1980 'Symbols for machine tools — Part 2 : Specification for numerical control symbols'.

The text of the ISO standard has been approved as suitable for publication as Indian Standard without deviation. Certain conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

> Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

In this adopted standard, reference appears to ISO/R 369. The Indian Standard IS 2182 : 1992 'Symbols to be given on indication plates of machine tools (*first revision*)', which is technically equivalent to ISO/R 369 is to be substituted in its place.

Indian Standard

NUMERICAL CONTROL OF MACHINES — SYMBOLS

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a standard range of symbols for the identification and display of control functions on numerically controlled (N.C.) machine tools. The symbols represented here are specific to N.C. applications. Conventional machine tool functions of any practical system also need to be identified, and the appropriate symbols shall be chosen in accordance with ISO/R 369.

2 REFERENCE

ISO/R 369, *Symbols for indications appearing on machine tools.*

3 BASIC SYMBOLS

Many of the symbols standardized in clause 4 are made up from certain basic symbols which are used repeatedly and consistently as the basis for symbols for related sets of functions.

The arrow is one such symbol and deserves special consideration. It rarely appears on its own and is frequently used to qualify another symbol to which it gives additional meaning. There are two different applications of the arrow and a different form is used in each instance.

In addition to the arrow, N.C. applications require certain other symbols which are used as a basis for the general range.

The basic symbols shown overleaf are used repeatedly and consistently as the basis for symbols for related sets of functions.

3.1 Directional information arrow

The recommended form of a directional arrow is shown on the right, the important dimensions being the shape and size of the head relative to the width of the shaft.

Overall length is not important and may be varied to accommodate situations where the arrow is graphically combined with other symbols.

(See also ISO/R 369 – Symbol 1.)

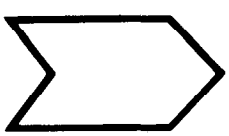
3.2 Functional arrow

Many symbols require the use of an arrow whose direction is not necessarily related to a specific movement. In such cases, the same form of arrow is often inappropriate, and a bolder, heavier arrow form is used.

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 (3.4 and 3.5) 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.

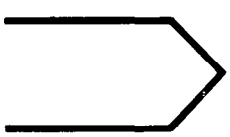
3.3 Data carrier

Used to designate the actual data medium (paper tape, magnetic tape, magnetic disc, etc.) as opposed to the program or data itself.



3.4 Program without machine functions

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.



3.5 Program with machine functions

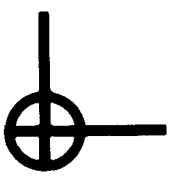
Used as a basis for symbols designating the program to identify modes or functions where the slide motions and machining functions are fully operational.

3.6 Block

Used to identify and qualify functions which relate specifically to program blocks.

3.7 Origin/Datum

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.



3.8 Compensation

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.

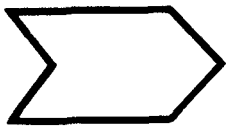
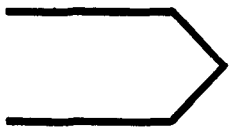
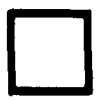
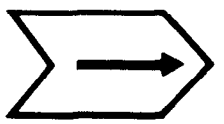
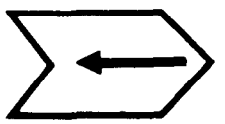
3.9 Store

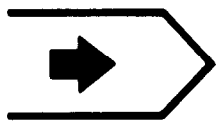
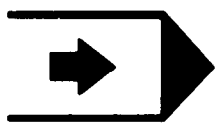
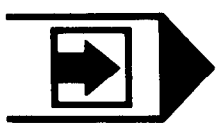
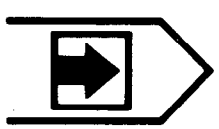
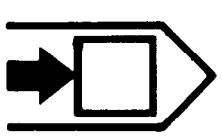
Used to identify functions where elements or data are held pending access or execution by the machine system. The symbol can apply equally to data, components or cutting tools.

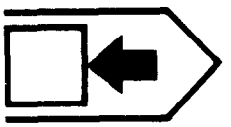
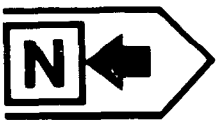
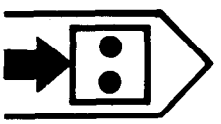
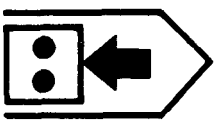
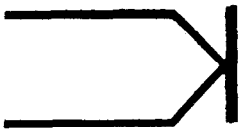
3.10 Interchange

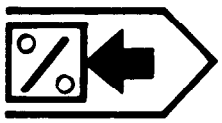
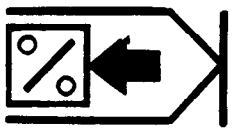
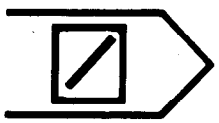
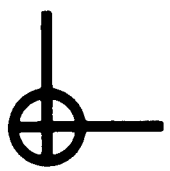
Used with symbols indicating the elements to be interchanged.

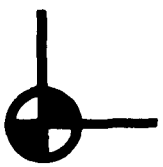
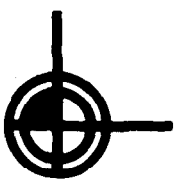
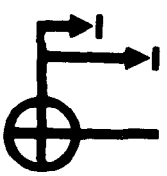
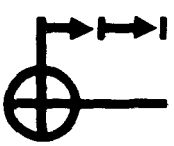
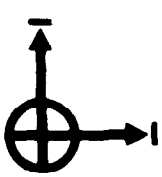
4 SYMBOLS TO BE USED ON MACHINE TOOLS

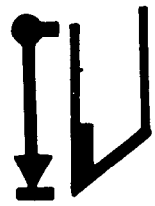
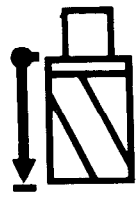
No.	Designation	Symbol	Example	Notes
4.1	Data carrier			May refer to paper tape, magnetic tape, magnetic disc, etc. See 3.3
4.2	Program without machine functions			See 3.4
4.3	Program with machine functions			See 3.5
4.4	Block			See 3.6
4.5	Forward tape wind Without data read Without machine functions			
4.6	Backward tape wind Without data read Without machine functions			

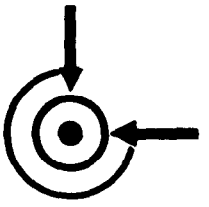
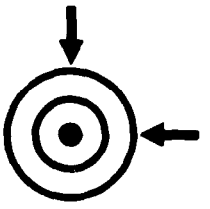
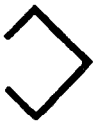
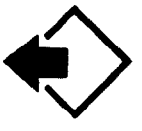
No.	Designation	Symbol	Example	Notes
4.7	Forward continuous Read all data Without machine functions			
4.8	Forward continuous Read all data With machine functions			
4.9	Forward block by block Read all data With machine functions			After reading and execution of each block, operator action is required for reading and execution of next block.
4.10	Programmed stop		Corresponds to M00 function	
4.11	Programmed optional stop		Corresponds to M01 function	
4.12	Forward block by block Read all data Without machine functions			After reading of each block, operator action is required for reading of next block.
4.13	Forward Search for particular data Without machine functions		See 4.15 4.17	Type of data to be specified for each particular application.

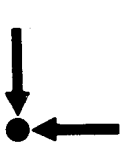
No.	Designation	Symbol	Example	Notes
4.14	Backwards Search for particular data Without machine functions		See 4.16 4.18 4.21 4.22	Type of data to be specified for each particular application.
4.15	Forward Search for block number Without machine functions			
4.16	Backwards Search for block number Without machine functions			
4.17	Forward Search for program alignment function Without machine functions			
4.18	Backwards Search for program alignment function Without machine functions			
4.19	Beginning of program			
4.20	End of program			

No.	Designation	Symbol	Example	Notes
4.21	Backward search for beginning of program Without machine functions			
4.22	End of program with automatic rewind to beginning of program Without machine functions			
4.23	Optional block skip			
4.24	Manual data input			
4.25	Axis control, normal (machine follows program)			Appropriate axis designation may be added if necessary.
4.26	Axis control in mirror image mode (machine mirrors program)			Appropriate axis designation may be added to indicate which co-ordinates are modified. The "axis control, normal" symbol may be used in conjunction with this symbol.
4.27	Origin/datum			See 3.7

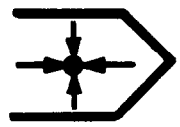
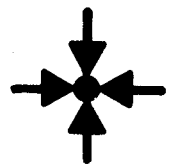
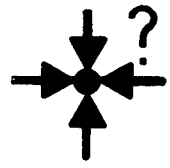
No.	Designation	Symbol	Example	Notes
4.28	Reference position			A pre-determined position, generally used in incremental systems, to which the slides are moved to achieve correspondence between slide position and any known origin. The slides may be re-aligned with this position without reference to the measuring system.
4.29	Co-ordinate basic origin			This represents the origin of the machine co-ordinate system.
4.30	Absolute program (co-ordinate dimension words)			
4.31	Incremental program (incremental dimension words)			
4.32	Compensation or offset		See 4.34 4.35 4.36 4.37 4.38	See 3.8
4.33	Zero offset			Axis notation may be added if required.

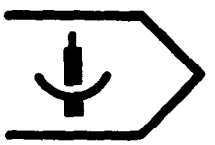
No.	Designation	Symbol	Example	Notes
4.34	Tool offset (non-rotating tool)	1)  2)		Appropriate axis designation may be shown to indicate the offset axis according to ISO 841. This offset allows for variations in the tool position on the indicated axis.
4.35	Tool length compensation (rotating tool)			
4 36	Tool radius compensation (rotating tool)			
4.37	Tool diameter compensation (rotating tool)			
4.38	Tool tip radius compensation			
4.39	Positioning accuracy — fine			

No.	Designation	Symbol	Example	Notes
4.40	Positioning accuracy – normal			
4.41	Positioning accuracy – coarse			
4.42	Store (basic symbol)			See 3.9.
4.43	Write data into store			
4.44	Read data from store			
4.45	Reset			
4.46	Cancel; Delete			

No.	Designation	Symbol	Example	Notes
4.47	Reset store contents			
4.48	Delete store contents			
4.49	Interchange			To be used with symbols indicating the elements to be interchanged. See 3.10
4.50	Program data error			For example : syntax error, parity failure, omission.
4.51	Data carrier fault			For example : torn or broken tape.
4.52	In position			Axis notation may be added if required. This symbol is applicable to one or more axis.
4.53	Storage overflow			

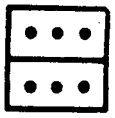
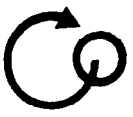
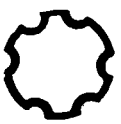
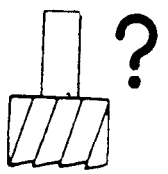
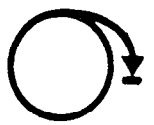
No.	Designation	Symbol	Example	Notes
4.54	Prewarning storage overflow			
4.55	Storage error			
4.56	Battery			This symbol is identical to IEC symbol 5001
4.57	Program storage			Basic symbol
4.58	Subroutine			
4.59	Subroutine storage			
4.60	Modify, amend, edit			Basic symbol

No.	Designation	Symbol	Example	Notes
4.61	Program edit			
4.62	Editing data in storage			
4.63	Bufler storage			
4.64	Repositioning			Returning to the point of interruption of the program such as, for example, after a faulty tool has been replaced
4.65	Programmed position			
4.66	Actual position			
4.67	Position error (Servo error)			

No.	Designation	Symbol	Example	Notes
4.68	Grid point (Sub-reference position)			
4.69	Program from external device			
4.70	Data carrier input via an alternative device			This is usually an external device connected in addition to the normal input device

NATIONAL ANNEX
(National Foreword)

5. ADDITIONAL SYMBOLS

No.	Designation	Symbol	Remarks
5.1	Plugboard		
5.2	Planetary milling		
5.3	Oriented stop		
5.4	Continuous path		
5.5	Point-to-point		
5.6	Display		
5.7	Magazine		
5.8	Tool store		
5.9	Maximum		
5.10	Minimum		
5.11	Null		
5.12	Percent		
5.13	Do not		To be used only with other symbols
5.14	Restart after optional stop		Ring shaped symbol is red The vertical bar is green
5.15	Tool fault, e.g. missing tool		
5.16	Verified		
5.17	Operator action required examine, check		
5.18	End point of circle		

NOTE — The following symbols are not given in ISO 2972 : 1979.

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