AS ISO 22093—2004
ISO 22093:2003



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# Industrial automation systems and integration—Physical device control—Dimensional Measuring Interface Standard (DMIS)



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This Australian Standard was prepared by Committee IT-006, Information Technology for Industrial Automation and Integration. It was approved on behalf of the Council of Standards Australia on 30 March 2004 and published on 3 June 2004.

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*This Standard was issued in draft form for comment as DR 04109.*

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# Industrial automation systems and integration—Physical device control—Dimensional Measuring interface Standard (DMIS)

First published as AS ISO 22093—2004.



Published by Standards Australia International Ltd
GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 5956 4

# PREFACE

This Standard was prepared by the Standards Australia Committee IT-006, Information Technology for Industrial Automation and Integration.

This Standard is identical with, and has been reproduced from, ISO 22093:2003, *Industrial automation systems and integration—Physical device control—Dimensional Measuring Interface Standard (DMIS)*.

The objective of this Standard is to provide a standard for the bi-directional communication of inspection data between computer systems and inspection equipment. The Dimensional Measuring Interface Standard (DMIS) is a vocabulary of terms, which establishes a neutral format for inspection programs and inspection results data.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

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a) Its number appears on the cover and title page while the international standard number appears only on the cover.

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References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

| *Reference to International Standard* | | *Australian Standard* | |
|---|---|---|---|
| ISO | | AS ISO | |
| 10303 | Industrial automation systems and integration—Product data representation and exchange | 10303 | Industrial automation systems and integration—Product data representation and exchange |
| 10303-1 | Part 1: Overview and fundamental principles | 10303.1 | Part 1: Overview and fundamental principles |
| 10303-11 | Part 11: Description methods: The EXPRESS language reference manual | 10303.11 | Part 11: Description methods: The EXPRESS language reference manual |
| 10303-12 | Part 12: Description methods: The EXPRESS-I language reference model | 10303.12 | Part 12: Description methods: The EXPRESS-I language reference model |
| 10303-21 | Part 21: Implementation methods: Clear text encoding of the exchange structure | 10303.21 | Part 21: Implementation methods: Clear text encoding of the exchange structure |
| 10303-22 | Part 22: Implementation methods: Clear text encoding of the exchange structure | 10303.22 | Part 22: Implementation methods: Clear text encoding of the exchange structure |
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| 10303-209 | Part 209: Application protocol: Composite and metallic structural analysis and related design | 10303.209 | Part 209: Application protocol: Composite and metallic structural analysis and related design |
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| 10303-212 | Part 212: Application protocol: Electrotechnical design and installation | 10303.212 | Part 212: Application protocol: Electrotechnical design and installation |

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|---|---|---|---|
| 10303-214 | Part 214: Application protocol: Core data for automotive mechanical design processes | 10303.214 | Part 214: Application protocol: Core data for automotive mechanical design processes |
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# INTRODUCTION

DMIS provides the vocabulary to pass inspection programs to dimensional measuring equipment and to pass measurement and process data back to an analysis, collection, and/or archiving system. A piece of equipment which interfaces to others, using the DMIS vocabulary, may do so directly or it may have a pre-processor to convert its own native data formats into the DMIS format and/or a postprocessor to convert the DMIS format into its own data structure.

An environment making use of the DMIS formats as a data exchange standard is depicted in (Figure 1 — DMIS environment). As illustrated, an inspection program can be created by many different approaches. Inspection program creation can be assisted by CAD systems, non-graphical systems, automated systems, or constructed manually. A programming system may require a pre-processor, which converts the program into DMIS format. A DMIS inspection program can then be executed on dissimilar dimensional measuring equipment (DME)s. In (Figure 1 — DMIS environment), DME I has a DMIS pre-processor and post-processor which converts the DMIS data into its own unique data format. DME IV is utilizing DMIS as its native format and therefore no pre-processors or post-processors are required. Also, a host computer is being used to control DME II and DME III. The host has a post-processor which decodes the DMIS program and drives the two DMEs, either through DMIS formats, or through some user-defined data exchange format.

Resultant data may be passed back in DMIS format through various scenarios. For example, this data could be passed directly as DMIS or via a post-processor. Resultant data is typically passed to an analysis system and/or a storage system such as a Quality Information System (QIS).

The manual interface indicates that DMIS programs can be hand written, and results analyzed, without the use of computer aids. In addition, many other uses of the DMIS data exchange format could be applied.

The implementation of DMIS is dependent on individual users. DMIS simply defines a neutral data exchange format that can be transmitted via ASCII files from one DMIS supporting system to another. The method for the transmission, storage, and management of these files is user-dependent.

This version of DMIS incorporates the statements necessary to drive coordinate measuring machines, video inspection devices, and hybrid in-process verification systems for dimensional and functional inspection of discrete mechanical parts and electronic components. The intent of DMIS is to provide a standard of communication for all dimensional measuring equipment.

Future applications may expand capabilities to support:

1) robotics for both workpiece presentation and measurement, and

2) additional provisions for in-process verification and process adjustment in a closed loop manufacturing cell.

This First ISO edition of DMIS has been completely restructured from the previous DMIS 3.0 ANSI/CAM-I 101-1995 standard. This restructuring was required to conform with ISO/IEC Directives, Part 3. In addition to this restructuring, all approved changes since DMIS 3.0 ANSI/CAM-I 101-1995 was published have been incorporated. This release includes additional functionality in the areas of sensor definitions, sensor component grouping, complex alignment, CAD connectivity, soft functional gauging, quality information systems, relaxation of various length limitations, and operator interface using the PROMPT statement. The majority of approved changes are contained in clause 7; the remainder of the text has not changed significantly, although the restructuring tends to suggest otherwise. The DNSC acknowledges the support and participation of the European DMIS User group (EDUG) in the development of the DMIS 04.0 version. The significant changes are listed below:

| | |
|---|---|
| (label name) | Allows the use of a period '.' in label names. |
| ACLRAT | Changes to the input format. |

| | |
|---|---|
| ALGDEF | New statement added to define an algorithm, and assign to it a label name. |
| BADTST | New statement for trapping specific errors. |
| Characterization file | The format of the characterization file has changed to an Extended Backus Naur Form. Refer to paragraph 5.5 and sub-paragraphs, and also to Annex C. |
| CMPNTGRP | New statement added to group of components for a sensor, as a single component. |
| CONST ( input format 4 ) | Extended capabilities. |
| CONST ( input format 8 ) | New statement for constructing an offset feature. |
| CONST ( input format 9 ) | New statement for soft functional gauging. |
| CONST ( input format 10 ) | New statement for soft functional gauging. |
| CONST ( input format 11 ) | New statement to copy a feature actual and transform it into another coordinate system. |
| CONST ( input format 12 ) | New statement to construct a circle on an actual cone. |
| CONST ( input format 13 ) | New statement to construct a nominal point from CAD geometry by locating the nearest point. |
| CROSCL | New statement to enhance use of rotary tables. |
| DECL | Added a VECTOR variable type, and multi-dimensional arrays. |
| DECPL | New statement to define decimal precision of output. |
| DMESW | Added DELAY as a minor word option. |
| DMISMD | The DMIS version is now mandatory with this statement. |
| DMISMN | The DMIS version is now mandatory with this statement. |
| EQUATE | New statement to equate two coordinate systems. |
| ERROR | Several changes to enhance error trapping. |
| EXTENS | New statement to define sensor extensions. |
| EXTFIL | The SYS minor word has been removed for the next major release of this standard. |
| FEAT/ARC ( input format 1 ) | Removed the restriction that the arc must lie in a plane parallel to the current working plane. |
| FEAT/ARC ( input format 2 ) | Removed the restriction that the arc must lie in a plane parallel to the current working plane. |
| FEAT/EDGEPT | New statement to define an edge point. |
| FEAT/GEOM | New statement to define a feature using previously defined geometry. |
| FEAT/TORUS | New statement to define a torus feature. The addition of this statement also caused changes to the CONST ( input format 1 ) statement, the GEOALG statement, the MEAS statement, the RMEAS ( input format 5 ) statement, the TOL/DIAM statement, the TOL/GTOL statement, and paragraph 5.3.2.1.1. |

| | |
|---|---|
| FEDRAT | Changes to the input format. |
| Figure Identifiers: | All Figure Identifiers have been renamed to conform to the ISO format. |
| FILNAM | The DMIS version is now mandatory with this statement. |
| FLY | New statement added to set or disable continuous motion mode on the controller. |
| GECOMP | New statement to turn geometric compensation on or off. |
| GEOM | New statement for defining CAD geometry associated with features. |
| GOTO | Extended the capabilities for the GOTO statement. |
| GROUP | New statement to define a group of previously calibrated sensors. |
| Intrinsic Functions: | Several changes to return system information. |
| ITERAT | New statement for complex alignments. |
| Label name Length: | Extended to 64 Characters. Refer to paragraph 5.1.2.2. |
| LOCATE | New statement for complex alignments. |
| MATDEF | New statement to specify parameters for functional mating. |
| POP | New statement to recall, from memory, various system information. |
| PROMPT | New statement to prompt the operator for input. |
| PUSH | New statement to save, in memory, various system information. |
| QISDEF | New statement for use in Quality Information Systems(QIS). |
| REFMNT | New statement to define a mounting reference point for a sensor mount component. |
| REPORT | Several minor words added, for enhanced reporting capability. |
| RESUME | New statement to recover from errors. |
| RMEAS ( input format 7 ) | New statement for measurement of edge points. |
| SENSOR | New statement to define a sensor component capable of making measurement. |
| SNSDEF ( input format 6 ) | XRAY sensor definition, and all references to XRAY sensors will be removed in the next DMIS major release. |
| SNSDEF ( input format 7 ) | New input format added to build a sensor from wrists and components. |
| SNSGRP | New statement for defining a group of sensor components. |
| SNSLCT | Modified the format to specify wrist angles; Tip numbers; Feature axes; i,j,k, ang_tol; Sensor groups. |
| Statement Length | The statement length limit was 256 characters, this has been removed. See paragraph 5.1.6. |
| TECOMP | Added the capability to pass the thermal expansion coefficient of the part to the output file. |

| | |
|---|---|
| THLDEF | Added wrists and extensions to the tool holder/changer definitions. |
| TOL/ANGLR | Modified the input format to allow a second datum feature for orientation tolerances. Also added the capability to specify a parallel plane tolerance zone for all orientation tolerances on cylindrical tolerance features. |
| TOL/COMPOS | Modified to comply with ASME Y14.5M-1994. |
| TOL/CORTOL | The minor word RADIUS has been replaced with RADIAL. The minor word RADIUS was a typographical error. The RADIUS and RADIAL minor words have the same definition in this case. Both the RADIUS and RADIAL minor words will coexist for one DMIS version. The RADIUS minor word will be removed in the next DMIS major release. |
| TOL/GTOL | New statement for soft functional gauging. |
| TOL/PARLEL | Modified the input format to allow a second datum feature for orientation tolerances. Also added the capability to specify a parallel plane tolerance zone for all orientation tolerances on cylindrical tolerance features. |
| TOL/PERP | Modified the input format to allow a second datum feature for orientation tolerances. Also added the capability to specify a parallel plane tolerance zone for all orientation tolerances on cylindrical tolerance features. |
| TOL/POS | The minor word RADIUS has been replaced with RADIAL. The minor word RADIUS was a typographical error. The RADIUS and RADIAL minor words have the same definition in this case. Both the RADIUS and RADIAL minor words will coexist for one DMIS version. The RADIUS minor word will be removed in the next DMIS major release. |
| TOL/PROFS | An option in var_3; dev,AVGDEV was changed to AVGDEV,dev. |
| UNITS | A major change to allow multiple UNITS statements within a program. See paragraph 5.4.1.7. |
| VALUE | Major modifications have been made to gain access to the tolerance value when more than one value is possible, and to return various information. |
| VFORM | Added capabilities with var_3. |
| WRIST | New statement to define wrist rotations and offsets. |
| XTRACT | New statement to extract bounded features from complete curves or surfaces. |

AUSTRALIAN STANDARD

# Industrial automation systems and integration — Physical device control — Dimensional Measuring Interface Standard (DMIS)

## 1 Scope

The objective of this International Standard is to provide a standard for the bi-directional communication of inspection data between computer systems and inspection equipment. The Dimensional Measuring Interface Standard (DMIS) is a vocabulary of terms, which establishes a neutral format for inspection programs and inspection results data.

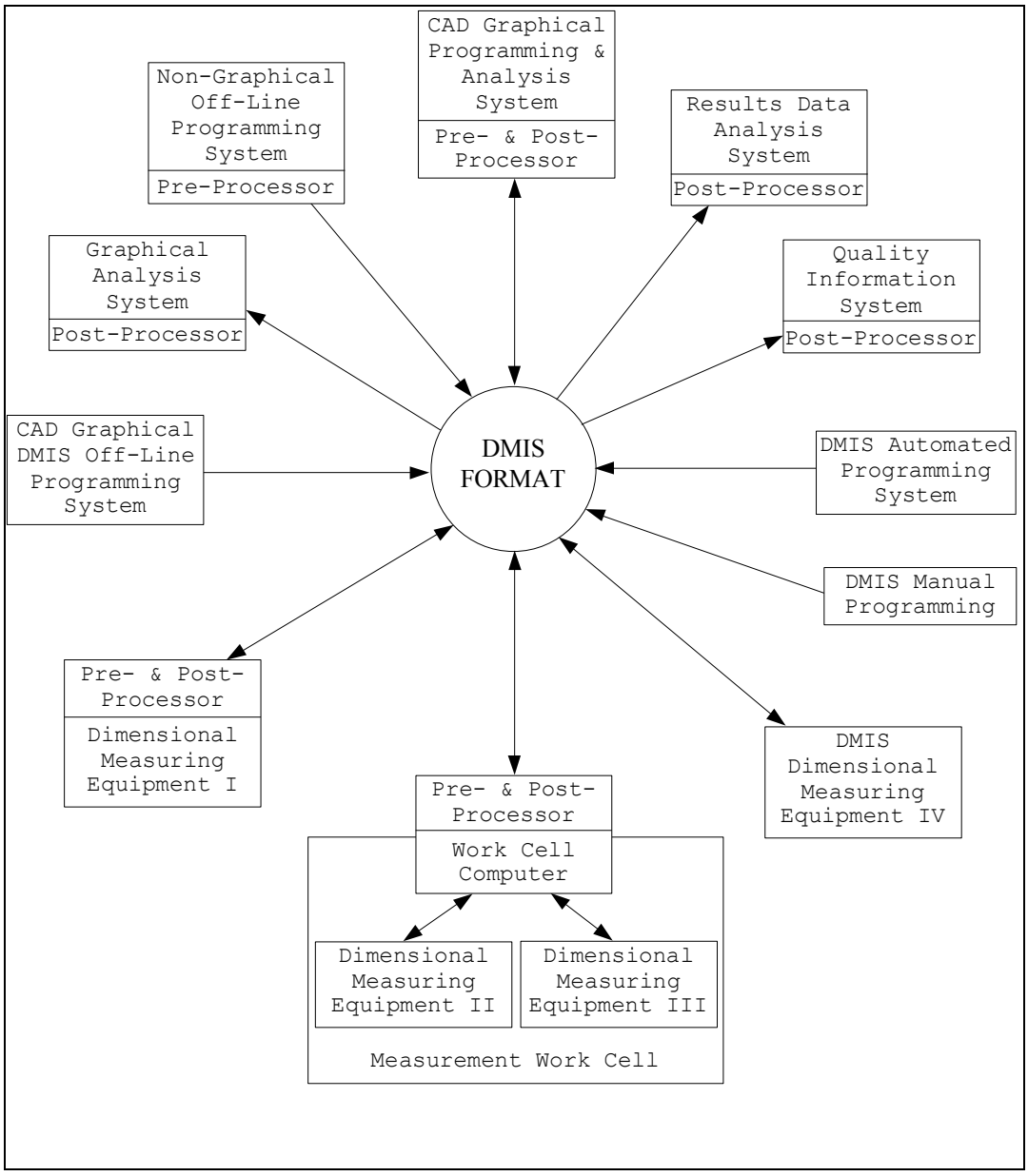


**Figure 1 — DMIS environment**