MCOSMOS – the high-functionality, user-friendly software for coordinate measuring systems.
Mitutoyo’s power software gives 3D measurement the extra edge.

Mitutoyo’s comprehensive MiCAT software platform delivers support for CMMs in the form of the powerful MCOSMOS (Mitutoyo Controlled Open System for Modular Operation Support) suite, which consists of several standard modules complemented by a variety of optional modules for specialised applications.

MCOSMOS modules are designed to enhance the performance of coordinate measuring machines by enabling a very high level of 3D measurement capability. Efficient feedback of result data assists with the streamlining of production processes and provides a professional level of control in measurement and evaluation.

Software from Mitutoyo equips you for the future. Using MCOSMOS means that all your measurement and testing tasks can be accomplished with ease. Large quantities of result data can be recorded and used for supporting every link in the production chain.

Data is easily and simply moved around the local network – or even the Internet. Reject levels are minimised through a more effective measurement process and optimised information flow. The efficiency of the entire production process is increased and costs reduced. In short, using MCOSMOS can be a major factor in reducing the time to market for your products.

Mitutoyo: performance made perfect
Professional

MCOSMOS

Software packages

- Part Manager
- Geometry
- Online/offline programming
- 3D freeform surface evaluation
- 2D profile evaluation
- Statistics evaluation
- Aerofoil evaluation
- Involute gear profile evaluation
- Dimensional interface (DMIS)
- NC correction
- Queuing system

manual

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CNC

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Highly functional and easily expanded.

Software to meet your every need

With Mitutoyo’s high-end, modular software you have the capabilities of a variety of standard modules included in each version of the suite plus the option of specialised expansion modules at your fingertips. Every module is designed to help you make comprehensive evaluations of measurements made by your CMMs and then take care of presenting them in an effective manner. Measurement data is archived into clear, easy-to-use structures within the system.

The MCOSMOS modular software suite is available in three versions: MCOSMOS 1, 2 and 3 to provide a range of capability matching the kind of work that your company handles and the type of CMM employed. All versions are suitable for CNC CMMs with MCOSMOS 1 supporting manual machines.

**PartManager**

The control centre from where the software system is started and part programs are managed.

**Geometry**

For online and offline part program creation using measurements of workpiece features. Includes extensive tolerance comparisons and output functions.

**Online/offline programming**

For online and offline part program creation using measurements of geometric elements directly from the CAD model, with automatic collision avoidance.

**3D freeform surface evaluation**

CAD model based generation of surface measurement points, and comparison of actual/nominal data, with graphical output.

**2D profile evaluation**

Combines scanning and evaluation of workpiece contours and 3D digitisation of surfaces.

**Statistics evaluation**

Real-time collection, analysis and display of SPC data. Networking and web sharing capabilities.

**Dimensional interface**

For bi-directional transfer of measurement programs, in DMIS standard format, between MCOSMOS and various external systems.

**Aerofoil evaluation**

Analyses aerofoil surface profiles, such as turbine blades, from scanned data.

**Involute gear profile evaluation**

For the measurement of all kinds of involute profiles and subsequent comparison with factory or international standards.

**NC correction**

Fully automatic machine tool correction using optimised data from multiple part measurements.

**Queuing system**

Executes a list of existing part programs consecutively at pre-defined positions on the measuring table to allow unattended operation when measuring multiple parts.
PartManager is the management module of the MCOSMOS system – the control centre for every measuring task. PartManager performs efficiently and with outstanding simplicity, helping you control and handle a wide variety of part-program data files, document measurement data in detail and systematically file extensive data records.

This powerful module enables you to manage all your notes, records, statistics, data, image and sound files for each measuring process, clearly listed and linked to part-program files, without a scrap of paper. This eliminates the inefficient practice of managing separate records for each workpiece. A Column Module Structure for each part-program highlights all options used so that they are visible at a glance – the documents appear and the desired programs are started at the click of a mouse on an icon.

User management is incorporated in PartManager to allow a detailed hierarchy of user rights. This meets the security requirements stipulated in EN ISO 9000 ff and Directive 21CFR PART 11 (FDA).
This is one of the most advanced CMM analysis and programming modules available. Superior levels of operation are offered by the use of tool bars, logical icons and pull-down menu options that completely eliminate the use of awkward codes, even while editing programs.

A graphically enhanced display provides step-by-step on-screen prompts, allowing even inexperienced users to measure parts but still giving the flexibility demanded by experienced CMM operators. Interactive graphics and messaging facilities make this module really easy to use, and a large selection of measuring features and data processing options – such as distance and angle measuring tools – is available. Intuitive icons are used throughout to aid usability.

On-line macros can be generated easily to efficiently implement multiple commands so that regularly used routines are instantly available for maximum productivity.

Electro Discharge Machining (EDM) is supported by dedicated functionality that allows highly accurate calculation of the corrections (offsets) that have to be made to the tool position during the machining process.

Features

> Clear user guidance with menus and graphics
> Offline program setup (virtual or in editor mode)
> Convenient, fast program correction with program interruption in Repeat Mode
> Macros for automatic measurement of all geometries
> Integration of text, images and sound
> Customer-specific recordkeeping as required
> PTB-certified algorithms for geometrical calculations
> Dedicated functionality supports EDM
> Certified QS-Stat interface
Online and offline geometric programming eliminates the requirement for manual data input, allowing you to create measuring programs easily and efficiently. The information required for the measured elements and their nominal data is extracted directly from the CAD model in just a few mouse clicks – simple and effective. Probe movement and probe changes are also calculated from the CAD elements’ position and orientation.

The complete probe path and all measurement points are displayed on a clear 3D graphic view, which can be rotated, zoomed or panned to any convenient viewpoint. The module also features a unique collision avoidance system, which automatically creates a collision free path in advance, and so eliminates the need to run a simulation with collision check.

**Features**

- Offline program setup for optimum use of machine time
- Simple measuring-program setup from the CAD model
- Measuring commands by simple mouse clicks
- Full CAD model manipulation by mouse movement
- Clear display of probe path and measurement points
- Automatic collision-free program generation
- Simple program datum setting from CAD data
- Automatic rotation of the surface vector in the event of errors in the CAD model
3D freeform surface evaluation module.
Tolerance comparison of freeform surfaces.

This is an advanced 3D surface-analysis program for comparing measurement data from three-dimensional surfaces with nominal data generated from a CAD model. A typical use is for automotive body parts, but increases in 3D machining capabilities make it applicable to many applications in aerospace, marine and consumables engineering.

Measurement points are generated from the CAD model by simple surface grid selections from graphic menus, with additional functions to handle the special requirements for measuring sheet metal edges. The comparison of measured and CAD model data is simple and quick to make and deviations from nominal size at each point are displayed by appropriate colour marking. Once generated, these comparisons can be simply repeated for the second and subsequent parts, which is automatic when the CAD model is reactivated.

Part alignment to the CAD data can be by selection of discrete points, or the whole point grid can be used to achieve a ‘best fit’ which displays the positional shift and rotation required to achieve this alignment.

Features
- Simple, easy operation
- Fast comparison of actual values to nominal CAD data
- Rotatable, scalable 3D imaging
- Deviations from size highlighted with colour shading of surfaces
- Best fit of measured points to the CAD model (nominal data)
- Standard IGES – STEP – SAT & VDAFS interfaces
- Optional direct CAD interfaces for Catia – ProE & Parasolid
- Common CAD interface to CAT300
- All interfaces for this module can be used with the online and offline programming module
- Display of results with labelling, when desired
2D profile evaluation module.
Scanning and evaluation of 2D contours, plus 3D digitising.

Included in

MCOSMOS 3

Allows the acquisition of sectional data by using the well-known 'scanning' technique. Data acquisition can be programmed for use with touch trigger or continuous contact probes such as Mitutoyo’s MPP series or Renishaw’s SP25/SP80 scanning probes. The resulting 2D section can be directly compared to nominal data from a CAD model, or the geometric elements (lines and circles) can be extracted. Distances and angles can also be computed, and an extensive tool kit is provided for manipulating the contour (expand, contract, mirror, etc).

‘Patch’ scanning is also supported to enable 3D digitising, and data can be exported to many external systems via the included Transpak interface program for reverse engineering applications.

Features

> Simple, safe operation
> User-friendly graphic interface
> Graphic display of Actual/Nominal comparison
> Best Fit capability
> Extensive contour manipulation toolkit
> Supports flexible logging functions
> Complex forms are digitised using the Patch-Scanning Generator by combining several scans
> Over 70 output formats in Transpak
> Flexible output using Protocol Designer in the Geometry module
Statistics evaluation module.
Real-time acquisition, analysis and process monitoring.

The Statistics evaluation module is an analytical tool for describing and comparing results. It takes care of the statistical evaluation of your measurements and is the ideal tool for statistical process control as it makes trends visible, and intervention possible, before processes go beyond the specified action limits. As with all measuring programs it is multitasking and can run as a background process. Special emphasis is placed on simple guidance for the user. Dialogue traceability fields are freely configurable to your needs.

Results are clearly displayed as traditional SPC charts – or they can be presented as a graphical multi-variant display, in which the callouts are positioned against an image of the workpiece. This image can be a drawing, digital photograph or CAD model to make the interpretation of results simplicity itself. Additional modules are also available for ‘Gauge R&R’ and ‘Gauge Management’ to provide a comprehensive suite to meet all your QA management requirements.

Features
> Real-time control card representation
> Monitors various measuring stations in network mode (factory plan, internal/external networks)
> Monitors test features from the Geometry and Aerofoil evaluation modules
> Test instrument monitoring and Gauge R&R capability check available as additional sub-modules
> Enhanced screen customization (plot point colour, shape & output, etc)
> Pareto pie charts and coloured histogram charts
> Multi-variant charting
> Report templates with logo, bitmap & free text support
> Multi-media aids (video, sound, images, etc)
> Mixed variable/attribute routines
> FDA 21 CFR Part 11 support
Aerofoil evaluation module.
Analysing aerofoil profiles.

Automatically analyses selected features of aerofoils such as camber lines, leading/trailing edge radius and twist angles. Components with aerofoil surfaces, such as turbine blades, require special calculations according to the particular design specifications. This module uses cross sectional data on the shape, obtained by the 2D profile evaluation module, to perform these calculations and outputs the result via the Geometry module.

The program is configured to present an easy-to-use check box system for the various calculations. Many different calculations are possible that can, on request, be tailored to meet your particular company standards, together with a ‘best fit’ computation and tolerance comparison facility. The results are automatically stored for use in further calculations, if required.

Features
> Easy operation by self-explanatory pictograms
> Evaluates all major aerofoil parameters
> Full interfacing with the Geometry module and support of all its evaluation functions (image output, text output, logging, Statistics evaluation module)
> Optional output to the Statistics evaluation module and inbuilt Protocol Designer functions in the Geometry module
> Special computations can be incorporated
> Suitable for the aerospace, marine and power generation industries
Involute gear profile evaluation module.
Rapid and precise – for internal and external gears.

Advances in CMM controller techniques have made the measurement of gears feasible and this module takes advantage of this development to bring you sophisticated gear tooth profile measurement capabilities. The program consists of four modules: the ‘involute’ module handles both internal and external straight-sided gears, either spur or helical; the other modules measure worm, bevel or hypoid gears.

From a simple series of input menus to define the gear geometry and measurement requirements, the program automatically creates a complete measurement sequence, which is then run in the standard measurement program. Single-point (touch trigger) probing or continuous path scanning using contact probes, such as the SP25 or a model from the MPP series, is used to obtain the profile data.

Evaluation of the data provides output of standard parameters, such as pitch, involute profile, flank line and concentricity. Simulated single- and two-flank contact rolling tests can also be performed using the nominal data of a mating gear. Output of results is freely selectable and can be any graphic/numeric combination to suit operator preference.

Features
- Automatic generation of gear measurement programs
- Easy and convenient measurement of involute gear profiles
- Easily interpreted graphical, numerical and combined reports
- Clear marking of tolerance deviations
- Tolerance comparison to international standards
- Clearly structured dialogues and functions
- Dialogues for profile and flank line modifications
- Simple menu inputs with pictogram guidance
- Reports in HTML format
- Automatic calculation of all probe position data
- PTB Certified algorithms
Dimensional interface module. Importing and exporting part programs.

Optional module

Support for the international standard DMIS (Dimensional Measurement Interface Specification) is provided by this module. It provides a means to translate programs created by external systems in (pure) DMIS format, which is an open text file, into the secure environment provided by the MCOSMOS part program structure, and hence to allow execution in MCOSMOS. Conversely, existing part programs can be output in DMIS format to allow use by other systems.

This module is operated from PartManager and performs syntax checking as well as highlighting commands not included in the configuration file of MCOSMOS. The DMIS program can also be edited before translation, if required.

Features
> Enables measurement programs to be exported to other systems or imported for execution under MCOSMOS
> Bi-directional transfer of DMIS format programs
> Automatic syntax checking
> Editing facility for quick modification
> DMIS V4.0 compliant (within MCOSMOS configuration file)
This module is the world's leading program for automatic correction of CNC machine tool processes. It uses optimised measurement data, obtained from the CMM by MCOSMOS software, to provide rapid feedback when a dimension drifts from the centre of the specified tolerance range. This enables immediate online correction to be applied to the NC program. In contrast to normal correction based on machine or tool parameters, which then affect the entire program, online correction takes into account each individual feature: for example, position and diameter of bored holes.

Measurement data from individual features is analysed statistically and then optimised to create correction values. The use of statistical techniques means that tool wear can be predicted and corrections applied before the feature reaches an 'out of tolerance' position. The machine tool program, for the individual feature, is automatically updated when specific, preset, values for that feature are reached, without any operator intervention.

Unlike other systems based entirely on machine tool parameters, this feature-based process ensures that production quality is maintained at the highest level, defective parts are virtually eliminated, and profit is maximised.

**Features**

- Automatically analyses measurement results and generates correction data directly and without loss of time
- Fast machine tool update without operator intervention
- Individual-feature based
- Corrected data is implemented for the next workpiece due to immediate data transfer to the machine tool control system
- Significantly reduces in-process error by correcting process
- Shortens introduction period for new process cycles
- Allows rapid transition from 100% measurement to random sampling regime due to early stabilisation of the process
- All current ISO controllers supported
Queuing system.
Measuring workpieces automatically in sequence.

Optional module

This module queues part programs for sequential execution at predefined positions on a CMM measuring table. The workpieces at these positions may be multiples of the same component (batch), or different components. Whichever the case, the throughput of the CMM is increased as the system need not be manned continuously.

At any time you can establish, by means of icons, the order in the queue, the position on the table and the status of all parts in the queue at a glance. This way, good parts, bad parts or failed parts can be sorted easily after completion.

Failed/not measured parts will not interrupt the queue if the relevant commands have been used, i.e. safety planes and/or branch-on-error. This allows measurement of the next part in the queue to commence without any operator input.

Execution of the queued programs is initiated by the mouse or, alternatively, via a touch screen monitor. The operator does not need to have access to the setting of the queue and can be locked out by the programmer.

Features
> Automatically measures identical components, or different components, in sequence
> Measurement of the next workpiece commences without any operator input even if current workpiece measurement fails for any reason
> Icons show table position and measurement status of all workpieces
> Queue setup is lockable
MiCAT-CMM, the software platform from Mitutoyo for professional control, measurement and evaluation as part of coordinate measurement systems.

Note:
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