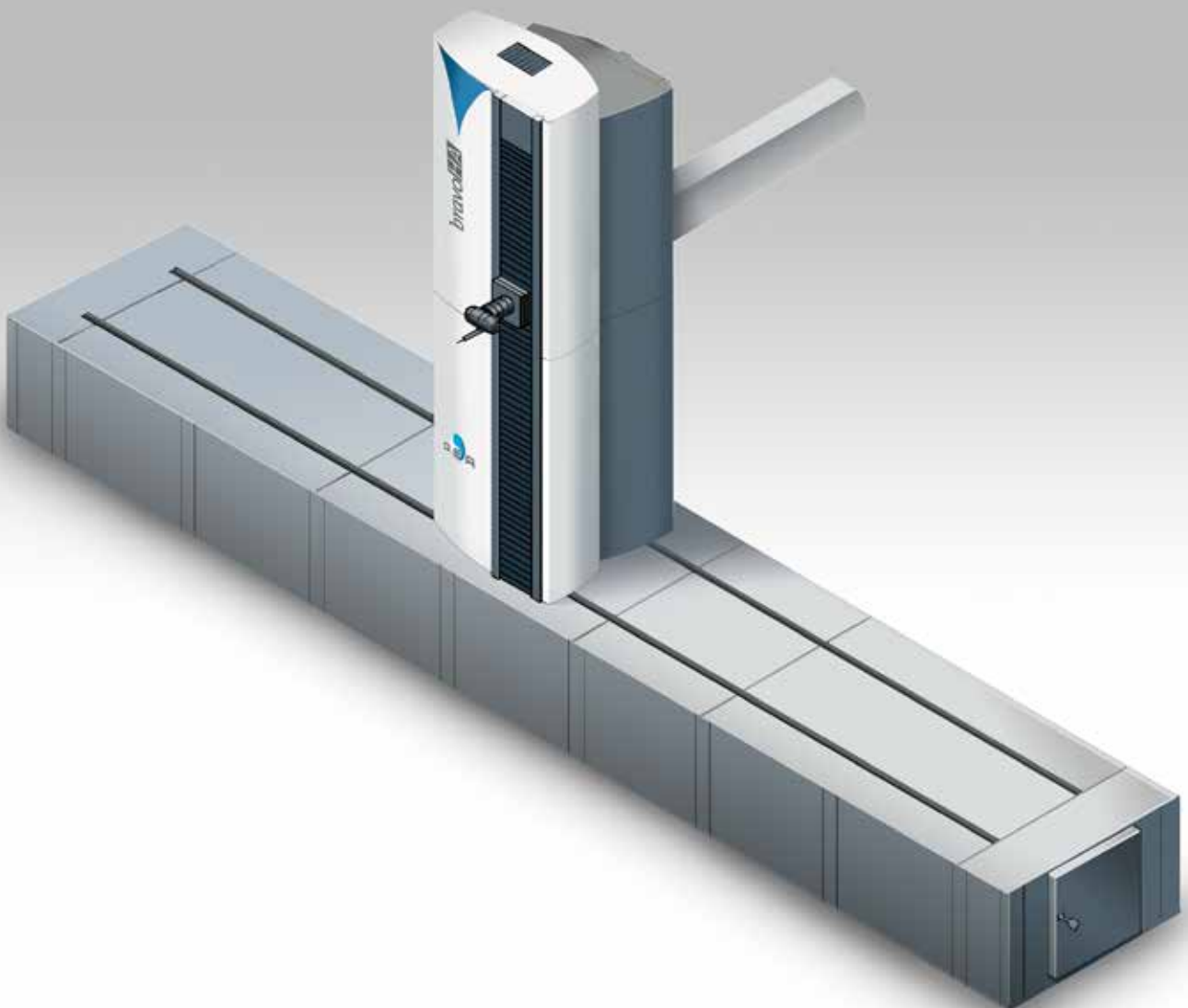


# DEA BRAVO HA

Horizontal-Arm Coordinate Measuring Machines





# THE EVOLUTION OF SHEETMETAL INSPECTION

**DEA BRAVO is a family of horizontal-arm measuring machines that has made a mark in dimensional inspection of automotive bodies and sub-assemblies with over 600 installations at the major carmakers throughout the world.**

The integration of industrial metrology in fast, modern production lines for measuring car bodies and complex contoured shapes requires dynamic, accurate and robust systems that are capable of optimizing the dimensional inspection process.

One of the most critical and complex phases of the car manufacturing process is undoubtedly the production of the car body. The style of a car and the quality of body assembly may severely affect its success on the market. Furthermore, automation of the manufacturing process alone does not ensure the final quality of the product.

Quality standards are getting higher and higher and integration with flexible control systems is fundamental to keep the production process under constant control and to prevent defective parts. Flexible measuring cells based on DEA BRAVO HA systems specifically developed for the dimensional control of car bodies throughout the production process are the concrete answer to this requirement. Here are the characteristics that make of DEA BRAVO HA a state-of-the-art system for body-in-white inspection, and make it ideal for automatic flexible manufacturing processes:

**INTEGRABILITY** – The open architectures of the electronic control, the software and of the mechanical structure of the DEA BRAVO line, allow for an effective integration of the measurement cell in production environments. Hexagon Metrology uses an experienced team of systems engineers and project managers that facilitate and guarantee the success of the integrated solutions.

**SPEED** – A direct contribution to shorter measurement cycle times. An essential issue to keep production process under close permanent control.

**FLEXIBILITY** – Inspection of different kinds of parts with a single measurement cell.

**ACCURACY** – Accurate and reliable measurement data to ensure the best preventive actions.

**RELIABILITY** – Part inspection is carried out under the environmental conditions of the manufacturing process. No special working conditions required.

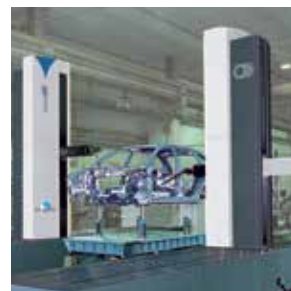
**MODULARITY** – The measurement cell is customized to meet the specific requirements of the production process.

**SOFTWARE** – Tailored applications based on real car body inspection requirements.

## An abridged list of DEA BRAVO system users

- ACTIVE INDUSTRIES
- AUDI
- AUTOEUROPA
- ALCOA
- ALFA ROMEO
- ARACO
- BERTONE
- BMW
- CENTRAL AUTOMOBILE
- CITROEN
- CHRYSLER
- DAIHATSU
- DAIMLER CHRYSLER
- FERRARI
- FIAT
- FORD
- GENERAL MOTORS
- HINO AUTOMOBILES
- HYUNDAI
- HONDA
- IVECO
- KANTO AUTOMOBILES
- KARMANN
- KOUZUI MOTORS
- A. LAEPPLER
- MAZDA
- MIYAZU
- NEDCAR
- NISSAN
- NUMMI
- PEUGEOT
- PININFARINA
- PORSCHE
- RENAULT
- SAMSUNG
- SANYO KOGYO
- SATA
- SEAT
- SEVEL
- SEVERSTAL
- SKODA
- SOGEDAG
- TOFAS
- TOYOTA
- VOLKSWAGEN
- VOLVO
- YMOS

## Revolutionary through the years since the '80s





# **FLEXIBILITY. RELIABILITY. PERFORMANCE.**

Designed to operate in an industrial environment, the DEBRA BRAVO HA constitutes the optimized answer to the dimensional inspection of bodies and subassemblies in the shop floor.

DEBRA BRAVO HA moulds cutting-edge technology with Hexagon Metrology's unparalleled metrology and application experience in car body inspection. The exclusive design and the adoption of innovative materials and technical solutions enable DEBRA BRAVO HA to achieve the best metrologic and dynamic performance in the harshest environmental conditions.



## Enhanced Flexibility

In its standard configuration, DEA BRAVO HA is equipped with the sturdy high-performance multi-axis DEA CW43L-mw continuous wrist. The CW43L-mw handles a series of probe extensions (up to 570 mm) thus allowing full accessibility to all part features.

The DEA BRAVO HA flexibility can be further enhanced by the adoption of advanced non-contact sensors that allow the performing of measurement tasks in a much shorter time than traditional probing technology.

The Y measurement stroke – extended to 1600 mm – further increases the system working volume.

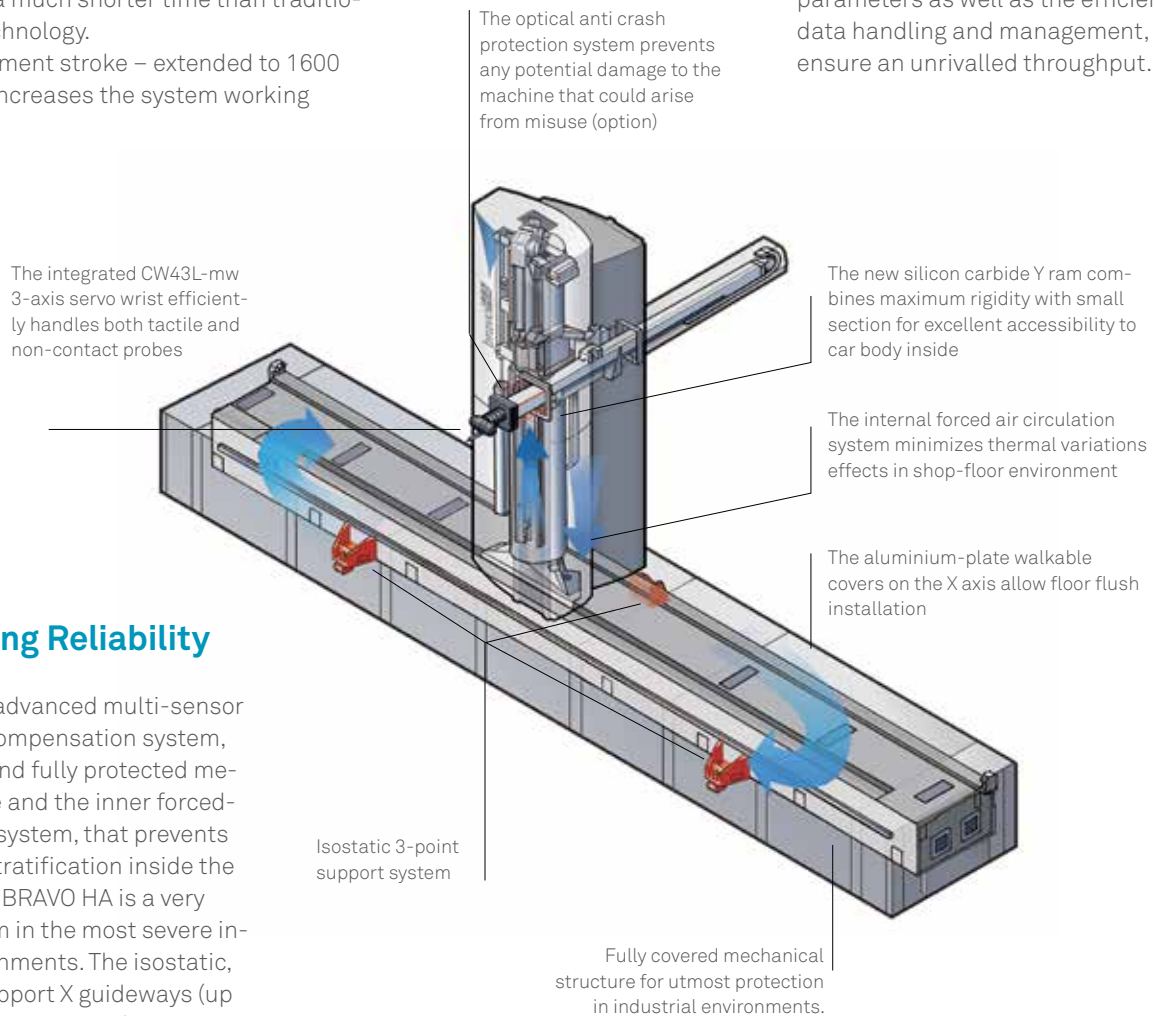
## Top Class Performance

Exclusive design, patented solutions, selected components, innovative materials, and refined geometric compensation maps allow DEA BRAVO HA to achieve top measuring accuracy in a wide operating temperature range. The well-known outstanding dynamic performance of the DEA BRAVO system along with the optimized probing parameters as well as the efficient data handling and management, ensure an unrivalled throughput.

## Outstanding Reliability

Thanks to the advanced multi-sensor temperature compensation system, the very rigid and fully protected mechanical frame and the inner forced-air circulation system, that prevents temperature stratification inside the structure, DEA BRAVO HA is a very reliable system in the most severe industrial environments. The isostatic, three-point support X guideways (up to 6 m net stroke available) eliminates the need for dedicated foundations in most cases, and guarantees metrologic performance over time.

The Y ram is made of silicon carbide, a material ensuring an optimal structural behaviour and avoiding bending deformations. The aluminium walkable covers protect the longitudinal guideways and allow easy access to working volume in floor flush installations.



## DEA BRAVO HA

Models	Strokes (single arm models)			Strokes (double arm models)			
	X	Y	Z	X	Y	YT	Z
	mm	mm	mm	mm	mm	mm	mm
60.14.20	6000	1400	2000	6000	1400	2750	2000
70.14.20	7000	1400	2000	7000	1400	2750	2000
60.16.20	6000	1600	2000	6000	1600	3150	2000
70.16.20	7000	1600	2000	7000	1600	3150	2000
60.14.24	6000	1400	2400	6000	1400	2750	2400
70.14.24	7000	1400	2400	7000	1400	2750	2400
60.16.24	6000	1600	2400	6000	1600	3150	2400
70.16.24	7000	1600	2400	7000	1600	3150	2400

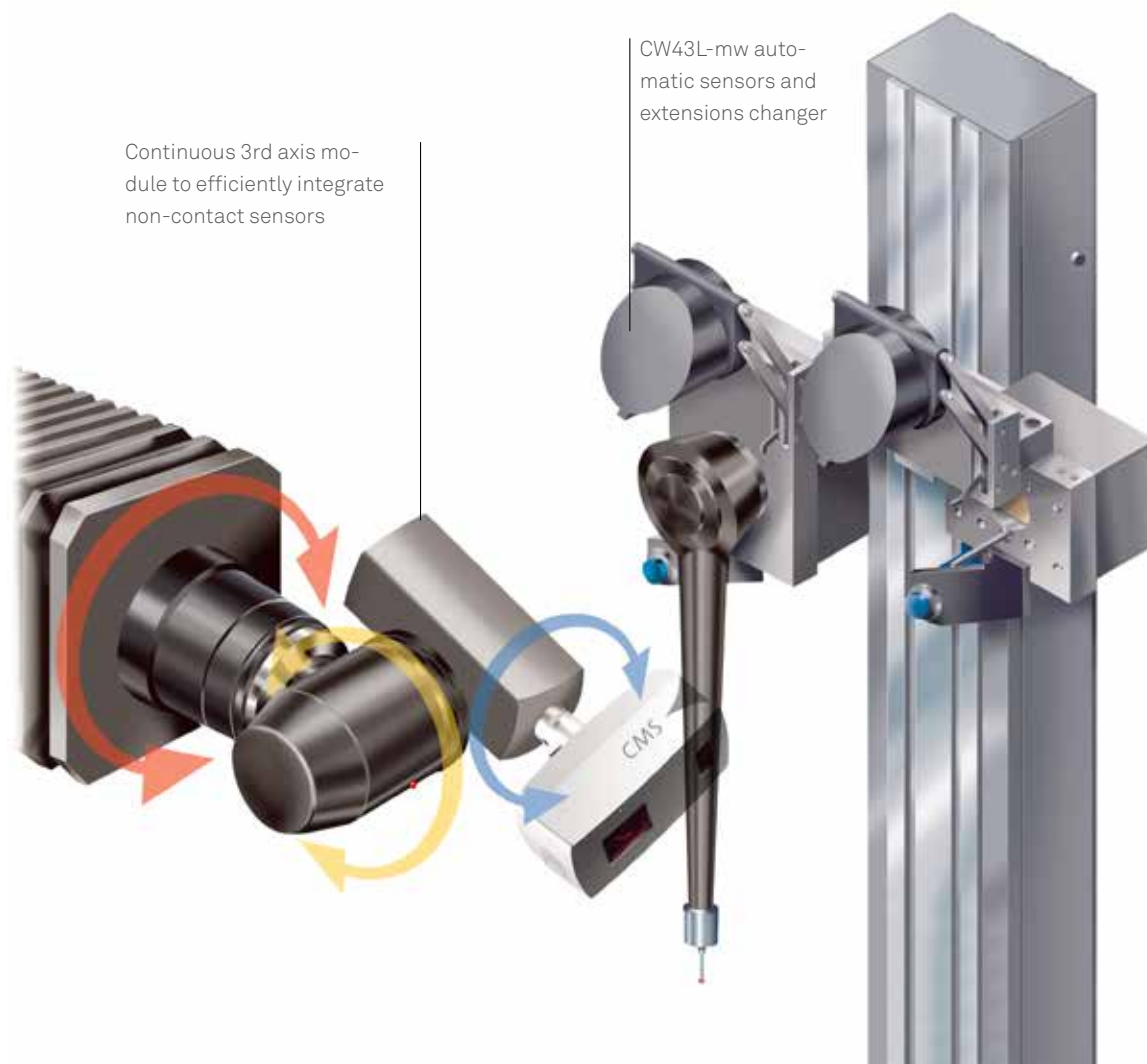
Longer X-axis strokes are available on request



## PRECISE PROBE HEAD ORIENTATION

Performance and efficiency of DEA BRAVO HA are enhanced by the exclusive DEA CW43L-mw multi-axis continuous wrist. Its ability of orienting the probe as needed in space (virtually infinite angular positions) along with the possibility to handle exceptionally long probe extensions, allow full access to the part to be measured. The CW43L-mw is available also in the

configuration with integrated 3rd continuous axis developed for the optimized use of non-contact sensors. The CW43L-mw wrist is compatible with the most widespread Renishaw probes and tip/tool changers, thus enabling to measure both in point-to-point and in scanning mode.



## Specifications

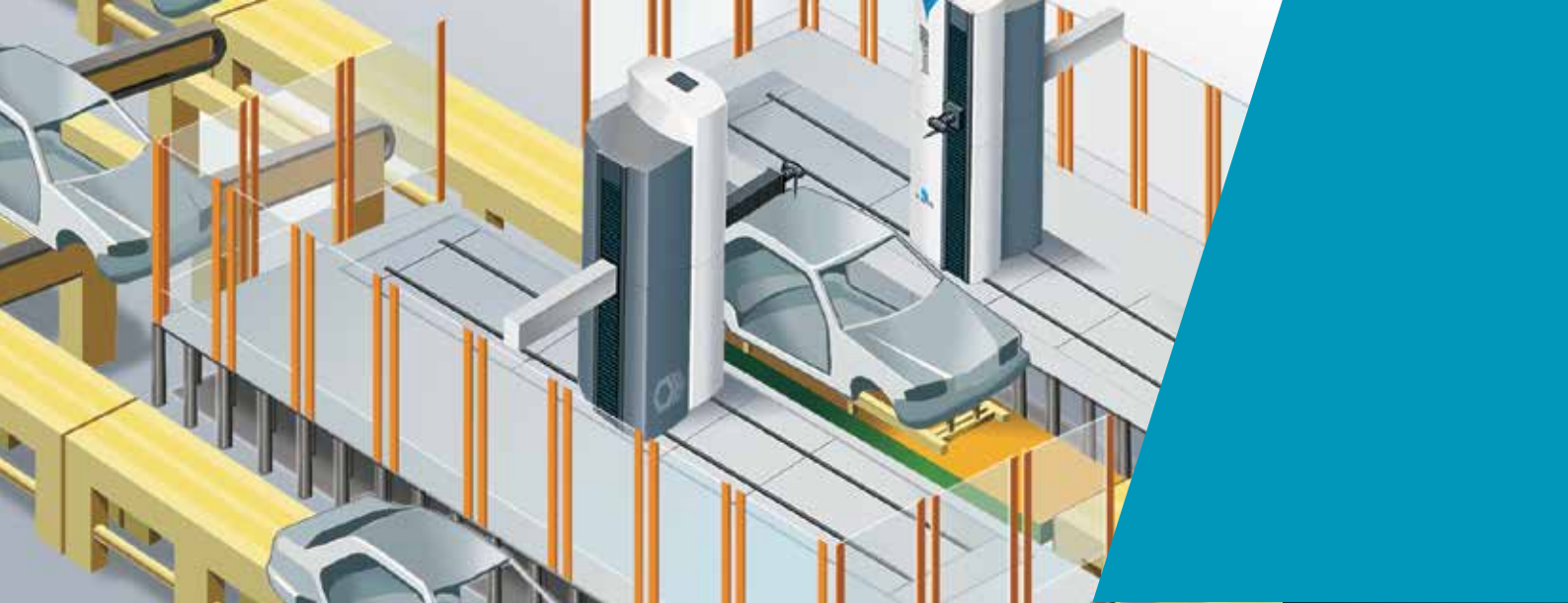
	CW43L-mw 2 axes	3rd axis
Wrist Rotation Angle	Roll axis +/- 180°; Pitch axis +/- 170°	+/-180°
Rotation Speed	1 (rad/s)	1 (rad/s)
Acceleration	10 (rad/s <sup>2</sup> )	10 (rad/s <sup>2</sup> )
Resolution	0.14 (arc")	3.16 (arc")
Positioning Repeatability	1 x 10 <sup>-5</sup> (rad)	7 x 10 <sup>-5</sup> (rad)
Weight	3.5 (kg)	1.7 (kg)
Max. Tool Weight	1.5 (kg)	1 (kg)
Max. Applied Torque	2 (Nm)	1.5 (Nm)
Extensions	up to 570 mm	
Probes	TESASTAR-p TESASTAR-mp TESASTAR-rp	Non-Contact Probes
Probe Changer	ACR1, CW43L-mw AC TESASTAR-r	CW43L-mw AC



Non-contact probing drastically reduces inspection cycle time.



CW43L-mw long probe extensions (up to 570 mm) allow to reach all inside body details



# OVERCOMING INFLUENCE ON ACCURACY

## Ambient Temperature

Ambient temperature variations have always been one of the factors affecting the performance of all measuring tools.

To curb negative effects, the most common solution consists in using enclosures that reproduce the ideal temperature environment. Technically, this is the simplest solution but it is also the most expensive one, in particular for large-sized measuring machines.

DEA BRAVO HA eliminates the need for enclosures because it has been designed to work efficiently in a shop floor environment. The technological solutions adopted (multisensor compensation, full covering of the structure, inner forced-air circulation system, appropriate motors positioning) are the outcome of many years' experience in the application of measuring systems in shopfloor environments.

## Accessibility to Features

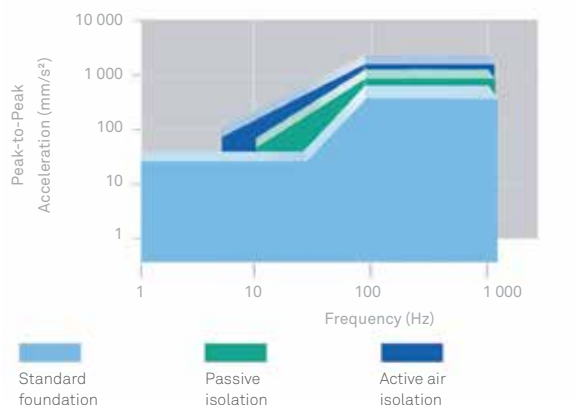
In particular, in the dimensional inspection of car bodies the need for very long tool extensions (to gain access to critically positioned features) and the need for specific approach angles are felt.

These requirements become even more significant – at times imperative – when non-contact probes are used. In these cases, the approach angle may significantly affect probing accuracy and it is therefore fundamental to adopt a continuous multi-axis probe head. The CW43L-mw continuous rotary wrist therefore combines the automatic management of long probe extensions with the control of three continuous rotary axes for optimal operation with non contact sensors.

## Environmental Vibrations

The vibrations present in a shopfloor environment have a decisive influence on metrologic performance. The foundation on which the measuring machine is installed plays not only the important role of stabilizing the geometric rigidity of dual arm systems but also the role of damping vibrations. Depending on the nature (frequency and intensity) of vibrations, the foundation may be supplemented with further isolating units both of the passive type (isolating pads) and of the active type (electronically controlled pneumatic dampers) in the most critical cases.

In all cases, the in-built rigidity of the main X beam of the DEA BRAVO HA adds to ensuring that the nominal performance is maintained over time.





# TURNKEY SOLUTIONS TO IN-PROCESS SHEETMETAL GAGING PROBLEMS



For easy and efficient integration into the production line, DEA BRAVO is capable of being automated with the same part loading or transfer devices as other equipment in the manufacturing process and can be remotely managed by a supervisory computer system.

The possibility of installing the robot flush to the floor and its robust walk-on covers that protect the longitudinal ways simplify part loading and unloading operations.

Additional hardware, such as pallet transfer systems, handling robots, indexing tables, as well as operator safety and part recognition devices can be supplied with DEA BRAVO to configure integrated car body inspection cells that help maximizing manufacturing productivity.

A full time staff of system engineers studies and analyses customers application requirements and defines the software and hardware configurations of possible special systems to address specific car body manufacturing situations, for one machine or an entire system.

They have an outstanding familiarity with the characteristics and the use of DEA BRAVO, complemented by an excellent knowledge of multiprocessing and computer network technologies, OEM system components, as well as mechanical and construction engineering techniques. Stand-alone units, inspection cells, integrated system stations – every one of them is intended to provide the user with control over production. On line. In real time.

# THE INTELLIGENT SOFTWARE FOR ALL CMMS

DEA BRAVO HA is equipped with PC-DMIS, the industrial grade measuring software that provides a multi-tasking multi-user environment to inspection operations.

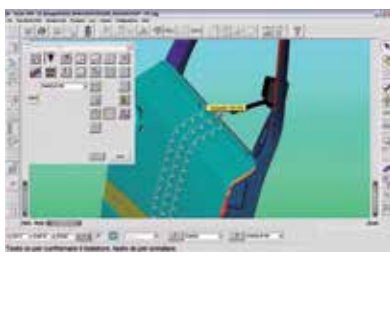
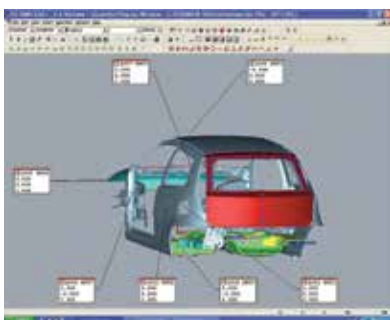
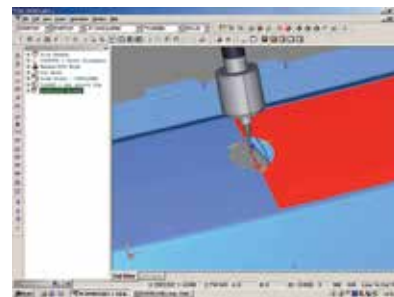
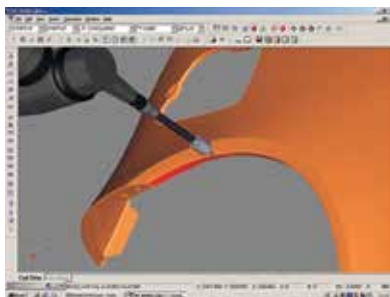
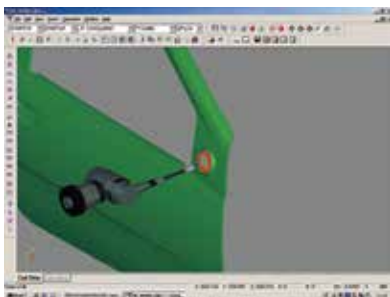
## Main Features

- User-friendly Windows operating system
- Customizable 3D graphics-based operator interface
- Direct CAD Interface (DCI)
- IN/OUT DMIS
- Direct part measurement using original CAD data
- Direct measurement without a CAD model, with automatic recognition of part shapes and features
- Management of non-contact measuring probes
- DCC program-driven measurement
- Reverse engineering functionality
- Management of continuous scanning probes
- Off-line part programming supported by original CAD design data and graphical simulations
- On-line part programming (Self-Teach)
- Advanced tools for program proofing, fine tuning, and debugging
- Flexible graphical and analytical reporting
- Advanced SPC and process monitoring options
- Management of multi-arm measuring systems
- Management of FIVE and FIVE U-nique flexible fixturing system options

## Power Sheet Metal Routines Optimize System Performance

PC-DMIS includes powerful point-and-click sheet metal measuring routines for the automatic inspection of thin-walled components, and the presentation of results for intuitive interpretation. The sheet metal routines are efficient software tools that simplify and speed up part programming. They only need the operator to enter data.

The system automatically generates the part program containing the necessary positioning and probing instructions. At run time, automatic and self-adaptive search routines overcome element mispositioning. If the element is not present, automatic skip cycles allow the machine to continue part program execution.





## ACCESSORIES

### Flexible Fixturing System

The systems commonly used for fixturing thin-walled components, both fixed and modular ones, are effective devices but they are definitely costly – from the building of fixtures to their maintenance and handling, and all that by the high number of elements required to fixture whole product lines.

The FIVE system – Hexagon Metrology's exclusive patent – offers the users a revolutionary alternative to fixturing systems. It is characterized by an extremely flexible use and reasonable costs. A set of columns can be positioned by the CMM on the surface plate and the rod lifted at the requested height. The columns' position is determined based on the design data of the part. The fixture is then completed with supporting, clamping or reference modules for the part to be measured.

### Remote Terminals



To improve efficiency, the DEA BRAVO HA system can be equipped with optional operator terminal and wireless jogbox.

The operator terminal performs the task to remote the main PC (screen, mouse and keyboard) allowing the user to work as close as possible to the CMM measuring volume.

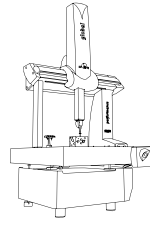
The wireless jogbox (available as an option) is particularly useful for operations with such a large CMM, i.e. during self-teach part programming, when cables may be a hindrance to the operator.



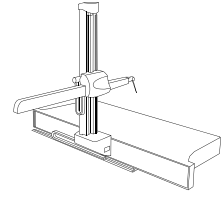
LASER TRACKERS & STATIONS



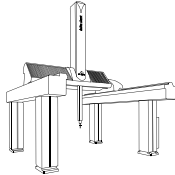
PORTABLE MEASURING ARMS



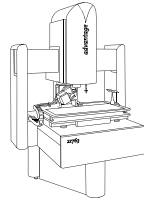
BRIDGE CMMS



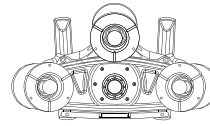
HORIZONTAL ARM CMMS



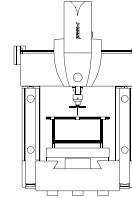
GANTRY CMMS



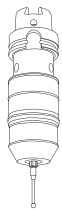
MULTISENSOR & OPTICAL SYSTEMS



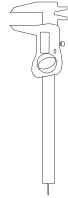
WHITE LIGHT SCANNERS



ULTRA HIGH ACCURACY CMMS



SENSORS



PRECISION MEASURING INSTRUMENTS



SOFTWARE SOLUTIONS



Hexagon Metrology offers a comprehensive range of products and services for all industrial metrology applications in sectors such as automotive, aerospace, energy and medical. We support our customers with actionable measurement information along the complete life cycle of a product – from development and design to production, assembly and final inspection.

With more than 20 production facilities and 70 Precision Centers for service and demonstrations, and a network of over 100 distribution partners on five continents, we empower our customers to fully control their manufacturing processes, enhancing the quality of products and increasing efficiency in manufacturing plants around the world.

For more information, visit [www.hexagonmetrology.com](http://www.hexagonmetrology.com)

Hexagon Metrology is part of Hexagon (Nordic exchange: HEXA B). Hexagon is a leading global provider of design, measurement and visualisation technologies that enable customers to design, measure and position objects, and process and present data.

Learn more at [www.hexagon.com](http://www.hexagon.com)

© 2012 Hexagon Metrology. Part of Hexagon

All rights reserved. Due to continuing product development, Hexagon Metrology reserves the right to change product specifications without prior notice.

Printed in Germany, October 2012





# DEA BRAVO C/C HS/HD/HP

Horizontal-Arm Coordinate Measuring Machines





# THE EVOLUTION OF SHEETMETAL INSPECTION

DEA BRAVO is a family of horizontal-arm measuring machines that has made a mark in dimensional inspection of automotive bodies and subassemblies with over 600 installations at the major carmakers throughout the world.

The integration of industrial metrology in fast, modern production lines for measuring car bodies and complex contoured shapes requires dynamic, accurate and robust systems that are capable of optimizing the dimensional inspection process.

DEA BRAVO C and DEA BRAVO C HS are technically advanced and cost-effective solutions for flexible and accurate dimensional inspection of thin-walled components, ideal for mid-size parts in industrial environments.

DEA BRAVO HD and DEA BRAVO HP are automatic horizontal-arm systems characterized by high performance, designed to optimally tackle a wide variety of metrology applications.

They are advanced systems offering a consistent and efficient approach to car-body inspection and integrate innovative industrial measurement technologies into single- and double-arm horizontal structures.

These are the features that make DEA BRAVO systems the state-of-the-art for the dimensional inspection of body-in-white, and allow to implement a truly automatic, flexible inspection process:

#### Integrability

The open architecture of electronic control and software as well as the Runway mechanical structure of the DEA BRAVO line allow the effective integration of the measurement cell in manufacturing environments. Hexagon Metrology uses an experienced team of systems engineers and project managers that facilitate and guarantee the success of the integrated solutions.

#### Performance

They make a direct contribution to reducing measuring cycle times, which is essential to keeping the production process under control in real time. The traditional dynamic performance of DEA BRAVO systems is present in the DEA BRAVO HP (High Performance) series, while maximum flexibility also in a control room is offered by the DEA BRAVO HD (Heavy Duty) series.

The DEA BRAVO Console line is a cost-effective solution, fully made of steel, ensuring high structural stability in all environments. Two versions are available: DEA BRAVO C and DEA BRAVO C HS (High Speed) with dynamic and accuracy performances at the top of its class.

#### Flexibility

Inspection of several components with a single measurement cell. Possibility to use a broad range of indexable or continuous motorized heads, probe extensions and contact as well non-contact sensors.

#### Accuracy

Generation of accurate, significant data capable of ensuring the best preventive measurements, both in the control room and on the assembly line. All DEA BRAVO HD and DEA BRAVO HP systems use an innovative compensation algorithm for mutual alignments in dual opposing arms systems.

#### Dependability

Efficient operation under the same environment conditions of the production process – no need for special operating conditions. The most sophisticated proven technologies allow

the DEA BRAVO systems to operate with maximum accuracy even in environments with sudden temperature changes.

DEA BRAVO HD and DEA BRAVO HP can operate in a temperature range of 16–32 °C, while DEA BRAVO C and DEA BRAVO C HS are metrologically tested in a temperature range of 16–24 °C.

#### Modularity

Configuration of the measurement cell to the specific requirements of the manufacturing process. The DEA BRAVO series is available with the widest range of useful measuring travels.

#### Software

The system can be adapted to reflect the real application requirements. Broad selection of platforms and computers customizable to suit the customers' needs.

*Revolutionary through the years since the 80s*





# THE DEA BRAVO FAMILY

DEA BRAVO systems stand out for their exceptional dynamic and metrology performance, the excellent dependability of operation in harsh industrial environments and the ability to withstand being subjected to sudden differences in temperature.

## DEA BRAVO HD, DEA BRAVO HP

The open structure can be embedded in the walkable area. Walkable covers along the longitudinal axes ensure the maximum ease of access to the measurement area, thus simplifying the part loading/unloading operations, programming and automatic dimensional inspection.

DEA BRAVO HP and DEA BRAVO HD are designed to ensure maximum protection to the operator and the parts being measured, in compliance with the strictest international safety regulations.

## Main Features

- Rigid steel structure for maximum dimensional stability in a wide range of operating conditions
- Axis sliding through high-accuracy recirculating ball pads (compressed air is not required)
- Rigid ram with 80 x 100 mm section, prewired to accept the anticrash protection option.
- Fully covered mechanical structure (DEA BRAVO HP)
- Forced air circulation inside the main beam for leveling structure temperature
- Multisensor temperature compensation – ensures optimum measurement accuracy even with significant temperature variations (up to 16–32 °C)
- Axis motion with sturdy reliable motors coupled with rack & pinion systems for the X axis and timing belts on the Y and Z axes
- Innovative adjustable slack-free arm counterbalance
- X sliding having a provision for installation flush to the floor
- Linear optical scales with 0.5 µm resolution
- Compatibility with CW43L-mw continuous rotary wrist (up to 3 axes), efficient control of non-contact sensors and probe extensions up to 570 mm





### DEA BRAVO C, DEA BRAVO C HS

The DEA BRAVO Console line is a technically advanced and cost-effective solution for flexible and accurate dimensional inspection of thin-walled components, ideal for mid-size parts in industrial environments. The guideways located on the side of the machine base (Console architecture) allow the arm to be moved fully outside of the working area. This allows for optimal access to the work area for simple part loading/unloading operations. The cast iron machine table features the exclusive three-point support system, which eliminates the need for costly dedicated foundations, and makes the installation on vibration dampers easier. Just like the HP and HD series, the DEA BRAVO Console line is fully made of steel, ensuring high structural stability in all environments.

Two versions are available: DEA BRAVO C and DEA BRAVO C HS (High Speed).

### Main Features

- Rigid ram with 80 x 100 mm section
- Axes slide on high-accuracy recirculating ball pads
- Innovative adjustable slack-free arm counterbalance system
- Linear optical scales with 0.5  $\mu\text{m}$  resolution
- Compatibility with CW43L-mw continuous wrist (compressed air is required); efficient control of non-contact sensors and probes extensions up to 570 mm
- Isostatic three-point support system only for X stroke = 3000 mm
- Protection bellows on the X and Y axes (available as an option)
- Axis motion with sturdy reliable motors coupled with rack & pinion systems for the X axis and timing belts on the Y and Z axes
- Work plate made in cast iron, available as options with tapered M8 x 1.25 holes pattern, T-slot, high load bearing capacity and FIVE U-nique plane

### An abridged list of DEA BRAVO system users

- Active Industries
- Audi
- Autoeuropa
- Alcoa
- Alfa Romeo
- Araco
- Bertone
- BMW
- Central Automobile
- Citroen
- Chrysler
- Daihatsu
- Daimler Chrysler
- Ferrari
- Fiat
- Ford
- General Motors
- Hino Automobiles
- Hyundai
- Honda
- Italdesign
- Iveco
- Kanto Automobiles
- Karmann
- Kouzui Motors
- A. Laepple
- Maserati
- Mazda
- Miyazu
- Nedcar
- Nissan
- Numni
- Peugeot
- Pininfarina
- Porsche
- Renault
- Samsung
- Sanyo Kogyo
- Sata
- Seat
- Sevel
- Severstal
- Skoda
- Sogedag
- Tofas
- Toyota
- Volkswagen
- Volvo
- Ymos

# DEA BRAVO HP

## FAST, ACCURATE, INTEGRATED

Series	Strokes (mm)			Overall Dimensions (mm)			
	X	Y	Z	Length	Width	Height	Weight (kg)
60.16.21	6000	1600	2100	6997	4144	3594	4665
60.16.25	6000	1600	2500	6997	4144	3994	4715
60.16.30	6000	1600	3000	6997	4144	4494	4775

### Applications

- Dimensional inspection of car body components, body-in-white, chassis, subassemblies, panels, and also for process control along assembly lines
- High-speed reverse engineering of complex surfaces creating CAD models

### Operating Environment

- Shop-floor environment, adjacent to or directly integrated into the assembly lines or car body welding
- Metrologic temperature ranges:  
18–22 °C, 16–26 °C, 16–32 °C
- Dynamics optimized for maximum speed and throughput

### Probe Heads

Standard: CW43L-mw (two or three axes)  
Optional: TESASTAR-m

DEA BRAVO HD/HP standard X axis measuring strokes: 4000, 6000, 7000, 9000 mm.  
All DEA BRAVO HD/HP models are available in both single and double arm configuration.  
The specified strokes, dimensions, and weights refer to the single arm configuration.



# DEA BRAVO HD

## VERSATILE, ACCURATE, ROBUST

Series	Strokes (mm)			Overall Dimensions (mm)			Weight (kg)
	X	Y	Z	Length	Width	Height	
60.16.21	6000	1600	2100	6997	4148	3547	4640
60.16.25	6000	1600	2500	6997	4148	3947	4690
60.16.30	6000	1600	3000	6997	4148	4447	4750

### Applications

- Dimensional inspection of thin-walled components, bodysells, chassis, subassemblies, panels, car doors, glasses, dashboards
- Dimensional inspection of castings, structural aircraft, ship and railway components
- Metrology support to die and mould manufacturing
- Reverse engineering of complex contoured shapes creating CAD models

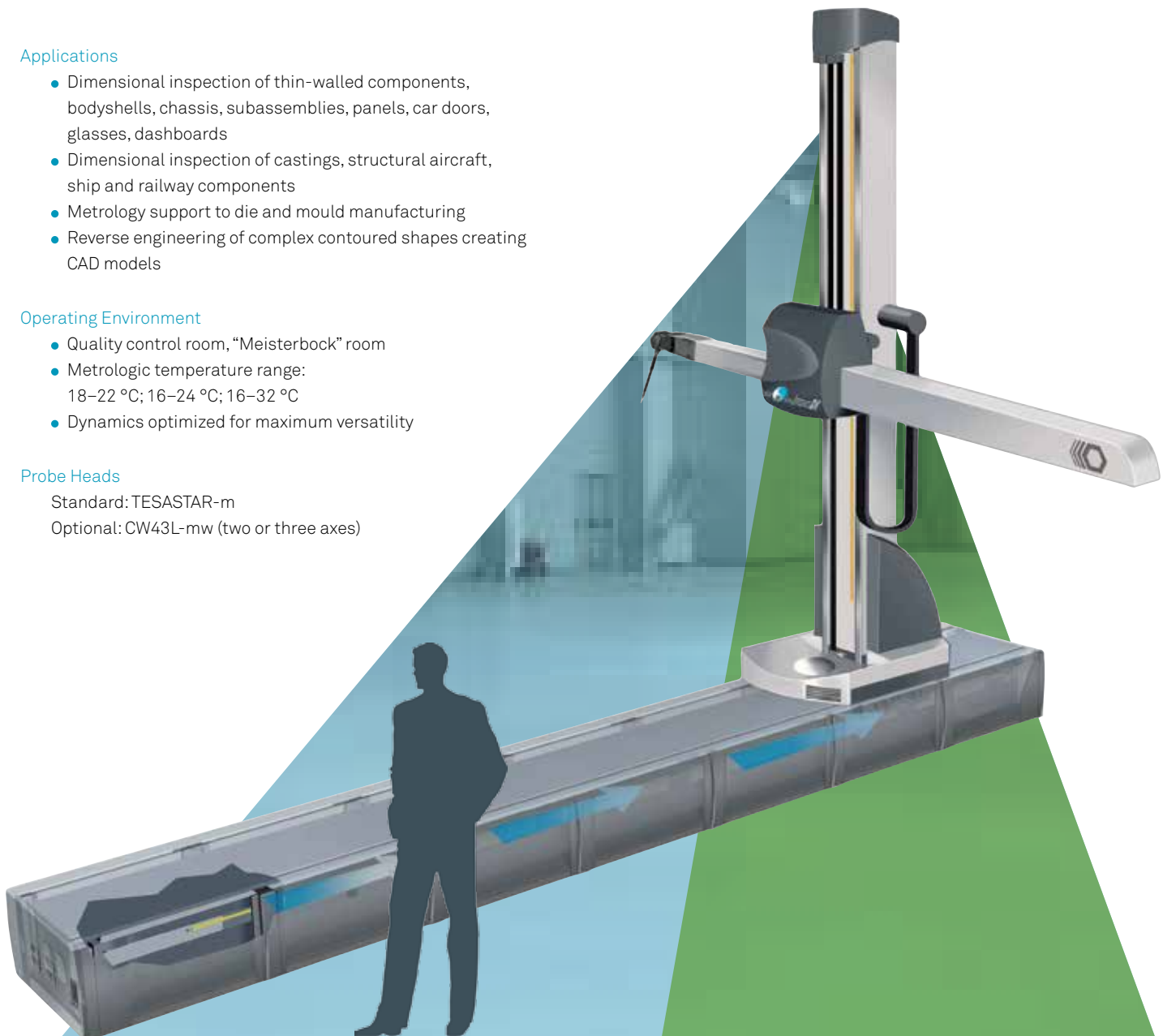
### Operating Environment

- Quality control room, "Meisterbock" room
- Metrologic temperature range:  
18–22 °C; 16–24 °C; 16–32 °C
- Dynamics optimized for maximum versatility

### Probe Heads

Standard: TESASTAR-m

Optional: CW43L-mw (two or three axes)



# DEA BRAVO C, DEA BRAVO C HS

## COMPACT, FLEXIBLE, ROBUST

Series	Strokes (mm)			Overall Dimensions (mm)			Weight (kg)
	X	Y	Z	Length	Width	Height	
30.14.16	3000	1400	1600	3750	3698	2983	4600
40.16.16	4000	1600	1600	4750	4098	2983	6600
50.16.21	5000	1600	2100	5750	4098	3483	8200
60.16.25	6000	1600	2500	6750	4098	3883	9800

### Applications

- Dimensional inspection of thin-walled components, ideal for mid-size parts in industrial environments
- Reverse engineering of complex contoured shapes creating CAD models with non-contact probes

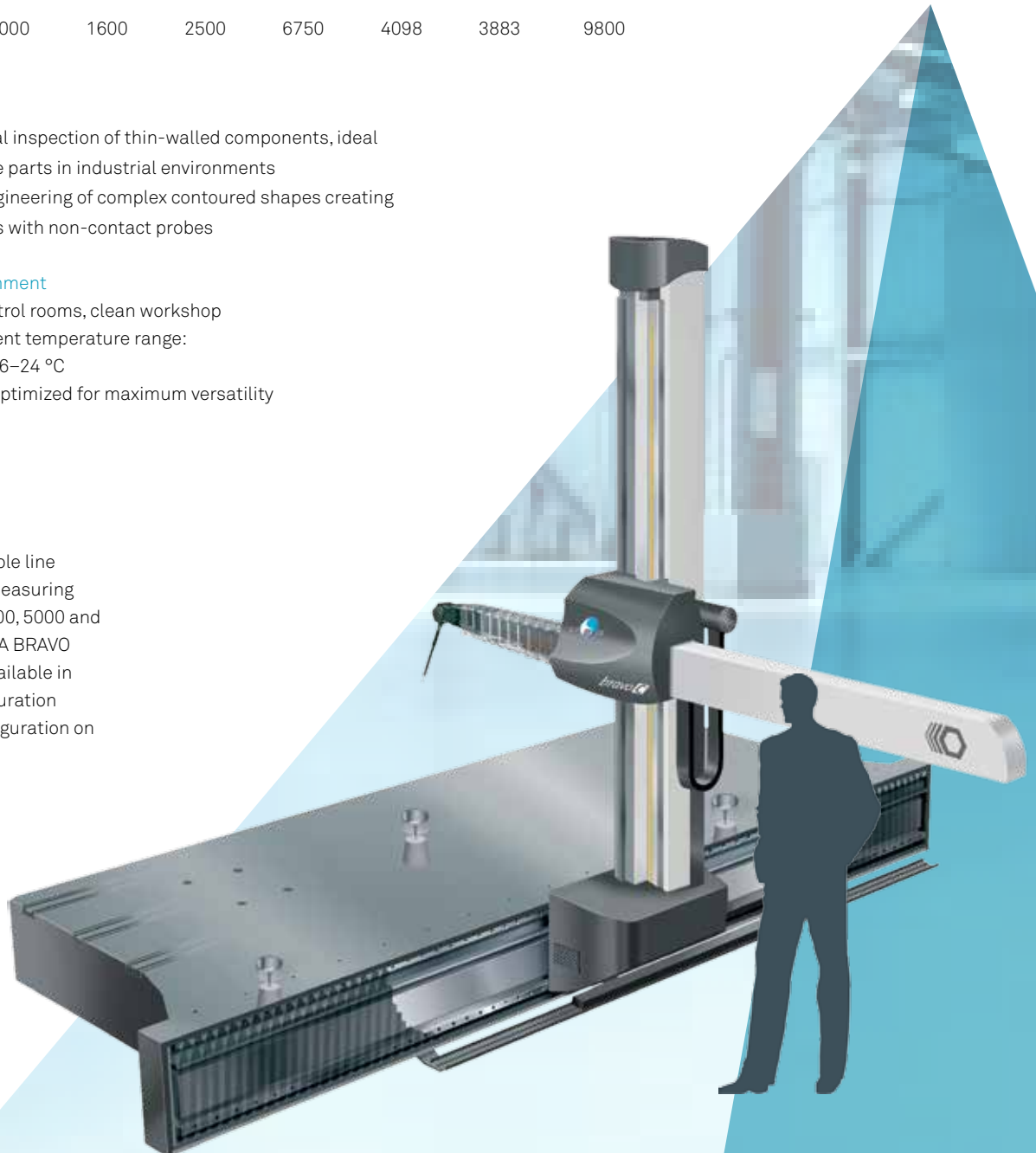
### Operating Environment

- Quality control rooms, clean workshop
- Measurement temperature range: 18–22 °C, 16–24 °C
- Dynamics optimized for maximum versatility

### Probe Heads

TESASTAR-m  
CW43L-mw

DEA BRAVO Console line standard X axis measuring strokes: 3000, 4000, 5000 and 6000 mm. The DEA BRAVO Console line is available in single arm configuration (double arm configuration on request).



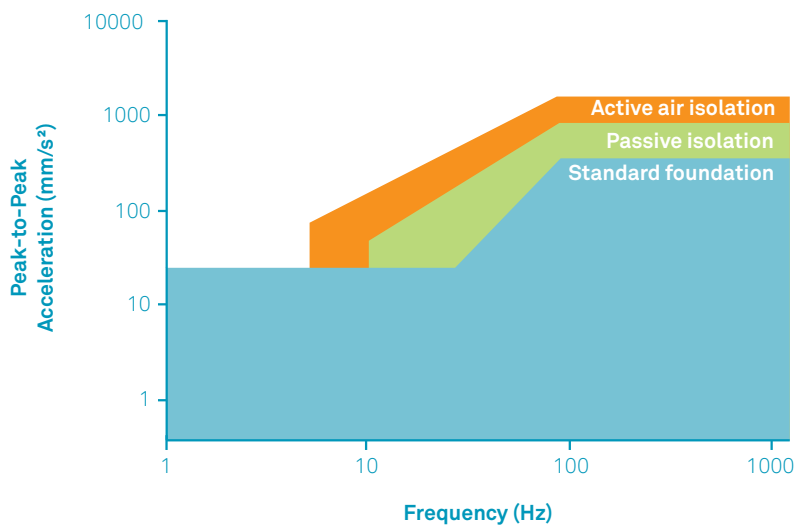


# FACTORS THAT AFFECT ACCURACY

## DEA BRAVO HP: Environment Temperature

Environment temperature variation is one of the factors affecting the metrologic performance of measurement equipment. To limit unwanted effects, the most common solution consists in simulating the ideal temperature conditions in enclosures or rooms. This solution is the simplest on a technical basis, but it is the most expensive one, particularly for large-sized measuring machines. In most cases, the DEA BRAVO HP series requires no air-conditioned machine enclosure since it is designed to work efficiently in a shop-floor environment. The technological solutions adopted are the outcome of many years of experience in the application of measurement systems in industrial environments.

## Environment Variations



## DEA BRAVO HP: Environment Vibrations

The vibrations present in a shop-floor environment are a determining factor affecting the metrology performance. The foundation on which the measuring machine is installed plays two significant roles: it stabilizes the geometric rigidity of dual-arm systems and it insulates vibrations. Depending on the nature (frequency and intensity) of vibrations, further insulating elements may be added to the foundation - both passive, and, in the most critical cases, active elements. In all cases, the rigidity of the X beam of the DEA BRAVO HP systems helps ensure that the initial performance is kept over time.

# THE MEASUREMENT SOFTWARE

## PC-DMIS

PC-DMIS® is the measurement software for the analysis and inspection of simple prismatic parts, complex geometric features and 3D surfaces. Available in three versions (PRO, CAD, CAD++), PC-DMIS performs most application tasks required by the modern industry.

PC-DMIS allows the user to create customized, intuitive inspection reports. With its CAD and CAD++ modules, PC-DMIS can import directly the CAD model of the part, thus simplifying the programming task. In addition, the CAD++ module offers several useful functions for measuring form errors of complex contoured components, like turbine blades, dies, models, sheetmetal components and other curved shapes.

### [Automatic Procedures for Measuring Sheetmetal Components](#)

The CAD++ module of PC-DMIS includes a series of automatic procedures for measuring the characteristic features of sheetmetal components. These procedures improve the efficiency of the measurement system, and they simplify and speed up programming tasks. The operator only needs to enter key data. The system will automatically generate the measurement program, complete with positional moves and measurement instructions. While the cycle is being executed, automatic feature search functions prevent part positional errors or the lack of the characteristics required from causing system collisions or accidental program blocks.

# SENSORS

All DEA BRAVO models offer

## Easy access to the feature

The inspection of body-in-white requires both long probe extensions (to get access to critical points) and special angles of approach. The latter requirement is even more important when non-contact probes are used. The angle of approach may considerably affect probing accuracy. The DEA BRAVO series is available both with the CW43L-mw continuous wrist and with the TESASTAR-m motorized indexable probe head.

## CW43L-mw

This continuous rotary wrist allows full access to the part being measured and the automatic change of extensions (up to 570 mm) and adapters. The CW43L-mw is available in 3<sup>rd</sup> continuous axis configuration for the correct application of non-contact sensors, such as the laser sensor CMS106.

## TESASTAR-m

Motorized articulating probe head capable of rotating about two axes in 5° increments, which translates to a total of 2,952 possible positions. The robust aluminum construction permits extension rods with lengths over 300 mm.

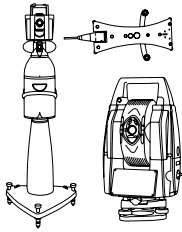
## CMS106

The CMS106 is a laser line scanning sensor with two unique features:

- three level zoom offering a 24, 60 or 124 mm laser line
- automatic, real-time laser power adjustment

The sensor offers rapid non-contact metrology for three key application areas: free form surface inspection, sheet metal feature inspection and reverse engineering.

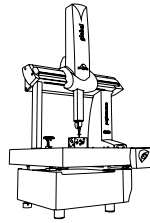




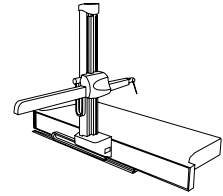
LASER TRACKERS & STATIONS



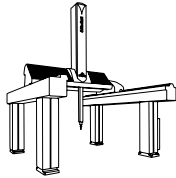
PORTABLE MEASURING ARMS



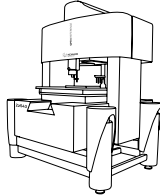
BRIDGE CMMs



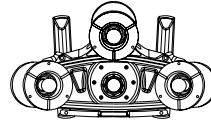
HORIZONTAL ARM CMMs



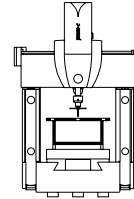
GANTRY CMMs



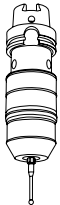
MULTISENSOR & OPTICAL SYSTEMS



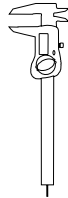
WHITE LIGHT SCANNERS



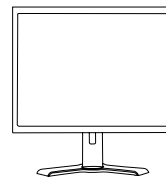
ULTRA HIGH ACCURACY CMMs



SENSORS



PRECISION MEASURING INSTRUMENTS



SOFTWARE SOLUTIONS



**HEXAGON**  
METROLOGY

Hexagon Metrology offers a comprehensive range of products and services for all industrial metrology applications in sectors such as automotive, aerospace, energy and medical. We support our customers with actionable measurement information along the complete life cycle of a product – from development and design to production, assembly and final inspection.

With more than 20 production facilities and 70 Precision Centers for service and demonstrations, and a network of over 100 distribution partners on five continents, we empower our customers to fully control their manufacturing processes, enhancing the quality of products and increasing efficiency in manufacturing plants around the world.

For more information, visit [www.hexagonmetrology.com](http://www.hexagonmetrology.com)

Hexagon Metrology is part of Hexagon (Nordic exchange: HEXA B). Hexagon is a leading global provider of design, measurement and visualisation technologies that enable customers to design, measure and position objects, and process and present data.

Learn more at [www.hexagon.com](http://www.hexagon.com)

© 2013 Hexagon Metrology. Part of Hexagon

All rights reserved. Due to continuing product development, Hexagon Metrology reserves the right to change product specifications without prior notice.