BS ISO 3592:2000

BSI Standards Publication

Industrial automation systems — Numerical control of machines — NC processor output — File structure and language format

Documents
Document Sharing Hub

Full document details: BS ISO 3592:2000

National foreword

This British Standard is the UK implementation of ISO 3592:2000.

The UK participation in its preparation was entrusted to Technical Committee AMT/4, Industrial data and manufacturing interfaces.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 22237 1

ICS 25.040.01; 25.040.20; 35.240.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2023.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO 3592:2000

INTERNATIONAL STANDARD

ISO 3592

Second edition
2000-09-15

Industrial automation systems — Numerical control of machines — NC processor output — File structure and language format

Systèmes d'automatisation industrielle — Commande numérique des machines — Informations de sortie des processeurs CN — Structure de fichier et format de langage

Reference number
ISO 3592:2000(E)

Logo deleted

© ISO 2000

Documents
Document Sharing Hub

Full document details: BS ISO 3592:2000

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2000

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Documents
Document Sharing Hub
© ISO 2000 – All rights reserved

Full document details: BS ISO 3592:2000

Contents

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Co-ordinate system 1

4 General structure of CLDATA 1

5 CLDATA file structure 3

5.1 General comments 3
5.2 Letters 4
5.3 Digits 5
5.4 Special characters 6
5.5 Characters 7
5.6 Symbol for literal delimiter 8
5.7 Literal character strings 9
5.8 Symbol for unary operator 10
5.9 Integer numbers 11
5.10 Real numbers 12
5.11 Keywords 13
5.12 Symbol for element separator 14
5.13 Elements 15
5.14 Symbol for record separator 16
5.15 Records 17
5.16 Symbol for file separator 18
5.17 File 19

6 Record structure 20

6.1 General comments 20
6.2 Original program sequence identification 21
6.3 Integer code type post processor command 22
6.4 Surface data 24
6.5 Relative tool position 26
6.6 Tool position 27

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

6.7 **Post processor information** 29
6.8 **Starting information record** 34
6.9 **Relative tool direction** 35
6.10 **Post processor parameters** 36
6.11 **Part program termination** 39
6.12 **Unsegmented tool path** 40
6.13 **Part contour description** 43
6.14 **Literal type post processor command** 50
6.15 **Deferred processing record** 53
6.16 **Proprietary records** 54

Annex A (normative)
Rules for representing the RL on record oriented media 55

Annex B (normative) **Rules used in the syntax definitions** 56

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3592 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 1, *Physical device control*.

This second edition cancels and replaces the first edition (ISO 3592:1978), which has been technically revised.

Annexes A and B form a normative part of this International Standard.

Documents
Document Sharing Hub

© ISO 2000 – All rights reserved

Full document details: BS ISO 3592:2000

Introduction

The output of a general purpose numerical control processor is information used as input to a post processor. This information is called CLDATA, which was originally derived from “cutter location data.”

CLDATA provides a general language to pass manufacturing information from a numerical control processor to a post processor, where the general language is converted to the specific format required by the particular numerical control equipment.

Numerical control is applied to many types of machines, but the language defined in this International Standard has been developed primarily for numerically controlled machine tools – hence the words “tool” and “part” are used in the description of the language to indicate the working element and processed element respectively. Many of the vocabulary words are also derived from metal working terminology.

The CLDATA reference language (RL) is stream oriented, containing special characters to delimit the elements of the RL. Annex A describes the rules for representing the RL on record oriented media, and it is this representation that is used for the purpose of describing the RL in this International Standard.

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

Industrial automation systems — Numerical control of machines — NC processor output — File structure and language format

1 Scope

This International Standard defines a file structure format and a language format for the representation of CLDATA on physical media.

The CLDATA reference language (RL) is used for the machining of parts. It provides for the control of technological functions and movement at the numerical control machine.

Each processor using one of the numerical control programming languages shall be capable of producing CLDATA as defined in this International Standard.

Each post processor shall be capable of using the CLDATA defined in this International Standard as input.

The RL has been developed primarily for numerically controlled machine tools.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative documents referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange.*

ISO 841:—[1)], *Numerical control of machines – Axis and motion nomenclature.*

ISO 4342:1985, *Numerical control of machines – NC processor input – Basic part program reference language.*

ISO 4343:2000, *Industrial automation systems – Numerical control of machines – NC processor output – Post processor commands.*

1) To be published. (Revision of ISO 841:1974)

3 Co-ordinate system

ISO 841 is the basis for defining the co-ordinate system of CLDATA.

The co-ordinate system is a right-handed rectangular Cartesian system, related to a part mounted on a machine and aligned with the principal linear slideways of that machine. The positive direction of movement of a component of a machine is that which causes an increasing positive dimension on the part.

In the CLDATA, the reference axes of the co-ordinate system are *x*, *y* and *z*. Co-ordinates refer to a reference point on a tool (usually the center of the tip) relative to the part co-ordinate system. CLDATA can define the following location and orientation components:

x Dimension parallel to X
y Dimension parallel to Y
z Dimension parallel to Z
i X axis component of the tool axis vector
j Y axis component of the tool axis vector
k Z axis component of the tool axis vector
l X axis component of a secondary orientation vector
m Y axis component of a secondary orientation vector
n Z axis component of a secondary orientation vector

When specifying angles of planes, the positive direction is counterclockwise and the reference axis is as shown in table 1. The positive direction of angle is counterclockwise from the reference axis.

Table 1 – Reference axes

Plane	Reference axis
XY	X
YZ	Y
ZX	Z

Angles are expressed in degrees and decimal fractions of a degree.

4 General structure of CLDATA

CLDATA consists of a sequence of one or more records, which together comprise a CLDATA file.

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

Each record consists of a sequence of elements, to a maximum of 245, where an element is capable of representing:

a) an integer number;

b) a real number;

c) a literal character string;

d) a keyword.

Each element is composed of characters from the set of characters defined by ISO/IEC 646.

The first two elements of a record are always integers.

The remaining elements can be any combination of integer numbers, real numbers, literal character strings or keywords, respecting the syntax of the particular record.

The first element of each record contains a sequence number, commencing with 1, and incremented by 1.

The second element contains a record type code as shown in table 2.

Table 2 – CLDATA record types

Type	Name	Explanation
1 000	Original program sequence identification	This record carries the sequence and identification of the statements of the original numerical control programming language.
2 000	Integer code type post processor command	This record carries specific instructions for the post processor.
3 000	Surface data	This record carries the canonical form of the input geometry.
4 000	Relative tool position	This record carries the tool position with respect to the drive and part surfaces.
5 000	Tool position	This record carries tool position and motion vector information relating to the tool.
6 000	Post processor information	This record carries one type of information of tolerance, cutter or cut flag information.
7 000	Starting information	This record carries the tool position with respect to the startup surfaces.
8 000	Relative tool direction	This record carries information indicating tool direction with respect to the last move.
9 000	Post processor parameters	This record carries one type of multi-axis or base unit parameters.
14 000	Part program termination	This record carries the termination record.
15 000	Unsegmented tool path	This record carries unsegmented information concerning non linear tool paths.
16 000	Workpiece contour description	This record carries the workpiece contour description.
20 000	Literal type post processor command	This record carries specific instructions for the post processor.
21 000	Deferred processing command	This record is under consideration to permit user-selected input language statements to be passed to the CLDATA file in a literal form for subsequent processing.
28 000 to 32 000	Proprietary records	These records will not be standardized.

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5 CLDATA file structure

5.1 General comments

5.1.1 General semantics

A CLDATA file consists of records, each in turn consisting of elements. The basic entity of CLDATA therefore is the element, which can represent either an integer number, a real number, a literal character string or a keyword.

5.1.2 Sub-contents

For

1) letters, see 5.2;
2) digits, see 5.3;
3) special characters, see 5.4;
4) characters, see 5.5;
5) symbol for a literal delimiter, see 5.6;
6) literal character strings, see 5.7;
7) unary operators, see 5.8;
8) integer numbers, see 5.9;
9) real numbers, see 5.10;
10) keywords, see 5.11;
11) symbol for an element separator, see 5.12;
12) elements, see 5.13;
13) symbol for a record separator, see 5.14;
14) records, see 5.15;
15) symbol for a file separator, see 5.16;
16) file, see 5.17.

5.1.3 Limitations

None.

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.2 Letters

5.2.1 Semantics

In general, letters have no individual meaning, being used for forming literal character strings or keywords.

5.2.2 Limitations

None.

5.2.3 Syntax

<letter> ::= A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.3 Digits

5.3.1 Semantics

Digits have no individual meaning, being used for forming integer numbers, real numbers or literal character strings.

5.3.2 Limitations

None.

5.3.3 Syntax

<digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO 3592:2000

5.4 Special characters

5.4.1 Semantics

Special characters are used as punctuation marks (or separators) in the CLDATA file. When special characters are used in literal character strings they are treated as characters with no syntactical significance. The special characters are

+ – unary operators, used to specify the sign of integers, reals and their exponents;

. decimal point, used to separate the whole portion of a real number from the fractional portion;

E e exponent identifier, used to adjust the value of a real number up or down by an integral power of 10;

’ apostrophe, used for delimitation of a literal character string;

, comma, used as a separator between the elements of a record (<es>);

; semicolon, used as a separator between the records of a file (<rs>);

: colon, used for delimitation of a CLDATA file (<fs>).

The format control characters; horizontal tabulator (ISO/IEC 646 character code 9), line feed (code 10), form feed (code 12), carriage return (code 13) and space (code 32), have no significance except in literal character strings.

5.4.2 Limitations

None.

5.4.3 Syntax

<special_character> ::= + | – | . | E | e | ’ | , | ; | :

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.5 Characters

5.5.1 Semantics

A character is a letter, digit, special character or other valid character.

5.5.2 Limitations

None.

5.5.3 Syntax

<character> ::= <letter> | <digit> | <special_character> | <other_valid_character>

Other valid characters have no significance within this International Standard but are nevertheless considered as valid input. These characters are not otherwise defined in this International Standard. They shall be manageable by the specific implementation and be selected from the character set defined by ISO/IEC 646.

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.6 Symbol for literal delimiter

5.6.1 Semantics

The apostrophe is used at the beginning and at the end of a literal character string to indicate the extent of the literal string.

5.6.2 Example

cln,5000,5,'L1',0,4.,2.5,6.;

where *cln* represents an integer value identifying the CLDATA record sequence number.

5.6.3 Limitations

None.

5.6.4 Syntax

<symbol_for_literal_delimiter> ::= '

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.7 Literal character strings

5.7.1 Semantics

A literal character string may be used in records, for listing text, or in the post processor statements for passing special information through to the post processor. The set of characters permissible is not limited to the set of letters, digits and special characters defined in this International Standard. Within a literal character string, any special characters are treated simply as characters without syntactical significance.

5.7.2 Example

cln,20000,0,PPRINT,'Set machine origin above front left corner of part';

5.7.3 Limitations

None.

5.7.4 Syntax

<literal_character_string> ::= <symbol_for_literal_delimiter> $^{0:n}$[<character>] <symbol_for_literal_delimiter>

NOTES

1) The syntax of a literal character string implies that the empty string is allowed.

2) The format control characters; horizontal tabulator (ISO/IEC 646 character code 9), line feed (code 10), form feed (code 12), carriage return (code 13) and space (code 32), are significant in literal character strings.

3) A literal character string not terminated by an apostrophe prior to an arbitrary physical record size limit (for example, column 72 in annex A) is continued from the first column on the next physical record.

4) An apostrophe is represented by two apostrophes in a non-empty literal character string.

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.8 Symbol for unary operator

5.8.1 Semantics

The special characters + and − shall be used as unary operators, in which case the operator denotes the sign of the following term.

+ denotes that the following term is to be positive;

− denotes that the following term is to be negative.

In the absence of a unary operator the following term shall be considered positive.

5.8.2 Examples

+ 45
− .82844E−3
72.6

5.8.3 Limitations

None.

5.8.4 Syntax

<unary_operator> ::= + | −

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.9 Integer numbers

5.9.1 Semantics

Integer numbers have their usual meaning, being built up of decimal digits, and optionally being preceded by a sign. The integer number is considered positive if a sign is omitted.

Leading zeros have no significance.

5.9.2 Examples

123
– 14
+ 4527

5.9.3 Limitations

There is no defined limit to the number of digits within a number, the limit being implementation dependent, although at least one digit must be specified.

5.9.4 Syntax

<integer_number> ::= $^{0:1}$[<unary_operator>] $^{1:n}$[<digit>]

© ISO 2000 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000

5.10 Real numbers

5.10.1 Semantics

Real numbers have their usual meaning, being built up of decimal digits and a decimal character (required). Real numbers can optionally be preceded by a sign. The number is considered positive if a sign is omitted. Real numbers can also be optionally followed by an exponent raising (or lowering) the value, as indicated by the unary operator, by a integral power of 10.

Leading and trailing zeros have no significance.

5.10.2 Examples

123.
– .14
+ 45.27
.6428E–2

5.10.3 Limitations

There is no defined limit to the number of digits within a number or within the exponent, the limit being implementation dependent. No distinctions are made between whole real numbers and those containing a fractional part.

Number representation of real numbers within a computer is not necessarily exact. Therefore, approximations are used where necessary to achieve the effect of exact operations. These approximations are computer dependent.

5.10.4 Syntax

<real_number> ::= <simple_real_number> <opt_exponent>

<simple_real_number> ::= $^{0:1}$[<unary_operator>] $^{0:n}$[<digit>] **.** $^{0:n}$[<digit>]

<opt_exponent> ::= $^{0:1}$[<exponent_identifier> <integer_number>]

<exponent_identifier> ::= E|e

NOTE – The syntax of a real number implies that a solitary decimal point is allowed and denotes a real value of 0,0.

© ISO 2000 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 3592:2000