



## **MIDA 3DSI**

# **IT TURNS YOUR MACHINING CENTER OR MILLING MACHINE INTO A CMM**

Marposs 3D Shape Inspector (3DSI) is measurement software for PCs with Windows operating systems. It allows both mold makers and mass production machine shops, to turn their own machining center or milling/boring machine into a virtual CMM. This enables in-process measurement and verification of the accuracy of the machined shape without removing it from the machine.

3DSI makes it possible to check sculptured surfaces, one-dimensional, two-dimensional and tri-dimensional geometrical elements, as well as geometrical tolerances such as concentricity, parallelism, angularity, etc., which up to now were the prerogative of CMMs only.

Using the software is very simple and does not need specific competences: even an NC programmer using the CAD model of the part being machined, can rapidly generate an in-process measuring cycle without removing the part from the machine.

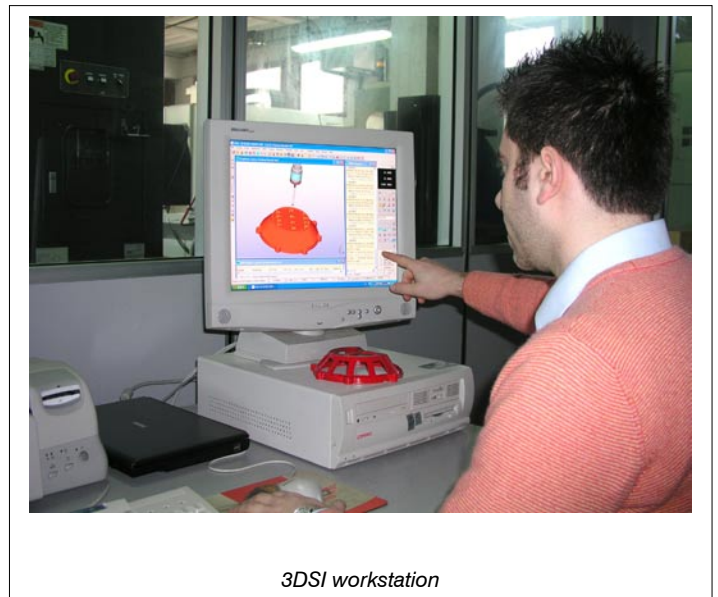
### **3DSI main features**

3DSI has the possibility of importing the most commonly used CAD 3D formats.

While machining an item, the machine tool equipped with a Marposs probe, can either periodically, or upon the operator's request, carry out the measurement of previously selected points and compare them with the nominal data of the CAD model.

Upon completion of the measuring cycle, 3DSI generates a report that will indicate to the user, either the validity or defectiveness of the machining. In the second case, the operator may decide to intervene, by re-machining the item or simply stopping the work cycle until optimum conditions have been restored. Reports may be customized in text, Excel and HTML format.

Measuring on the machine saves considerable time when compared to the measurement carried out on a CMM, since the part has not to be removed and then re-aligned for reworking. Actually, a CMM represents a bottleneck for the company when used for in-process checks rather than for final testing.



*3DSI workstation*

### **Advantages with the use of 3DSI**

The installation of 3DSI guarantees an immediate process improvement and even extends the feasibility of working high volume production with high accuracy and a reduced number of scrap / rework. Furthermore, the low purchase price of the software ensures a rapid return of investment.

3DSI is user-friendly. Indeed, it is equipped with a very intuitive graphical interface with which the measurement program is quickly created by selecting 2D/3D macros. Before carrying out the measurement on the machine, it is possible to simulate the whole measuring cycle so as to prevent collisions. The software integrates

both rapid calibration cycles with automatic search for the calibration sphere position and cycles that can be customized precisely to the customer's needs. Different part alignment cycles are also available, including the best-fitting.

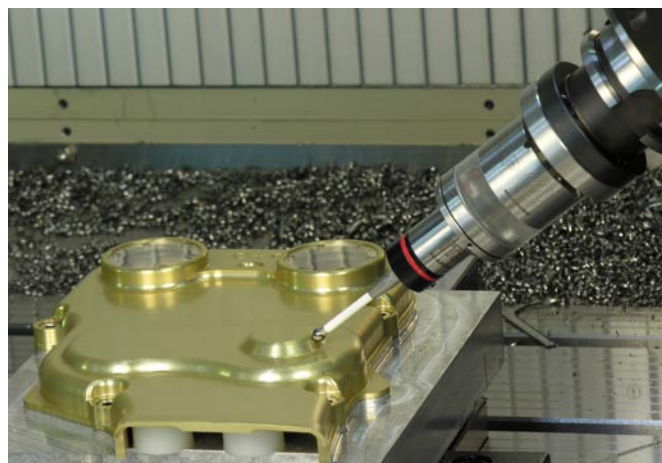
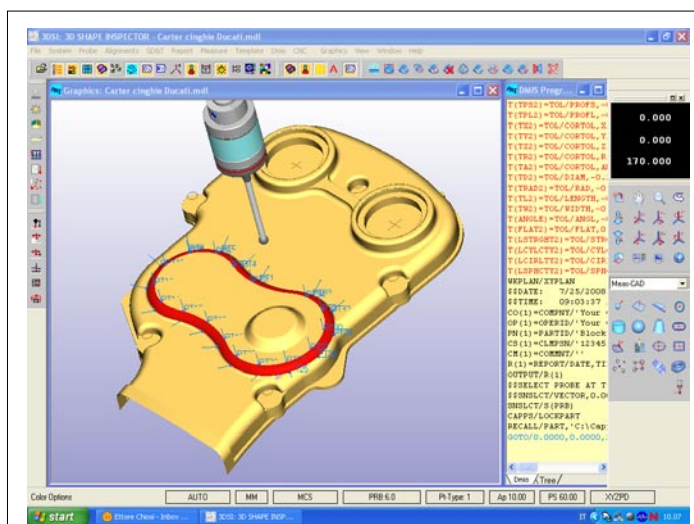
***"No need to remove the part to measure from machine"***

The measurement program generated by 3DSI is converted into the specific language of the customer's NC. Marposs have developed post-processors for the most commonly used numerical controls. Marposs were also the first to introduce the very fast Ethernet connection between the 3DSI station and the NC. At present, this type of transmission is available for Fanuc (FOCAS 1/FOCAS 2) and Siemens (OPC Server), numerical controls. Ethernet connection for other NC's are being developed.

### New functions

The latest release of 3DSI brought new functions, among which, the most important are:

- Anti-collision feature to check the measurement path during simulation, taking into account the overall dimensions of the entire probe assembly (stylus + body + transmitter).
- Tool Offset Feedback for tool length and / or radius compensation. Upon machining cycle completion, remaining stock can be evaluated and the tool table updated.
- Work Offset Feedback gives the possibility of setting the part origin (G54, G55, ..., G59) referred to the origin of the CAD model - in automatic mode.



Example of on-machine part checking and its programming with 3DSI

## 3DSI SUPPORTS DUCATI SPECIAL PARTS BY C+C MECCANICA



Overview of the C+C workshop and the Owner

C+C Meccanica was established in Tuscany (Italy) in 1975 as a shop of precision mechanical engineering. The available machine tool capacity consists of machining centers with 3, 4 and 5 axes, NC lathes, grinders, CMM and CAD/CAM software. The core business is manufacturing of molds for thermoplastics.

In 2005 the owners, driven by their passion for motorcycles, decided to diversify the production, starting projecting and making aftermarket accessories for Ducati and Aprilia motorcycles, made of ergal and titanium and obtained from a solid body.

#### A typical production workflow

Mr. Valerio Chiosi, owner of C+C Meccanica, tells us how a new product is generated: The work flow starts with a scanning of the original part using a CMM. This supplies all the dimensions necessary for the CAD modeling stage in which technical aesthetical solutions are studied for any type of product.

The mathematical model is transferred to the CAM to formulate the machining strategies. Then the post-processed program is loaded in machine and machining is started.

**“Thanks to Marposs 3DSI we remarkably shortened the reworking times...”**



Ducati and Aprilia special parts manufactured by C+C Meccanica

#### Wide range of parts measures

These accessories such as sprocket cases, clutch cases, adjustable rear set kits, number plate holders, etc., have sculptured surfaces and are fitted on the motorcycle where there are very precise housings and drilling planes. It is necessary to quickly check whether the dimensional requirements are met before proceeding with the finishing stage.

“The need for on-machine measurement was essential for a quick check of sculptured surfaces. Moreover, as these components are quite structured, measurements on the CMM involved very difficult fixturing and long times for re-alignment when returned to the machining center. Thanks to Marposs’ 3DSI, we drastically shortened the reworking times, since we can check the consistency between the CAD model and the machined part instantaneously” claims Mr. Chiosi.

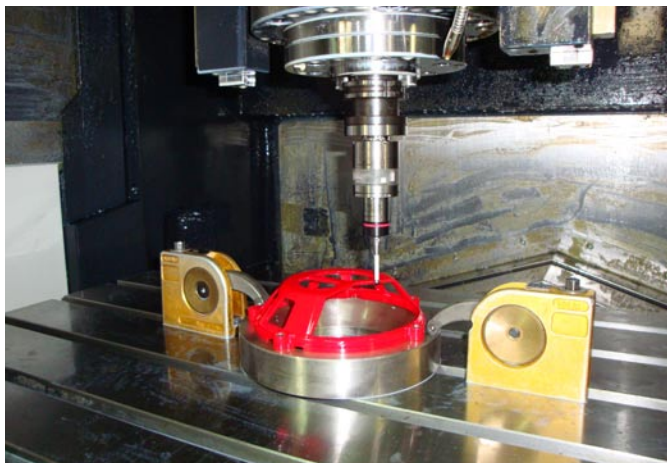
#### 3DSI solution

Actually, the problem was smartly solved by C+C Meccanica with the acquisition at the end of 2006, of the revolutionary measurement software - 3DSI - that Marposs had just introduced to the market. This was combined with a Hermle C 800 U machining center equipped with optical spindle probe OP32 for 3D measurements that has optimum spatial isotropy and unidirectional repeatability of 1 $\mu$  (2Sigma).

“Now we are working with a much higher degree of safety than before” states the owner, “since the calibration is automatically entrusted to the software, each operator is free from errors and his responsibilities lightened. Measurements to be performed are already set by the 3DSI station user, who programs and safely simulates the measurement path just by clicking the mouse. The percentage of scrap was drastically reduced as the finish machining begins only after evaluating the reports generated by 3DSI following the rough finish or semi-finish stage.”



On-machine checking of mold by Marposs optical spindle probe OP32 and 3DSI



*On-machine checking of Ducati clutch case by Marposs radio spindle probe WRS and 3DSI*

“The recent introduction of the Tool Offset Feedback function in the software enables us to set, for each tool, a stock thickness in length and radius and protects us from errors in the interpretation of the measurement results”. The initial skepticism at the purchase of the 3DSI was conquered as soon C+C Meccanica realized the great versatility of software joined to the simplicity of use confirmed by all the operators in the company. From the beginning, the software proved to be perfect for the Hermle machines with Heidenhain CNC, for which Marposs was the first to develop the post-processor.

This solution allowed the Italian company to avoid buying a new CMM: Mr. Chiosi tells us that before deciding to buy the 3D software, a comparison was made between the measurement output generated by the CMM and the output generated by 3DSI. The result was a perfect overlapping of data, with correlation in the order of 3-5 $\mu$ , and 2 $\mu$  repeatability.

### **Saving time and money**

In short, the owner quantifies a 20% saving in the machining cycle time of an individual item.

“We are enthusiastic about this software” comments Mr. Chiosi “since we had already been using Marposs part-probing successfully for many years, and with the last machining center bought, a Mazak Mold Maker 2500, we implemented the 3D measurement software combined with Marposs radio spindle probe WRS. A small investment with a big and immediate yield”.

***“It is quantified a 20%  
time saving in the  
machine cycle time”***

The introduction of the software in the product cycle, despite the high degree of complexity of these items, reduced the time to market for a quicker reply to the market dynamics allowing a substantial saving of time and money.

*Images and information have been kindly provided by:*

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