Mitutoyo

MGT
MITUTOYO GAUGING TECHNOLOGY

Mitutoyo Quality

MITUTOYO GAUGING TECHNOLOGY

Advanced applications of Mitutoyo quality tools and
CNC metrology equipment.

MITUTOYO GAUGING TECHNOLOGY

MUK0736

Mitutoyo

A CMM enclosure and loading system designed for handling large aero engine compressor blades in a production line situation. Clean air fed continuously from outside the factory to the enclosure creates a higher pressure inside than outside to stop dust from entering, which would otherwise contaminate the CMM and compromise measurement accuracy. The very large and heavy parts are loaded by the yellow gantry crane onto the sliding loading system pallet. The operator then manually pushes the pallet into the enclosure and onto the CMM bed where the part is measured.

MGT

About Mitutoyo Gauging Technology

A specialist division of Mitutoyo UK.

The MGT division of Mitutoyo is dedicated to providing our customers with the ability to have bespoke metrology systems schemed, designed, built, tested and delivered to solve a particular measurement need that is not completely met by off-the-shelf products. This service leverages the vast experience and equipment portfolio of the world's leading vertically integrated metrology vendor to provide a solution in the most timely and cost-effective way possible.

Standard Mitutoyo metrology products represent a standard of effectiveness, innovation and quality unmatched in the industry but these general-purpose products cannot meet every conceivable need. Often, an application requires an automatic handling system integrated with the measurement function to be viable and this is where MGT can apply the experience gathered from hundreds of similar projects for the benefit of your company.

MGT has an experienced, multi-disciplinary staff expert in the fields of dimensional metrology, mechanics, electronics, hydraulics, pneumatics, control technology and advanced software design ready and able to tackle practically any measurement application. The ability to combine this expertise with unmatched knowledge of the huge Mitutoyo product range gives MGT a powerful advantage when tasked with producing solutions that must deliver a level of performance that significantly increases profitability.

Established in 1998, MGT has helped hundreds of companies in the UK, and abroad, meet a measurement challenge without disrupting normal operations or placing an onerous burden on in-house engineering resources. In the case of specialist metrology applications, the make-or-buy decision is clear.

MGT

Special Purpose Machines

When an application demands something out of the ordinary.

1

General-purpose measuring equipment is mostly all that is ever needed for efficient inspection, especially if a CMM is available. However, there are applications where the restriction of factors such as batch size, budget, efficiency or footprint dictate that a bespoke solution is required. MGT's experience enables the design and development of special-purpose machines that outperform standard metrology products while incorporating one or more of these to accomplish the high accuracy measurement function itself.


2

5

3

4

1 An automated visual comparator photographs a good part and then compares this master image to photographs of production parts and records differences between them. 2 A multipoint comparator system using many pneumatically operated linear gauges to compare a production part with a master part in just 10 seconds. 3 This system measures the thickness of a part while under a constant 100kgf load and also maps the force/deflection characteristics of an internal spring mechanism. 4 This automatic surface finish testing system for automotive parts uses a Mitutoyo *SV-M3000-CNC Surftest* for making the measurements with part positioning handled by nine programmable axes. 5 This automated surface finish measuring machine uses two Mitutoyo *SJ-310 Surftests* to test up to 120 parts at a time. The parts are loaded into a magazine and the system picks the part up, moves it, measures it and then ejects it before repeating the cycle for the whole batch.

MGT

Turnkey Solutions

A full working solution straight out of the box.

1

So true, but this is where our service is so valuable as we provide complete packages that include the high performance metrology equipment needed for measurement, which is often a CMM but can be any product that can do the job, plus all the fixtures, loading systems and any MCOSMOS programming needed. Therefore every MGT system supplied, no matter how complex, is fully developed and tested to eliminate any teething problems and will work as required immediately after installation on your premises. Just turn the key and go!


2

3

5


4

1 Metal and plastic parts for a patella knee replacement orthopaedic joint are measured using a high-speed Mitutoyo *Kogame* CMM to achieve the desired cycle time. A full batch of parts is loaded at one time using a dedicated fixture pallet for each different type of part. 2 One of the fixtures from (1) which is stored in the bench next to the machine. 3 A fixture from a loading system for a cylinder head and camshafts designed to make loading onto the CMM easy and ergonomic, thereby reducing overall cycle time. 4 An orthopaedic hip joint being measured using a high-speed Mitutoyo *Kogame* CMM to achieve the desired cycle time. A rotary table indexes the parts into the measurement position in turn. 5 An in-line system using a conveyor to feed a high-speed Mitutoyo *Mach-V CMM*. The parts are picked from the conveyor automatically and loaded onto the CMM.

MGT

Coordinate Measuring Machine Fixtures

Fixturing solutions when probing systems are not quite enough.

1

In the case of the CMM, the extensive selection of probing systems available enable this general-purpose machine to tackle almost any measurement task without further assistance. However, there are situations that benefit from the use of custom fixtures to position and hold components to the best advantage for measurement.

A common example is where multiple components are measured within one cycle and a fixture that enables the operator to quickly load and clamp them all at once reduces fatigue and improves productivity.

MGT has designed and supplied so many CMM fixtures that it is practically certain that this experience can help provide you with an optimum fixturing solution in the most timely and cost-effective manner possible.

2

3

4

5

6

1 A CMM fixture for an orthopaedic shoulder joint designed to enable batches of 40 parts to be run automatically while providing clearance all around the fixture for quick and easy loading and unloading. 2 Two machine tools and a CMM are sequentially loaded and unloaded by a robot that also controls a pneumatically operated fixture to clamp the part. 3 This fixture was designed to enable measurement of punch tools in batches of 12 at a time. 4 In this application the operator needs to rapidly load and unload the part but also have a way of quickly reconfiguring the fixture. The top of the fixture is quickly and easily swapped over and measurement performed by a high-speed Mitutoyo *Kogame* CMM to achieve the desired cycle time. 5 A fixture mounted on a pneumatic pallet and delivered by rotary table for handling a whole family of gas turbine blades, adapting quickly to their individual shapes and sizes. 6 A CMM fixture enabling an orthopaedic knee replacement joint to be measured by a Mitutoyo *MiStar* CMM in batches of 12 at a time.

MGT

Coordinate Measuring Machine Loading Systems

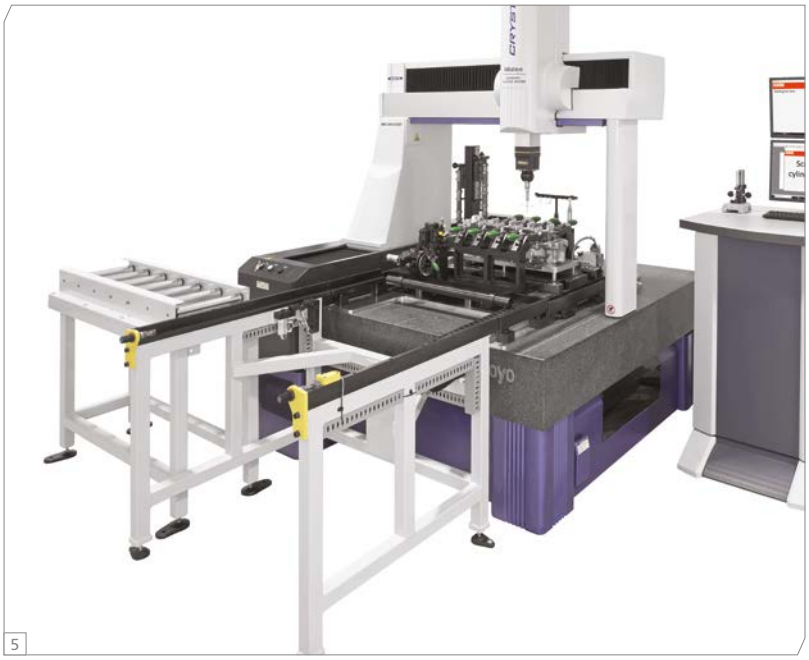
Simplifies loading and unloading the CMM.

Where the size, weight or sheer number of components demands a custom loading system, the performance of a highly efficient measuring machine will be hobbled if that system is non-optimal. Loading systems from MGT are thoroughly researched, designed and developed to provide maximum efficiency and reliability, and there is no limit to the type of solution considered at the scheming stage. However, the number of similar situations seen by the MGT experts means they are able to arrive at the best solution, get the chosen system built and operating as fast as possible.

1


2


3


5

4

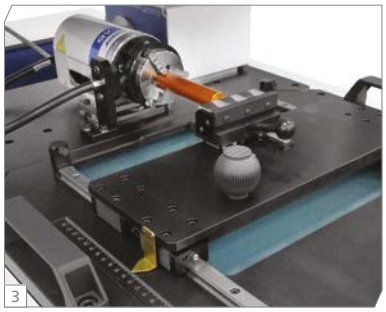
1 In this system, very large and heavy parts are loaded by gantry crane onto a sliding loading pallet. The operator then manually pushes the pallet into the CMM enclosure and onto the CMM bed where the part is measured. 2 A pallet loading system and trolleys are used to transport parts from the shop floor to the measurement room. 3 This loading system uses two fixture pallet stations feeding an enclosed CMM. The large and heavy parts are loaded onto the pallets by crane and then manually pushed onto the CMM bed. 4 A loading system for large aero engine fan blades. 5 A loading system for a cylinder head and camshafts designed to make loading onto the CMM easy and ergonomic, thereby reducing overall cycle time.

MGT

Vision Measuring Machine Fixtures

Adding versatility to a vision measuring machine.

Although VMMs are usually regarded as 2D measuring machines, with the addition of carefully designed fixturing they can be extremely useful for inspecting 3D products. MGT has designed and built many VMM fixtures to enable measurement of roundform components that would otherwise require a different kind of measuring machine to be available.



1 This fixture enables an orthopaedic knee replacement joint to be measured by a Mitutoyo *QV Active 404* in batches of 14 at a time. The operator loads the full batch of parts and presses *'GO'*. 2 This fixture orientates an aerospace actuator part and enables simple measurement on the shop floor. 3 A fixture for a Mitutoyo *QV Active 404* used for measuring hollow cutting tools. A standard rotary indexer holds the tool in a 3-jaw chuck for measuring the external profile and end face. Prisms are used to see the end face with backlight created using a light source shining through the tool via an optic fibre and mirror. 4 This fixture holds a part between centres square to the camera within 0,002mm to ensure highly accurate measurement. 5 Glass bottles are held in this fixture for programmed measurement in batches of 70.

MGT

Surftest, Roundtest and Contracer Fixtures

The scope is limitless.


1

The scope for increasing the usefulness of these types of measuring machine is practically limitless. MGT makes a speciality of designing and building highly specialized fixtures that enhance versatility by incorporating standard accessories such as turntables, indexing heads, XY tables, centre supports and calibration artefacts.


2


3

6

4

5

1 A fixture designed to enable a Mitutoyo *Roundtest* machine to measure the circularity of main and big-end bearing journals on an automotive engine crankshaft at one setting. 2 This fixture comprises a stand and XY stage to enable a Mitutoyo *SV-C3200 Surftest* to measure the surface finish at several locations on automotive engine cylinder heads. The XY stage uses Mitutoyo linear scales and a KA counter. The stand is purposely made very heavy to dampen any floor-borne vibration that would otherwise affect measurement accuracy. 3 This manually operated fixture system enables a Mitutoyo *SV-C3200 Surftest* to measure surface finish on automotive engine cylinder heads, blocks and crankshafts. It has two rotary axes and uses four different sub-fixtures that locate on the main fixture to accommodate each type of part. 4 This system uses two Mitutoyo *SJ-410 Surftests* and one *SJ-310 Surftest* to measure surface finish on automotive engine crankshafts. The part is held in a fixture and the operator is instructed by guided-sequence software to move the crankshaft into different measurement positions. 5 In this fixture the detector and drive unit of a Mitutoyo *SJ-210 Surftest* are mounted into a V-block so that the cylindrical part being tested for surface finish can be quickly and easily measured without any setting-up delay. 6 A Mitutoyo *Contracer* fixture that mechanically aligns and securely holds a part to enable sequential measurement of a series of small bores.

MGT

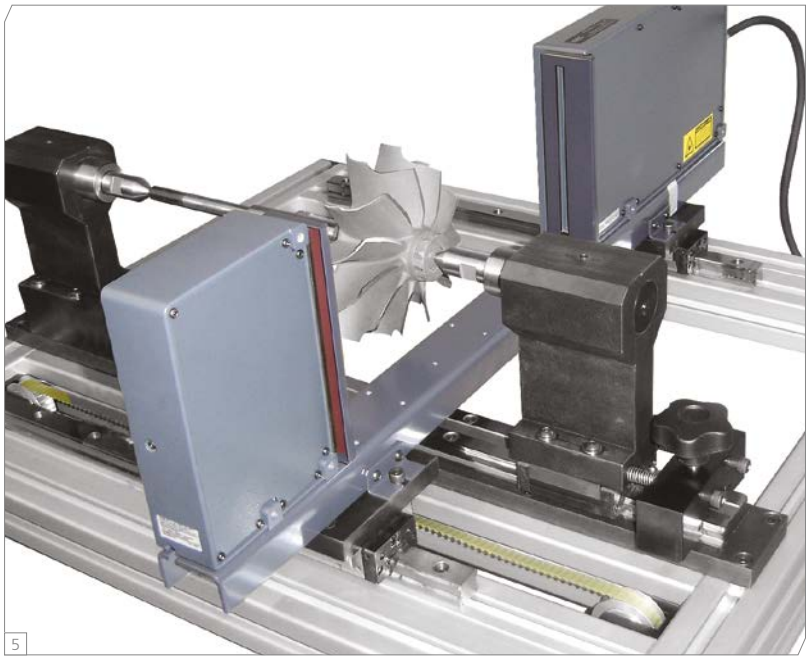
Laser Scan Micrometer Systems

Positioning is key in diameter measurement on a laser system.

1

MGT has extensive experience of maximizing the performance of the laser micrometer with custom fixturing that takes advantage of the exceptional performance of the instrument in measuring diameters on roundform components. It is vital to ensure that the fixture centres the feature of interest repeatably within the measuring region for maximum accuracy, especially if this involves translation and/or rotation during the measurement cycle.

2



5

3

4

1 Measuring various diameters on a hydraulic piston using a v-block to hold and position the part. 2 An automatic system moves and rotates bottle tops so the laser can measure the average of each of two critical diameters for output to Mitutoyo's *Measurlink* QA software. 3 Measuring diameters on a red-hot steel part requires the laser heads to be some distance away from the part to avoid destruction. 4 A very accurate fixture holds and rotates a 3-flute milling cutter for diameter and runout measurement. 5 A simple fixture holds a turbocharger impeller shaft between centres while the operator turns a handle to traverse the laser over the measured section.

MGT

Bench Gauges

Extending the reach of basic instrumentation.

The performance of bench gauging instruments can be significantly enhanced by carefully thought out fixture design to enable application to a wide range of measurement types. MGT has designed and delivered countless examples of fixtures that enable these basic instruments to perform measurement tasks well beyond the traditional boundaries of use.

1

2


3

6

4

5

1 Gauging the depth of a critical hole in an aerospace part using an analogue/digital indicator with GO/NO-GO judgement capability. 2 A multipoint comparator gauge using three Digimatic indicators to show variation between a master part and production parts at critical points. 3 Gauging the internal groove diameter of plastic waste pipe using specially shaped anvils connected to an analogue/digital indicator with GO/NO-GO judgement capability. 4 Gauging the wall thickness of rings by using a Digimatic indicator actuated using the standard lifting lever. 5 A loupe connected to a Digimatic scale is used to detect each edge of a sheet of tinfoil and so measure the sheet width. 6 Gauging the internal depth of orthopaedic hip joint castings with a linear gauge, and associated display, to check if sufficient material is available for a machining operation.

MGT

Hard Gauging

MGT delivers gauging as well as measurement solutions.

1

Sometimes form and fit can most economically be assessed by simple hard gauges that test the conformance of a component feature to tolerance specification, and MGT can rapidly manufacture these custom items to your exact specification. No matter the shape, MGT has the expertise to provide a cost-effective gauging solution.


2

5


3

4

1 Pin gauges are widely used to gauge small holes and boxed sets are available in both metric and imperial sizes and also in different increments between sizes 2 These setting masters enable quick setup for Laser Scan Micrometers in an automatic measuring machine. 3 A set of 3-points are manufactured to all have an identical height and enable flatness and parallelism measurement using first principle measurement. 4 Thread ring gauges are commonly used as the method to inspect external threads, quickly and easily. 5 Plug gauges both plain and threaded and also special designs with depth steps and multiple diameters are used to quickly gauge internal diameters on the shop floor.

MGT

Hand Tools

Cost-effective measurement from basic instruments.

The utility of basic handheld measuring tools can be extended by quite simple add-on devices, which results in a powerful route to cost-effective measurement. MGT can advise when an application is amenable to such an approach and design and deliver the most appropriate solution.

1


2


5


3


4

1 A tool to measure the depth of rivet heads below the surface of aeroplane wings to check that they are under flush. 2 These special long jaws are fitted to a carbon-fibre Mitutoyo Digimatic caliper for measuring the diameter of very large roll tooling. 3 The breakout diameter of a countersunk hole is measured using this special anvil fitted to a Mitutoyo Digimatic micrometer. 4 This tool is used is designed to measure the external diameter of a large component while it is still on the lathe by using a hinged section to enable access over the outboard centre. The tool is zeroed at the required size using gauge blocks and the measurement is made by rocking between the stops to find the maximum reading on the Mitutoyo Digimatic indicator. 5 A special caliper to measure the material thickness of cast automobile cylinder blocks.

MGT

Standard Products

A selection from MGT's portfolio.

CMM Enclosure

Protect your investment from contamination, improve reliability of measurements and reduce maintenance costs. Mitutoyo's Inspection Enclosures are designed to help keep your CMMs and instruments free of airborne contamination.

Every enclosure is an assembly of PVC and polycarbonate panels supported on a structural extruded-aluminium framework, a construction that, incidentally, provides another level of operator safety and security for valuable equipment.

- *Standard fans create positive pressure inside the enclosure to exclude airborne contaminants, increase reliability of measurements and reduce CMM maintenance costs.*
- *Air-conditioning option is available to add temperature control to the clean-air environment.*
- *Enclosed volume provides greatly improved working conditions for intricate inspection operations.*
- *Double doors fold back enabling easy access for part loading.*
- *Modular Design with removable panels enables easy construction around existing machines, straightforward relocation (if required) and assists in annual CMM servicing.*
- *Enclosures are robustly built to withstand the demands of a busy shopfloor manufacturing facility.*
- *Transparent, polycarbonate, easy-clean panels pass sufficient light for normal use and are shatterproof,tough and durable.*
- *Clean, functional design enhances the appearance of your CMMs.*

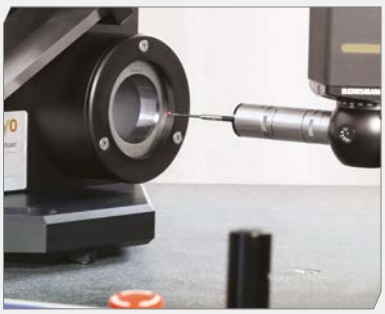
CMM Verification Artefact

Quality control depends on constantly maintaining the maximum accuracy performance of dimensional measuring equipment and these days that increasingly means your CMM resource. This requires regular testing of each machine between routine reverification by the manufacturer and Mitutoyo's Verification Artefact enables you to do this quickly and economically, as often as you want, with a permanent record of results that clearly shows accuracy trends.

Consisting of highly accurate length and form artefacts on a self-contained fixture the Verification Artefact provides all the features needed to test probe and CMM performance.

The supporting software package provides dedicated testing routines with optional control chart analysis and alert functionality, enabling immediate remedial action to be taken if necessary.

- *Provides early warning of any slow, systematic accuracy drift.*
- *Provides an immediate check after any incident that may have affected the accuracy of a CMM.*
- *Enables you to demonstrate to customers your commitment to the highest standard of quality control.*
- *Highly stable artefacts with a UKAS calibration provide unquestioned dimensional integrity.*
- *Designed for horizontal or vertical orientation on the measuring table at any angle within the XY plane.*



MGT

Standard Products

A selection from MGT's portfolio.

CMM Monitor Stand

Simple ideas can sometimes make all the difference on the shop floor. MGT's side-mounted monitor stand increases productivity by making the operator's life easier. No more awkward twisting needed to take in the progress of a measuring cycle or calibration routine on a screen that normally sits on a table beside a CMM.

The screen is exactly where it can be viewed at the same time as the probe and workpiece, just off to the side of the measuring surface.

The stand also helps make the most of valuable floor space. Eliminating the need for a PC/monitor table can free up almost as much floor area as the CMM itself, opening up opportunities for installing more equipment in the same space or even reducing the size of the inspection area.

- *Positions the monitor as close as possible to the workspace for maximum operator convenience.*
- *Fully adjustable arm enables optimum orientation to suit operator preference and helps eliminate distracting screen reflections.*
- *Side-mounting minimises a CMM's footprint to save valuable installation space.*
- *Eliminates the need for a dedicated PC/monitor desk in clean environments.*
- *Cabling is neatly contained within the arm and led around the rear of the CMM for appearance and safety.*
- *Optimised for touchscreen monitors but a version is available to mount a standard monitor together with keyboard and mouse.*

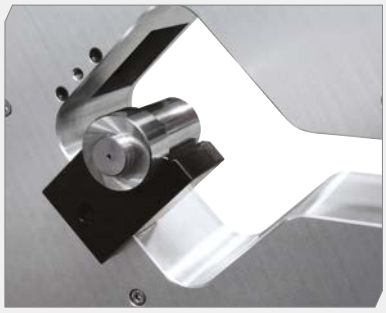
XY Laser Micrometer

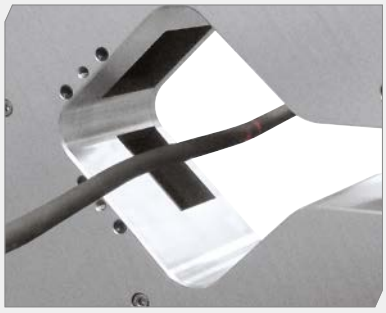
Mitutoyo's Dual Axis Laser Micrometer is a scanning-laser based measurement system designed to measure and feed back to control and recording equipment the external diameter of a wide variety of product including, but not limited to, extruded forms such as electrical wire, plastic and glass filaments, tubing, and similar. The crossed-axis lasers used enable position within the target area, as well as size, to be accurately measured.

The extremely fast, non-contact laser technology employed makes it possible to measure cold, hot, fragile or soft product that may be stationary or moving, even vibrating, where conventional instruments cannot be used and may well risk damaging the measured item.

As the system is based on Mitutoyo's well-established and extensive LSM-5xx Series Laser Scan Micrometer and the LSM-6200 Multi-function Display Unit*, a wide choice of measurement capacity, accuracy and resolution is available to suit practically any application.*

* See the Laser Scan Micrometer brochure for the choice of models and their detailed specifications, or call the Mitutoyo Sales Desk for advice.





- *Non-contact measurement for online or offline checking of outside diameter, position, ovality.*
- *Choice of dual- or single-axis operation allows flexibility and high performance.*
- *Measurement insensitivity to product positioning or movement guarantees reliability.*
- *Process and line-control applications include continuous fibre drawing, loose tubing, glass pre-forming, glass tubes/bars.*
- *Automatic control potential saves labour costs.*
- *Aids continuous improvement in product quality and reduction of scrap.*
- *Dedicated calibration master and v-block are available (optional items).*

MGT

Standard Products

A selection from MGT's portfolio.

Surfstand

MGT has developed a radically new solution for measuring surface roughness safely and efficiently on large and heavy, or delicate, components in the form of a manually operated stand carrying Mitutoyo's well-proven SJ-400 Series Surftest detector head.

Mounted on the same large surface plate as the workpiece to be inspected, this substantially built stand can be manoeuvred and adjusted to position the detector on practically any surface of the workpiece desired.

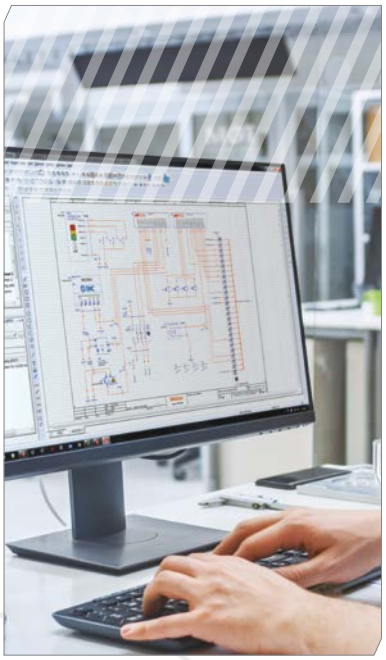
The SJ-400 Series detector is carried on an adjustable-length tube mounted on an extendable arm carried by a vertically travelling carriage on the column, thus enabling positioning of the detector anywhere in the vertical plane within reach.

- *Provides stability, repeatability and versatility in the surface roughness testing of challenging components.*
- *Enables practically any component surface to be accessed for accurate and repeatable measurement.*
- *Delivers significant productivity improvements by simplifying and speeding up component handling.*
- *Eliminates the potentially unsafe, improvised methods commonly used in industry.*
- *May be adapted to carry other types of probe that require safe, accurate and repeatable placement relative to a machined surface - such as, for example, a linear probe for measuring radial runout of rotating components.*
- *Grip on base provides easy handling.*

MGT

Services

Additional services offered by MGT.



Mechanical design

Our experts have enormous experience in mechanical design and can advise on the most cost-effective construction to perform to your design specification.

Electrical design

Safety, economy and longevity are key factors in electrical work, and our team is well versed in helping customers achieve these goals.

System design

MGT can help guide your staff through the maze of possibilities in system design and implement an optimum design if required.

Software design

Product performance and capability are factors inextricably linked with software design today. MGT has the expertise in-house to take on this critical function of your application and ensure maximum results.

Electronic design

Optimisation of electronic hardware is vital, and MGT can take on this task if required and ensure a cost-effective solution to specification.

Pneumatic design

Successful pneumatic design involves careful attention to choice of cylinders, pressures, masses, and leverage arrangement, factors that MGT has extensive experience in optimizing for any particular system.

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

Whatever the challenge, 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.

MGT
MITUTOYO GAUGING TECHNOLOGY

Mitutoyo Gauging Technology
Unit 6, Banner Park, Wickmans Drive
Coventry, West Midlands CV4 9XA
T +44 (0)2476 426300
mgt@mitutoyo.co.uk
www.mitutoyo-gauging-technology.co.uk

Mitutoyo

Mitutoyo (UK) Ltd
West Point Business Park, Joule Road
Andover, Hampshire SP10 3UX
T +44 (0)1264 353123
F +44 (0)1264 354883
enquiries@mitutoyo.co.uk
www.mitutoyo.co.uk