

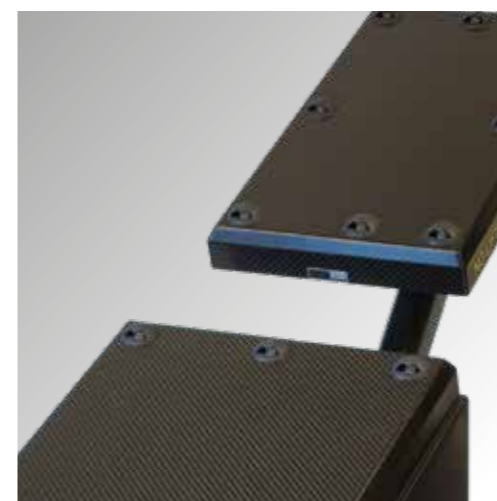


PORTABLE COORDINATE MEASUREMENT SYSTEMS

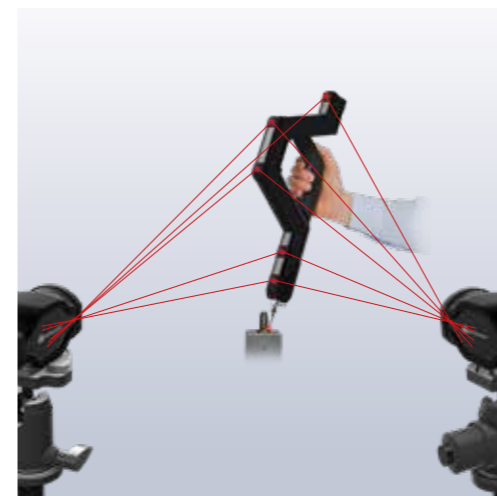
PRODUCT BROCHURE

VERSION 01.8





All Metronor technology is built on in-house research and development within electro-optics and photogrammetry – the science of precisely determining the location of items based on images.



TECHNOLOGY

PORTABLE PRECISION

METRONOR SYSTEMS MEASURE WITH LIGHT

- One or more cameras observe a known pattern of light sources – on the handheld probe or scanner – and determine its' position and orientation.
- Simple – in principle and in use. The very complex models and mathematics needed to achieve accuracy are handled by the computer – completely transparent to the user

METRONOR SYSTEMS COVER IT ALL

- The cameras only need to see the light sources – the probe tip or the scan area can be hidden from view, making precise deep probing possible – and scanning real-life objects simple.
- For full surface measurement, choose a Metronor scanner – and fill in with manually probed points in the hard-to-scan areas.
- Probe tips of different lengths and shapes can be assembled by the user, making measurement of just about any object easy.

ANYTHING FROM A PRECISION FITTING TO A FULL WIND TURBINE BLADE

- Metronor systems can measure just about any industrial object – in-situ, in-process.
- Typical measurement volumes from a cubic meter to the size of a heavy truck.

QUICK TO LEARN, EFFICIENT IN USE - FAST RETURN-ON-INVESTMENT

- Simple and intuitive operation with a lightweight hand-held probe or scanner, and wizard-like on-screen guidance.
- Rapid camera setup with no warm-up required.
- Market-leading analysis software included and also compatible with most other analysis software.

MINIMAL LIFE-CYCLE COSTS WITH STABLE ACCURACY OVER TIME

- The camera is completely solid state, and the probe is a carbon fiber structure – designed and made to perform well on harsh factory floors, year after year.
- The systems' accuracy is stable over time, and can be verified on site at any time, with no scheduled recalibration required.

A COMPLETE RANGE OF SYSTEMS ON A COMMON TECHNOLOGY BASIS

LIGHT-WEIGHT PROBE

1. Embedded computer for exposure & intensity control and system self-check
2. Infra-red light emitting diodes active targets
3. Operating button for measurement and sampling control
4. Red and green LEDs give instant operator feedback even when far from the computer
5. WiFi link for communication with the system computer
6. Runs on rechargeable, Li-Ion battery. Each charge lasts a full shift, and a second battery is included
7. Advanced carbon-composite shell ensures temperature stability and extreme rigidity and strength while keeping weight down for enhanced operator comfort
8. Robust rubber bumpers help probe withstand rough handling
9. Modular design enables easy repair in case of damage

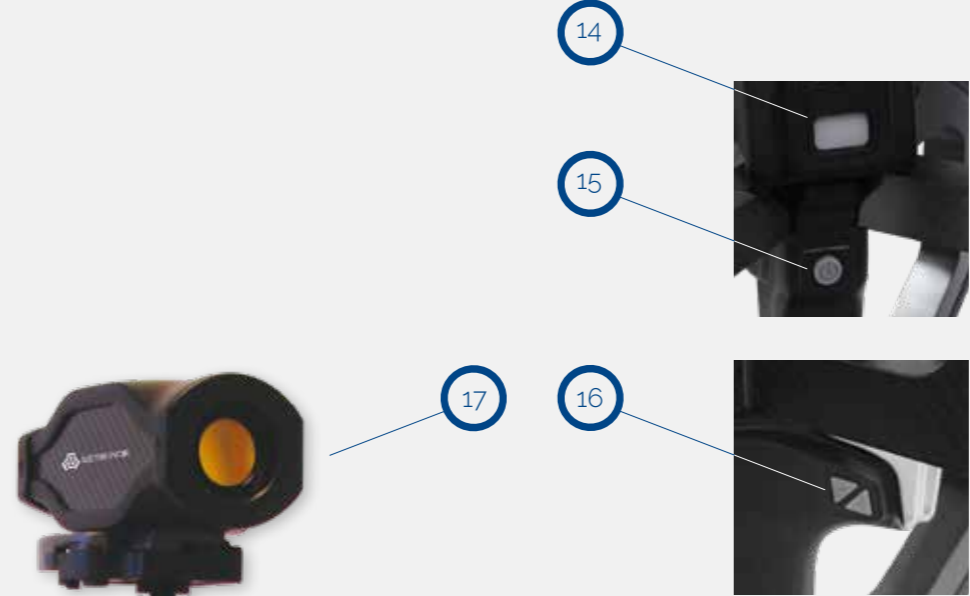


**Note:
Number of probes as well as type and dimensions included vary depending on system type*



COMPLETE & COMPACT SYSTEMS

10. High precision built in chuck enables quick probe change without the need for re-calibration
11. User-configurable set of straight and angled probes*
12. Multi-line laser projector
13. High Resolution scanner cameras
14. Status indicator
15. On/off operating button for scanning
16. Interface zoom button
17. Completely solid-state digital camera with precision optics
18. Compact and lightweight head providing a flexible and stable mounting to the camera
19. Carbon fiber lightweight temperature-stable tripod.
20. Roll away case holds entire system for easy and safe transport of the system**



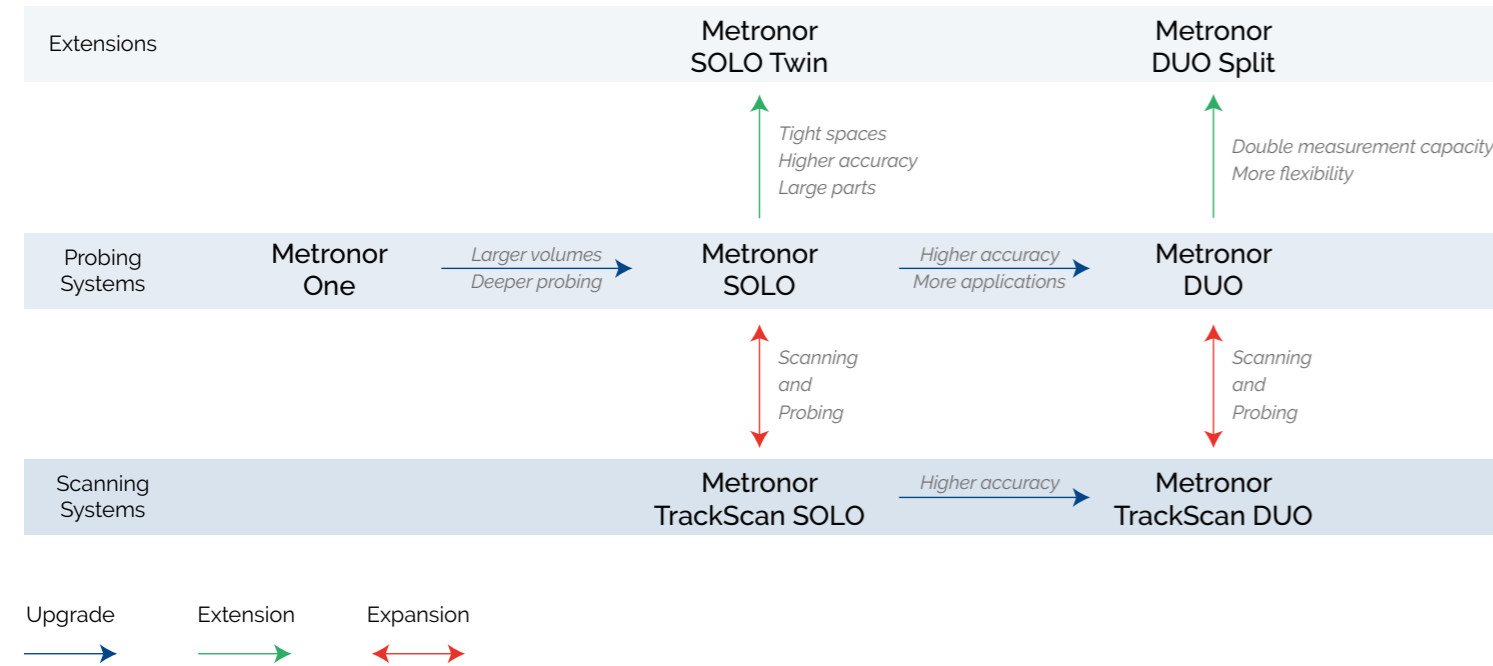
***Note:
Case type and layout vary depending on system type*

METRONOR SYSTEMS

METRONOR PORTABLE SOLUTIONS

Metronor probing and scanning systems offer more flexibility and adaptability than any other portable system. Reconfigure or expand at any time as necessary, securing your initial investment and overcoming new challenges – different measurement volumes, accuracy requirements, probing abilities or throughput.

Go from probing to scanning whilst staying truly portable, adding surface reverse engineering to an already broad measurement spectrum. Or add scanning to your probing solution, giving it maximum versatility.



ADD SCANNING CAPABILITY

TO YOUR PROBING SYSTEM - ANYTIME

Scanning capability can easily be added to any Metronor probing system. The scanner works together with the system camera or cameras in a similar way to the Lightpen, but returns several hundred thousand points for each measurement. This makes it a suitable tool for tasks such as part inspection, capturing the precise shape of a clay model or capturing the as-built geometry of a prototype.

If there are recessed areas that are difficult to scan, they can be filled in with measurements using the Lightpen, making it the most flexible metrology solution in the market.

MAIN BENEFITS:

- Add scanning capability when needed – from the beginning or later on
- Switch between scanning and probing combining data as needed
- Use deep probing to fill-in areas that cannot be scanned
- Optimize investment and maximize flexibility

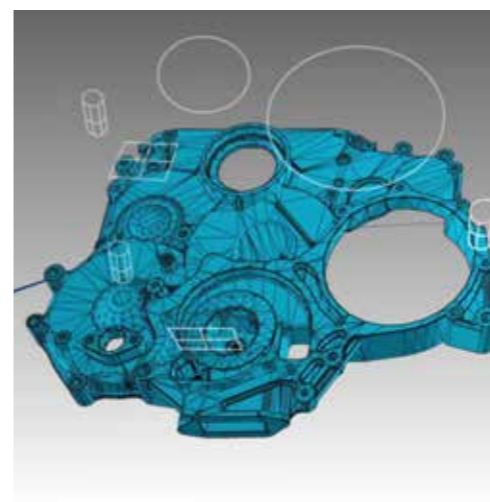


UPGRADES

YOUR INVESTMENT ADAPTS TO NEW REQUIREMENTS

As your company and the market grow, so do your metrology equipment needs. Experience the freedom of extending and upgrading your existing solution – without making a full new investment. Simply build on what you already have.

Upgrade your existing system and take advantage of the training that your employees already have, making the transition to a broader solution smooth and seamlessly.



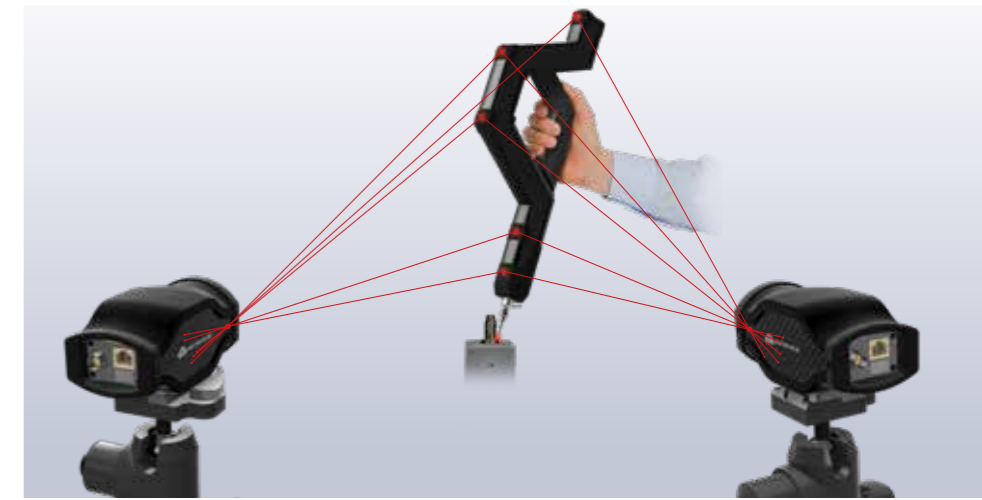
PROBING SYSTEMS

METRONOR PORTABLE CMMs

The products in the Metronor portfolio are divided into three different family groups: Metronor One, Metronor SOLO and Metronor DUO. Start at the point that fits your company best and add extensions as the need arises.

COMMON FEATURES:

- Cost-efficient to buy, easy to learn, efficient in use, simple to re-configure – excellent ROI
- Electro-optical principle without mechanical links ensures life-long accuracy - and easy and convenient operation
- Complete measurement solutions including probes, computer, software and transportation case



METRONOR ONE

Metronor One is the ideal portable measurement system for objects of limited size. The lightweight handheld probe works through optics and avoids any mechanical linkages. It is therefore convenient and flexible to operate also for long periods of time, and is reliable and accurate over time.

MAIN BENEFITS:

- True usable measurement volume of 15m³
- Cost-efficient and fast to learn
- Handheld probe without linkages - convenient and reliable



METRONOR SOLO

Capable of measuring 15 meter sized objects (more with optional extras), SOLO is a flexible and cost-efficient large-volume solution with a wide variety of applications. The handheld probe is easy to use and measures features hidden from view by 450mm plus the probe length.

MAIN BENEFITS:

- Large volume capability
- Extremely easy to learn, very fast to set-up with no warm-up time
- Probing of any detail, including hidden and deeply recessed details
- Excellent for planarity, parallelism, flatness and aligning of shafts



METRONOR DUO

Well established inside major industries such as automotive, aerospace and machining, DUO delivers the highest level of portable CMM accuracy.

By using two cameras, not only is very high accuracy achieved, it also becomes possible to track multiple targets relative to each other, or determining the deformation of structures. DUO systems can also be operated as a SOLO by simply unplugging one of the cameras.

MAIN BENEFITS:

- Highest accuracy
- Widest range of applications, including SwitchMode, deformation monitoring, tracking of objects in all 6 degrees of freedom, and process repeatability testing.

PROBING SYSTEMS EXTENSIONS

EXTEND YOUR SYSTEM CAPABILITIES

Extend your Metronor system within the same product line/family. System extensions bring you added capability, be it a larger field of view or the ability to multi-task with a metrology system. The component-based approach makes it possible to grow your technology instead of re-investing into completely new solutions.

METRONOR SOLO TWIN

This SOLO extension can be described as a system that uses two cameras to double the field-of-view. This enables the cameras to be placed closer to the measurement object, thereby increasing accuracy, or making it possible to measure in one-setup where several setups would otherwise be needed.

MAIN BENEFITS:

- Full 70° field-of-view
- Efficient in tight and confined spaces
- High accuracy on large objects



METRONOR DUO SPLIT

A DUO extension, Metronor DUO Split is the most flexible measurement solution in the market. It essentially consists of a high-accuracy DUO system that can be split into two independent SOLO systems for when less challenging or tight-tolerance inspection is required.

MAIN BENEFITS:

- Most flexible system - use either two independent SOLOs or one DUO
- Best return on investment
- Twice the capacity - or the highest accuracy



SCANNING SYSTEMS

A COMPLETE, PORTABLE 3D METROLOGY SOLUTION

TrackScan can capture millions of high-precision surface points in a few seconds.

The system camera or cameras track the active targets on the handheld scanner, continuously determining the position and orientation of the scanner. This way, all scan data is automatically captured in the same coordinate system, with no need for stickers or other preparation of the object to be measured.

TrackScan is easy to learn and efficient to use, and covers a wide range of measurement volumes. Follow the links to see the [TrackScan brochure](#) and the [TrackScan datasheet](#).



PRODUCT FEATURES:

- No stickers – just aim and scan
- Handheld, lightweight
- Scans fragile objects and surfaces
- Large measurement volume
- Easy to use, minimal training cost
- High accuracy DUO configuration
- Robust design for shop-floor use
- Portable CMM functionality

TRACKSCAN SOLO

Immediate scanning – simply aim the navigation camera at the object and start capturing data. No stickers, no preparation, just results in minimal time. That's TrackScan SOLO.

Optimized for relatively small geometries or large object with medium accuracy requirements, TrackScan SOLO has a tracker unit that secures full freedom of scanner orientation and is therefore ideal for more complex geometries, as it avoids having to reposition the navigation camera.

TrackScan SOLO delivers sticker-free scan data – also on fragile objects and sensitive surfaces.

TRACKSCAN DUO

The ultimate solution combining the highest accuracy with full freedom of scanner orientation, TrackScan DUO is the top-of-the line solution for the most challenging scanning tasks – large or small objects, complex or simple geometries, TrackScan DUO secures high-accuracy results.

Scanning is quick and easy, and results are very precise – benefitting from Metronor's renowned measurement accuracy and ensuring the best results that can be achieved by a handheld system.

MAIN BENEFITS:

- Actual non-contact scanning without stickers or surface preparation
- Maintenance-free and no scheduled re-calibration
- Large scan volumes – true measurement volume without arm impingement
- No accuracy deterioration over time due to wear

TRACKSCAN UPGRADES

EXTEND YOUR SCANNING SYSTEM CAPABILITIES

It is possible to maximize your return of investment by having your scanning system double as a full-range, portable precision CMM. Expand your current system to include large volume probing capabilities to get the best of two worlds in one solution. Switch back and forth between technologies to adapt to all your needs, allowing you to react to any situation.

FULL PROBING ADD-ON FOR TRACKSCAN SOLO

Add probing to your scanner. Capable of measuring 20 meter sized objects and beyond, SOLO is a flexible and cost-efficient solution for a wide variety of applications.

MAIN BENEFITS:

- Large volume capability
- Probe any detail, from hidden and recessed features to holes, cones and cylinders
- Excellent for part alignment



FULL PROBING ADD-ON FOR TRACKSCAN DUO

Adding probing to TrackScan DUO offers the highest level of accuracy that Metronor provides.

MAIN BENEFITS:

- Highest accuracy
- Widest range of applications,
- Unique capabilities like SwitchMode, tracking of objects in all 6 degrees of freedom and process repeatability testing



OPTIONS

METRONOR PORTABLE CMMs

All Metronor systems are complete, turn-key solutions. For special applications, additional options are available. Some of these include:



LED APPLICATION KIT (FOR DUO)

Metronor DUO is unique in measuring many points simultaneously. The LED application kit enables a wide range of unique benefits such as vibration stability control, float mode, repeatability studies, deformation and alignment.



LIGHTPENS

Lightpens are available in various sizes, thereby allowing optimal operator ease of use, maximum distances or probing deep and hidden features. The Lightpens are made from stable carbon fiber and have a quick-release chuck for attachment of probes.



VIBRATION STABILITY CONTROL BAR

The Vibration stability control bar is designed for shop-floor use and includes unique features that cancel environmental changes such as temperature swings and vibration.



PUNCH PROBE

Point stylus with a built-in light-weight automatic center punch. Enables marking features on objects based on measurement data or CAD comparison – once the required point has been found, push the probe against object to leave a punch mark.



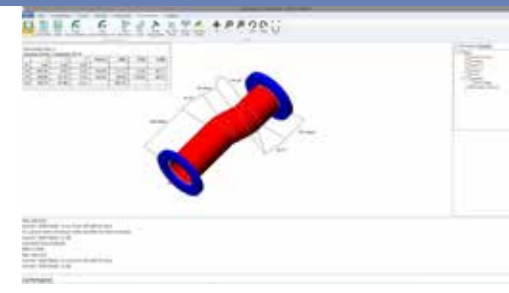
CAMERA BATTERY OPTION

The battery option allows any Metronor probing system to operate independent of wall power. It can either be connected to a Metronor One camera, or to a Metronor SOLO or Metronor DUO interface unit – both cable options as well as a wall charger are included.

The battery life is approximately 10 hours per charge if connected to a Metronor One or SOLO, 5 hours for a Metronor DUO.

SOFTWARE SOLUTIONS

Metronor systems run under Windows 10 and are compatible with a wide range of analysis software solutions. Whether you need special software for tube measurement or simply need special software to adhere to company guidelines, Metronor will be happy to quote a suitable configuration.



SHIPYARD SOLUTION

The Shipyard Solution was designed for measuring in confined spaces with limited accessibility. Our special packaging makes working with Metronor products safe and simple - the transport case can be carried as a backpack and the integrated setup allows the user to start measuring in minutes.

MAIN BENEFITS:

- Portability
- Measure flanges
- Measure holders
- Create pipes on-the-fly
- Data adjustment

With the Metronor systems capability to measure flanges and pipes quick and easily, we have created the perfect solution for workers in the shipbuilding business. The CAD files that are generated and the automatically-built measurement reports make the flow of information easier than ever – data can be seamlessly transferred to the workshops.

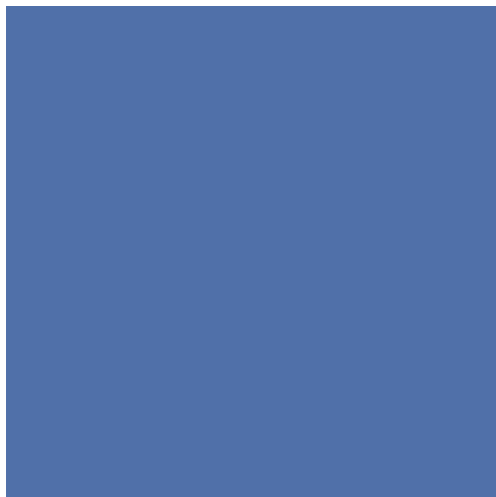
With as few as 12 point measurements, create a reproduction of any circle flange in under one minute, or measure non-standard flanges without any complication. Clamps that hold, for example, hydraulic pipes, can also be measured efficiently, and a 3D representation of your pipe holders can be created to construct a perfectly fitting pipe without corrections.

Draw a virtual pipe in free space avoiding obstacles as needed, generating a 3D CAD template that is accurate to the tenth of a millimeter, or Measure an existing pipe and send the data directly to a bending machine or export a blueprint for the shop floor.

PERFORM MODIFICATIONS AND TRANSFORMATIONS ON THE MEASURED GEOMETRIES:

- Measured flanges can be mirrored, creating perfect counterparts and therefore guaranteeing a matching hole pattern
- Space holders for sealings can be taken into account and pipes specified to end either directly with the flange or pass through it
- Measured angles can be manually overwritten should specific bending angles be preferred – the CAD model updates the geometries accordingly whilst not changing fixed points that are important for the correct fabrication.
- Calculate the correction values for bending processes, e.g. values for the springback correction.

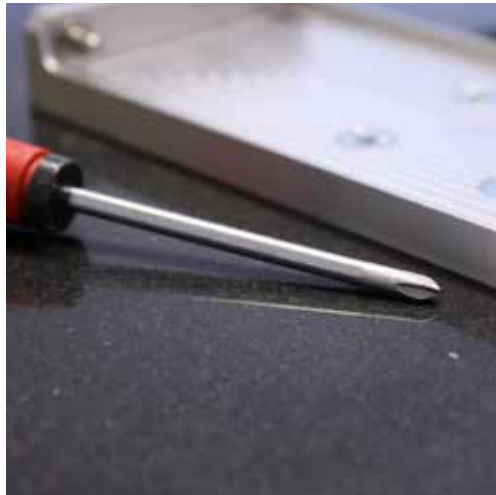




SERVICE & SUPPORT

TECHNICAL ASSISTANCE

The systems' inherent ruggedness and reliability together with our support services ensure that your Portable CMM will operate reliably for years to come. We understand that the Portable CMM is critical to your operations and represent a considerable investment - and we will work with you to ensure performance you can count on and excellent return on your investment both short-term and long-term.

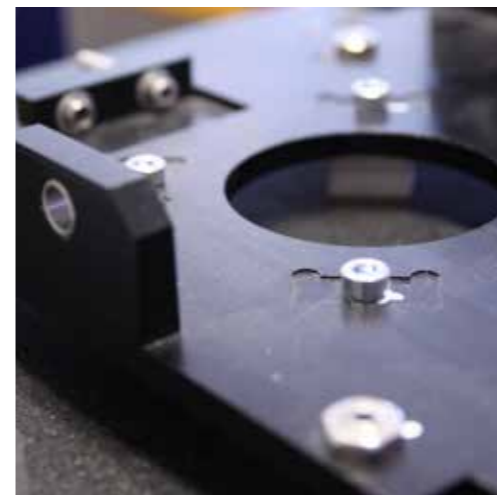


Our support team works hard to ensure a trouble-free life cycle for your Portable CMM, offering services ranging from preventative maintenance and online support to efficient repair and calibration services in case of an accident.



METRONOR TAKES CARE OF YOU – AND YOUR INVESTMENT

- Metronor support – either direct or through our local partners – ensures timely attention to any issues and upgrades to keep your system current for years to come
- Modular design means your investment can grow with your business. With few exceptions, any Metronor system can be upgraded or re-configured to any other configuration.
- No other company offers the same flexibility and long-term security that your investment will keep paying for itself whatever the future may bring.



CUSTOMER SERVICE

LOCAL PARTNERS: CONTACT YOUR LOCAL METRONOR REPRESENTATIVE

PHONE: YOU CAN CALL OUR SUPPORT TEAM ON +47 66 98 38 00

E-MAIL: SUPPORT@METRONOR.COM





APPLICATIONS

FOR OUR SYSTEMS

DIMENSIONAL MANAGEMENT

Minimization of all sources of variability from tool - to part - to subassembly - to final assembly.

PART INSPECTION

The Metronor system's portability and vibration stability control enables direct measurement at the place of fabrication - no matter how harsh the environment - and does not require a dedicated inspection area.

SCANNING

Portable, large-volume, fast and sticker-free, our scanning systems scan fragile objects and surfaces and are ideal for in-process inspection, reverse engineering, tool and die inspection, on-machine inspection and as-built documentation.

PROTOTYPING

Metronor's versatile measurement systems provide invaluable data during prototyping to enable better functional designs. Whether automotive, aerospace or other industries, Metronor has the solution for fast and accurate capture of critical measurements and geometries.

PROTOTYPE SCANNING

For fast and easy scanning of clay models or completed prototypes, using Metronor TrackScan ensures that fragile surfaces remain unblemished and secures consistent and accurate data in large volumes.

AS BUILT DOCUMENTATION

Metronor portable CMMs with their large volume capacity and the unique probing capability enables to capture the exact geometry of most large objects - be it power generators, trucks, cars, aeroplanes or space satellites.

REPEATABILITY STUDIES

The Metronor DUO systems have the unique capability of measuring up to 50 or more points simultaneously.



ALIGNMENT

Metronor offers the fastest and most flexible way to precision assemble parts with continuous part position and orientation updates in all 6 degrees of freedom - thereby saving the cost of expensive assembly and mating tooling.

MOVING LINE ASSEMBLY

Embedding LEDs in the moving assembly line allows real-time measurements to be made at any time. Same concept can also be used when parts are unstable. Just attach LEDs to the part and part movements are cancelled out while Lightpen measurements are performed.

JIGLESS ASSEMBLY

Metronor offers the fastest and most flexible way to precision assemble parts - saving the cost of expensive assembly and mating tooling.

EXCESS MATERIAL ANALYSIS

Metronor's unique "Excess Material Best-Fit" enables the CAD software to determine the optimal part balancing and alignment for machining becomes fast, efficient and guarantees enough material for a good part.

ASSEMBLY TOOL CERTIFICATION

To fully verify the performance of an assembly tool, it is necessary to verify the tool base condition for reproducibility of results, to verify the tool geometry to design CAD, to verify the repeatability of any moveable clamping devices and the overall ability of the tool to repeatedly position the parts. This is the job Metronor was originally designed for.

DEFORMATION ANALYSIS

With its ability to measure multiple points at the same instant, DUO along with the LED application kit is the ideal tool to measure deformation.

REVERSE ENGINEERING

With the Metronor system the basic geometries of even the most complex part with hidden features can be captured with ease.



INDUSTRIES

THAT BENEFIT FROM OUR SYSTEMS

AEROSPACE

Our systems are used for everything from inspecting large molds and castings, through to detail part inspection and is used with great success in moving line assembly.

AUTOMOTIVE

With the introduction of scanning to our systems, Metronor remain focused on the modern automotive production, honoring their very first system's legacy and giving customers the necessary competitive edge.

RAILWAY

Metronor portable CMM systems handle large volumes and efficiently and accurately inspect axles and bogies for flatness, squareness and straightness, as well as inspecting 'any' geometry to CAD design intent - ideally suited both for new production and maintenance work.

TRUCKS & BUSES

Metronor's SOLO system is perfectly suited for assembly and fabrication of large vehicles such as buses and trucks.

BOATS & YACHTS

Increasing demand for high quality and accuracy while keeping manufacturing costs down has led the boat and yacht industry to look to Metronor for portable CMM equipment, capable of handling large volume and demanding environment of modern yacht manufacturing.

FARM EQUIPMENT

Handling large volumes, aligning large parts like axles and bogies, inspecting parts for flatness and verifying geometries makes the Metronor system ideally suited for farm equipment manufacturers.

MOLD & DIE

Metronor enables comparing molds to CAD design data in minimum time as well as aligning molds, cores and inserts precisely to ensure quality product first time with minimum scrap and loss of time.

ENERGY

Metronor have a diversified range of customers in all branches of the energy industries: oil and gas exploration, wind energy, hydro-electric power plants, gas turbine production and nuclear power plants.

CASTING, FORGING & MACHINING

From aligning mold halves to verifying and optimizing excess material through to efficient alignment of cast parts for optimized machining with guaranteed coverage, Metronor systems offer the fastest and most cost-efficient process improvement tool available.

CONSTRUCTION EQUIPMENT AND EXCAVATORS

Large construction machines and equipment can be built faster and with better geometry control using Metronor's portable CMM.

METAL FABRICATION

From part inspection to jigless assembly and alignment of large parts, capturing geometry and as built data to recording fast alignment of parts on machine beds, the Metronor solutions are flexible and value-adding.

OTHER INDUSTRIES

The flexible and unique nature of the Metronor portable CMM family of products has allowed it to be adopted and adapted in many different industries.





Metronor is a privately held ISO9001 certified high technology company headquartered outside Oslo, Norway. Metronor has developed a range of high accuracy, large volume, portable electro-optical coordinate measuring systems that provide excellent return on investment for our customers as well as facilitate a highly efficient dimensional management of their manufacturing processes.

Metronor's Industrial Systems Business Unit provides a range of measuring systems to a variety of industries worldwide, either through trusted partners or directly through offices in Norway, the US, Germany and China. The flexible and robust nature of the systems enables them to be applied to a multitude of different applications within automotive, casting and machining, mold and die, energy and other transport and heavy industries. The systems are considered especially valuable when used for large measurement volumes, to optimize processes and in challenging environments.

Metronor's Military Systems Business Unit provides a custom MIL-STD 3DOF and 6DOF boresighting system and solution. The product line includes systems for boresighting/harmonization of various airborne and ground based weapon system platforms. HarmoLign also allows for full alignment/harmonization of Helmet Mounted Display and Sight tracker systems, making it a complete solution for the Military industry.

More information at www.metronor.com

HEAD OFFICE (NORWAY)

Metronor AS
P.O. Box 238
N-1394 Nesbru
Norway

Phone: +47 66 98 38 00
Email: info@metronor.com
Web: www.metronor.com

EUROPEAN OFFICE (GERMANY)

Metronor
Rathausstrasse 5
66292 Riegelsberg
Germany

Phone: +49 6806 994 0640
Email: info@metronor.com
Web: www.metronor.com

USA OFFICE

Metronor Inc
28064 Center Oaks Court, Suite 200
Wixom, MI 48393
United States

Phone: +1 248 921 1655
Email: info@metronor.com
Web: www.metronor.com

ASIAN OFFICE (CHINA)

Metronor AS Beijing Representative Office
Room 1102, Building M, Beijing Huiyuan Service Apt.
No.8 Beichen East Road, Chaoyang District.
Beijing, China, 100101

Phone: +86 10 6447 3936
Fax: +86 10 6447 3908
Email: info@metronor.com
Web: www.metronor.com.cn