Mitutoyo

"... the a fast way to measure and analyse turbine and compressor blade form."

**Whatever your challenges are,
Mitutoyo supports you from start to finish.**

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

MAFIS-Express

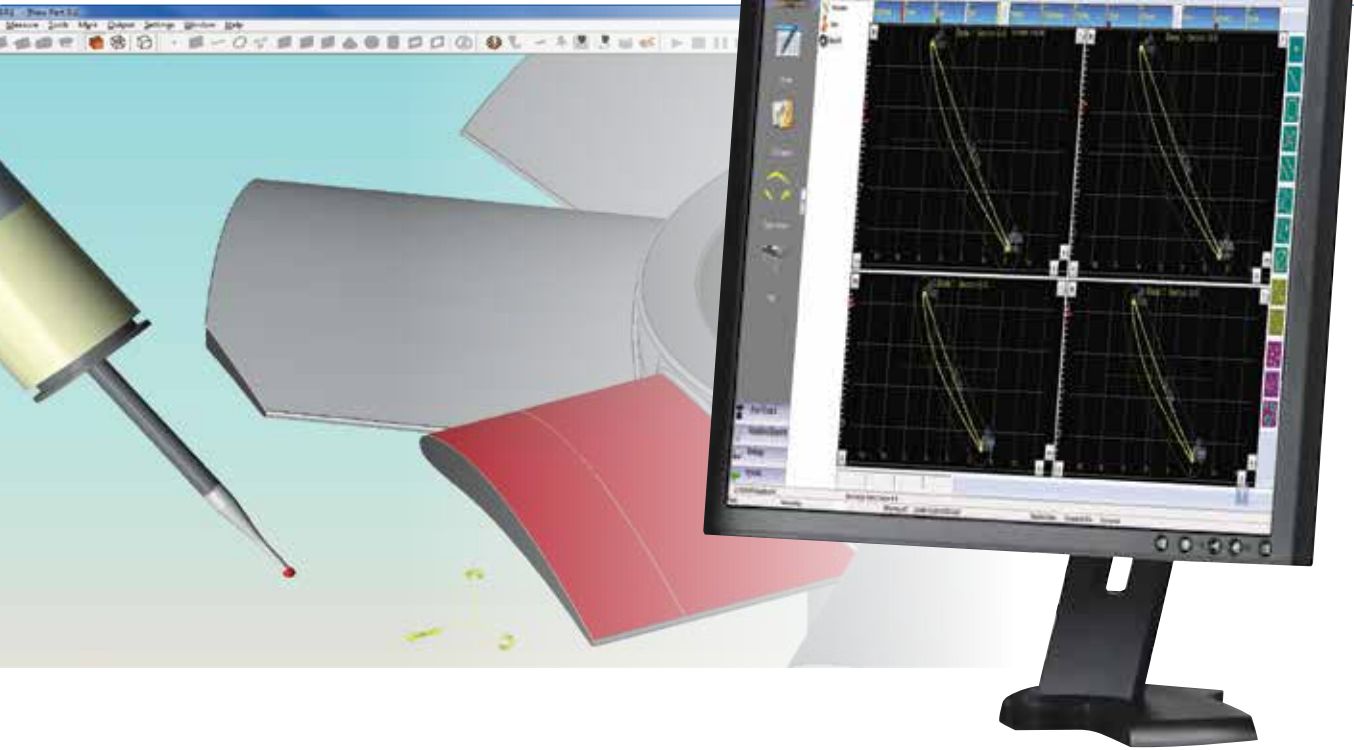Measure at express speed with Mitutoyo's premium aerofoil software package.

Coordinate Measuring Machines

Vision Measuring Systems

Form Measurement

Optical Measuring

Sensor Systems

Test Equipment
and Seismometers

Digital Scale and DRO Systems

Small Tool Instruments
and Data Management

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Rapid Aerofoil Inspection Software
MAFIS-Express

Blisks, Blades and Metrology

Engine manufacturers are increasingly turning to the blisk (bladed disk) concept where the blades are formed as an integral part of the rotor, and away from discrete blade designs for aero engine compressors and fans. The advantages are significant, such as elimination of the need to fit discrete blades to the rotor, reduction of the number of components and in the weight of the engine, and increased compression efficiency.

An added attraction is that manufacturing methods are still developing and improving, such as linear friction welding of blades to the fan rotor becoming viable as an alternative to more established methods such as 5-axis CNC-milling from the solid, investment casting and electro-chemical machining. This new method is especially suitable for blisks requiring large blades as it reduces the amount of material to be removed in the subsequent finish-machining operation.

As design and manufacturing capability has advanced, so the specification of blade aerofoil sections has evolved. The ability of CAD to help design complex shapes that could never have been considered before and of CNC machine tools to manufacture these new shapes has created many measurement challenges. Changes in design are, as with many products, made without consideration of the inspection capabilities available. As a result, the metrological world has had to develop new equipment, software and methodology to meet the needs of those manufacturing the new generation of aerofoil components. Foremost among these tools is the CNC Coordinate Measuring Machine (CMM) of ever-increasing speed and accuracy allied with powerful, easy-to-use measuring software such as MAFIS-Express.


Express-Speed Aerofoil Inspection on a CMM

MAFIS-Express, a dedicated companion module of Mitutoyo's software suite, is the fastest way to measure and analyse turbine and compressor blade form. Characterisation of individual blades, or complete blisks, is performed in just one measurement cycle with any number of scans on each blade, using simple routines and within a very short time. After the traverse path for the measuring probe is defined within MCOSMOS, the process of creating the inspection routine, performing the measurement and then evaluating the results can be up to 10 times faster than with typical aerofoil measurement software. Programming is intuitive and easy to use, with real-time evaluated results displayed graphically and numerically, with staggered-pitch blisks handled as easily as constant pitch designs.

Benefits

> Intuitive off-line programming on the CAD model.

> Optional template-based programming.

> Measurement routines generated by MAFIS-Express are executed in MCOSMOS.

> Customised inspection routines: measure all or just some dedicated intersections.

> Evaluation of data is carried out in parallel with measurement for maximum productivity.

> Clear numerical and graphical output of measurement results.

> Maximum accuracy is assured by a 3D probe-radius compensation function optimised for aerofoil surfaces.

> Supports standards set by the aerospace industry's leaders.

> Supports REVO* (5-axis scanning) as well as conventional scanning and touch-trigger probe systems.

* The time saved in the preparation of the measurement program is complemented by a shortening of the measuring cycle due to faster traverse movements in combination with a REVO 5-axis scanning probe.
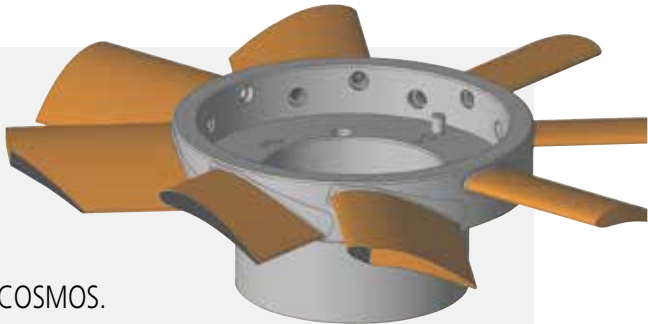
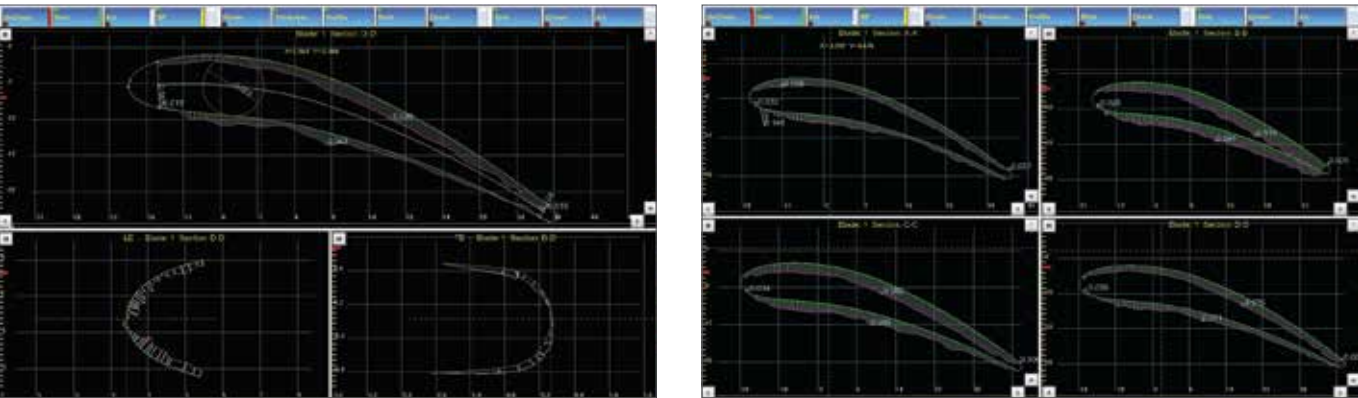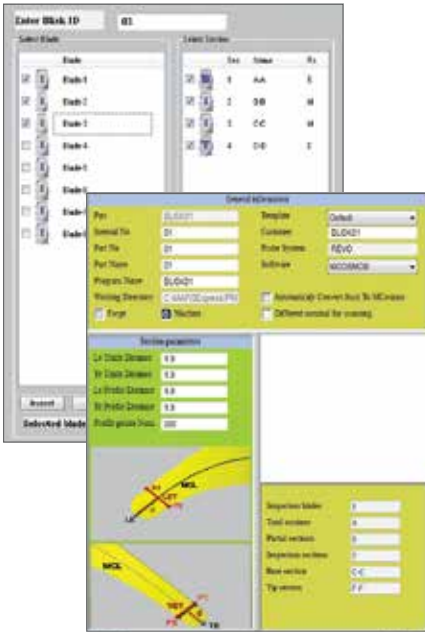### Highly Efficient Measurement Program Generation

Advanced data management means MAFIS-Express is highly effective at generating measurement programs. Illustrating this point is the fact that a single first set of data is sufficient for the software to generate a complete program. This functionality removes the need to create individual programs for each component and provides a consistent measurement strategy. This saves an enormous amount of time and effort when introducing new product to manufacture.

Numerical Evaluation

Each section plane is measured and the data evaluated according to the customer's specification, with detailed numerical results for each section of every blade displayed in the analysis window.

Graphical Evaluation

The power of graphics to show measurement results is immediately apparent. Deviations from the nominal blade can be displayed with a magnification factor set by the user, thus providing easy visualisation of any form error present.

Specifications

Manufacturers' design specification compliance for aerofoils and blisks	Rolls-Royce, Pratt & Whitney, PWC, GE, SNECMA, Honeywell, MTU, Turbomeca, Siemens
Functions	• Automatic measurement-program generation • Real time section-plane curve evaluation • Evaluated result display with graphs and tables • Measurement result storage
Supported probe systems	REVO, PH10M, SP25M and TP7 probes and probe heads
PC operating systems	Microsoft® Windows® 7