

Dmistifying DMIS

The CMM programming language standard

DMISTifying the DMIS Standard

In 1908 Henry Ford achieved the complete and consistent interchangeability of parts that were used to produce the Model T automobile and as a consequence the moving assembly line was borne with an assembly worker performing the same repetitive set of operations at a fixed location. This milestone brought about the mass production era that changed the manufacturing world creating a dramatic reduction in manufacturing costs, consistent levels of product quality and eliminating the unique craftsmanship previously demanded by many of the critical manufacturing operations. The key to part interchangeability was the introduction of a common gaging standard by Henry Ford.

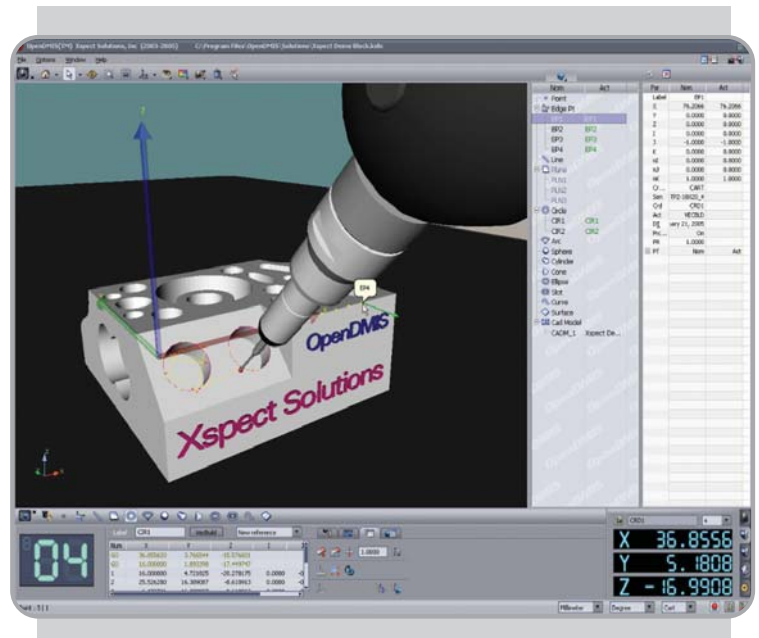
Today we are surrounded by standards in all aspects of our lives. A Standard can be defined as "adherence and conformance to a fixed specification". Standards and Standardization allows the complete exchange and interchangeability of objects and data and can transform the complex way we go about our everyday duties.

Visiting the Gas Station on a Friday night provides an excellent example of the chaos caused by the absence of a standard. The gas filler location on cars has yet to be standardized and hence the lack of a logical traffic flow as we jockey for a position at the pump. (Assuming of course we remember which side it is on!!!!)

DMIS (Dimensional Measurement Interface Standard) was created to enable CMMs (Coordinate Measuring Machines) to communicate seamlessly with each other. Traditionally each CMM manufacturer developed their own programming language that was imbedded within their respective CMM measuring application software's. Many CMM producers had more than one application software and each utilized a different programming language. It was therefore the norm for

no two installed CMMs, even possibly if from the same Vendor, to be able to execute each other's inspection part programs because of these unique programming language differences.

The original development of the DMIS standard was initiated in February 1985 as the Dimensional Measurement Interface Specification project, and as a result of joint efforts by users and suppliers of Dimensional Measuring Equipment the standard was developed for the common communication of inspection data between automated systems. The first version DMIS 1.0 was completed in March 1986 and the second version (DMIS 2.0) in September 1987. The third version DMIS 2.1 was accepted by ANSI as the American National Standard ANSI/CAM-I 101-1990 as was the fourth version DMIS 3.0 in 1995. The acknowledgments listed in the standard read like a Who's Who of global manufacturing corporations and measuring equipment suppliers. This truly is the CMM Users Standard. The standard itself references no less than 6 other Standards in its body.



Ensure that your CMM uses Native DMIS not Translated DMIS

The original goal of DMIS was to provide a means of transferring CMM programs from a CAD/CAM environment to a CMM independent of the Vendor at either end. DMIS can be defined as "a standard for two-way communication of inspection data between computer systems and inspection equipment". DMIS provides a readable and writable vocabulary of terms, which sets out a neutral format for preparing inspection programs and results data, which can also function and be implemented as a programming language.

While practiced in the 90s by some of the truly global manufacturing companies, who were deeply involved in creating the standard, in general its profile and active use had been somewhat limited. Today the implementation of DMIS is accelerating dramatically.

In 2004 DMIS 4.0 became an ISO Standard 22093

Maybe DMIS was ahead of its time since only in recent years has the use of CAD data become a major functional demand being imposed upon CMM software. Perhaps the equipment suppliers' contribution and initial involvement was more due to customer pressure, than a commitment to imbed the resulting DMIS standard into their respective companies ongoing product development strategies. The CMM industry consolidation of the past decade may have shifted development strategies more towards rationalization of products than developing new product and capabilities. Whatever the answer one fact is for sure the issue of a US Patent defining the invention of "using a communication protocol as a programming language" in 1993, by a now defunct CMM manufacturer stopped the momentum of DMIS overnight. DMIS until this time was only being used as a communication protocol and its progress was severely hampered by the patent. The patent was given over to the public domain in 1995 and as a consequence DMIS has been gathering rapid momentum again ever since.

While the patent halted the DMIS uptake and provided a reason for equipment suppliers to hold off new software development with a full DMIS implementation the patent did identify that DMIS 2.1 was a truly comprehensive Standard allowing it to become a programming language in its own right.

With the advent of electronic design data (CAD) penetrating all facets of manufacturing and the global market pressures to reduce time to market of new products, the creation of CMM part programs using

CAM tools has become a focal point of the sophisticated production companies and their supplier base whether large or small. Transferring these Off-Line generated programs in a neutral format to enable them to be subsequently run on any brand of CMM was one of the original goals of the DMIS standard.

This breakthrough in the utilization of DMIS eradicated the necessity to provide pre and post processors to convert DMIS at the CMM into the vendor specific CMM languages. Native DMIS, as it has become known is the use of DMIS as the CMM programming language and is widely accepted as the future of CMM software. Many of the worlds leading global manufacturing companies are following a native DMIS strategy and are active participants in the NADUG (North American DMIS Users Group) and EDUG (European DMIS Users Group) who are advancing the standard by meeting on a regular basis. DMIS 5.0 was approved for release in December 2004.



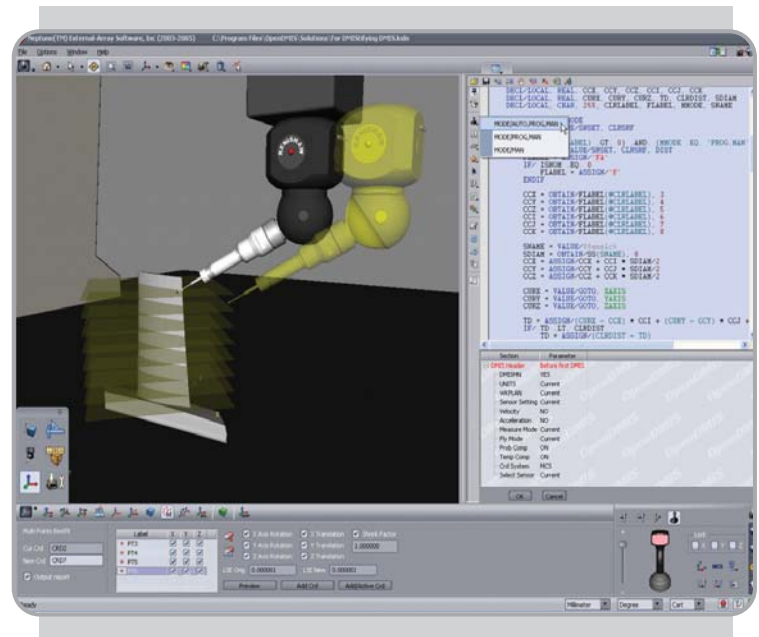
DMIS offers CMM users the following advantages:

- In the Tier 1 - Tier 2 component supply industry past logic has dictated that you acquire the identical CMM to your customer to cut down on potential quality arguments and to benefit from 'hand-down' inspection programs. DMIS eradicates this 'locked-in' equipment purchasing mentality.
- When adding CMM capacity DMIS provides the user the ability to purchase the optimum technical/commercial solution from the marketplace rather than being mandated to buy a CMM running the identical software from his existing CMM supplier.
- In today's global manufacturing economy, it is commonplace to manufacture the identical part at different plants sometimes on different continents. DMIS provides the portability of the CMM inspection program and enables it to be run on a CMM that has been purchased from the best available local source, which will not necessarily be the identical brand to the CMM that the initial program was created for.
- The fast paced software industry will ensure that your existing CMM software will be outdated within a short few years. Significant legacy inspection programs in the past has restricted the ability to change up to the 'best in class' product for fear of losing the existing part program library. DMIS eliminates this problem.
- Being DMIS ready provides the flexibility to change as component outsourcing strategies change.
- The majority of CNC metal-cutting machines are already programmed in CAM, this trend is fast coming to the CMM world. Off-Line CAD based programming also allows the task of operating the CMM to be handed over to production allowing the skill-set of the CMM Metrologist to be better utilized eliminating in part the CMM programmer deficiency that the market is currently suffering.
- With an industry standard CMM language the ability for Colleges to train students in a non brand specific programming language becomes viable and a readily available trained CMM work force becomes a reality. Look in the job vacancy section of any newspaper and you will find CMM operators needed with brand specific software skills. DMIS eliminates this dedicated software brand training issue.
- In a consolidating industry, where a significant portion of the CMM supply base has been eliminated in past years, and concern over the industry profitability continues; DMIS provides the insurance that created inspection programs will never become obsolete.

- CMM inspection programs can be developed and utilized at a new product prototype stage and transferred to manufacturing as the product gets transferred to production.
- DMIS is capable of handling touch probe, optical, scanning, prismatic and sheet metal inspection functions and offers a truly universal programming language regardless of data collection device.



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Graphical Off-Line Programming allows inspection programs to be generated in a virtual digital manufacturing environment away from the CMM and enables full CMM and Probe kinematic simulation and program verification/optimization in advance of part production, thereby reducing lead-times and CMM productive utilization.

DMIS increases CMM productivity

With such a powerful set of arguments for DMIS, it is difficult to understand why native DMIS is not at the 'top of the shopping list' for all CMM and CMM software upgrade customers.

The CMM software industry is currently in a transformation era as CMM vendors offer DMIS translators to their existing non-DMIS software packages, few of these offer DMIS-In and DMIS-Out focussing on only DMIS-In which allow for the off-line CAD programming link. As we are all aware whenever you perform a language translation some of the subject matter gets lost in the translation. This is best demonstrated by witnessing a CMM software that claims to have DMIS Export-Out and DMIS Import-In reading in its own exported DMIS – you would be surprised by the result and this poor performance has not helped the DMIS mission since it has gotten it a bad name. Flavors of DMIS are also common practice. This generally means that a CMM software supplier has 'rammed' DMIS into an existing product and has modified the DMIS standard to make it fit the incumbency of its existing product. Flavored DMIS is not DMIS, there is no valid excuse for it.

While all CMM manufactures are developing their next generation software, which will in all probability embrace the full DMIS standard, some manufacturers continue to claim that DMIS does not provide the power for the more sophisticated metrology applications. These claims have little substance and are usually the claims of a misinformed sales rep trying to sell his obsolete software rather than satisfy his customers needs.

Henry Ford started the trend on interchangeability within the manufacturing world and DMIS continues his mission. While the world of CMM programming cannot change by replacing all existing systems overnight; DMIS is and will change the CMM users world and the CMM industry better get used to winning business on merit rather than past practice.

Who knows maybe even Gas Stations may get together and write a Standard that the Auto companies will endorse and Friday nights will never be the same again; assuming you can remember which side of the

Buying a new CMM or upgrade an existing CMM software today without DMIS is like buying a PC without a network card, it will function as a island not as an integral link in the ever more complex manufacturing chain.



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Keith Mills is President of Xspect Solutions, Inc past President of International Metrology Systems (IMS) and past President of Digital Electronic Automation (DEA), an original contributor to the DMIS Specification and was involved in the passing of the DMIS patent into the public domain.