# **MoveInspect**

3D measurement of dynamic processes







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### Areas of application

In order to sustain its own competitive capability, every company has to meet the challenge to develop products within shorter periods, and manufacture them at lower costs. In so doing, the inspection of parts with respect to their motion and deformation behavior plays a decisive role. In which situation is the object deformed unintentionally during production operations? How does an element behave under load? How stable is the material? When does it fracture? AICON's optical measuring system MoveInspect is applied to detect these geometric changes three-dimensionally and to find precise answers to each question with the help of the measured data. MoveInspect has the unique ability to record any number of measuring points at a high frequency for an unlimited period of time. This is a true breakthrough in optical metrology.



#### Material testing

AICON's MoveInspect is also especially suitable for use in areas where movement is restricted and when the measurement is conducted under extreme environmental conditions. For example, MoveInspect can be used in an environmental chamber for motion analysis of material samples. Moreover, the system is ready for field work thanks to its compact design and its rugged camera body suitable for industrial requirements (IP 65).





## MEASURE THE



Depiction of measurement results

#### **Further fields of application**

The high speed digital cameras TraceCam F applied with MoveInspect HF can also be used for analyses in vehicle dynamics, for example for the analysis of wheel motion on a moving vehicle or in a test station (WheelWatch). Moreover, engine movements can be analyzed (EngineWatch).



## A D V A N T A G E

The following are typical applications for MoveInspect:

### **3D** motion and position analysis

- · Door slam testing
- Analysis of the closure processes of hoods (e.g. trunks), convertible tops and windows
- · Testing of body component vibrations
- Control of industrial robots
- Machine vision

#### **3D deformation analysis**

- Defect analysis in the production line (e.g. during welding)
- Behavior of components in wind tunnel and climate chamber
- · Analysis of collision damage
- · Material testing, structure analysis

#### **Functional principle**

Tests with Movelnspect take only a fraction of the time and effort that traditional sensors such as travel sensors need in laboratory tests. The measuring system acquires dynamic processes three-dimensionally and analyzes them with respect to their geometric change. Movelnspect's core piece is a camera bar equipped with digital cameras. It is available in two versions using different digital cameras: Movelnspect HF (high frequency) and Movelnspect HR (high resolution). That means, the applied digital cameras vary in acquisition frequency and resolution according to the measuring task. The high-end version is able to conduct tests without a time limit at a frequency of 490Hz. Both versions, however, allow for the analysis of any number of measuring points as determined by the operator.

For each point in time, the Movelnspect software determines, e.g. the 3D coordinates of object points, the 6-DOF coordinates of solid bodies, and the speed of the points and solid bodies. The calculation is based on the principle of spatial image triangulation (photogrammetry) and is fully automated.



Inspection of machine behavior

#### Work flow

Adhesive targets are placed at all points which are to be measured. As these targets are very inexpensive consumable supplies, MoveInspect is also the ideal system for destructive testing. Then MoveInspect is oriented in a way that all measuring points are located in the field of view of the cameras. After a short calibration (duration: 2 minutes), the system is ready for operation. The collected data of the coordinates are automatically transferred to the connected measuring software. Different modes are available to analyze the measurement: offine (i.e. later), online, or during the measurement in real time. The integrated magnifier function allows for the visualization of the slightest movement. This is also possible in case of high frequency processes with long recording times, i.e. when the data volume is large.

The results of the dynamic measurements are visualized in a clear and descriptive manner, for example with shifting vectors in the measuring image, way-path-diagrams, or video sequences. They may also be exported in the ASCII-format to external analysis software such as DIADem or MatLab. MoveInspect can be synchronized with other systems using standard interfaces. Thus, it also supports the control of dynamic processes.



Carrying out a seat measurement: mounting of cameras, target placement, measurement, report of results

# Practical example: Defect analysis in production process

Production defects can be detected and corrected right on site because MoveInspect may directly be integrated into running production. Although fixtures and production machines are periodically inspected with regard to their dimensional accuracies, problems arise in production nearly every day. For example, it may happen that a robot-based welding shop would suddenly deliver parts that are inaccurate and not true to gauge. Therefore, production machines, fixtures, and materials are checked step by step in order to find the cause of the deviations as quickly as possible. Yet causal research is very laborious without optical metrology. MoveInspect is able to significantly support this research. The measurement system is set up in running production. It continuously keeps track of each production step and observes both the machines and the part. Consequently it is possible to reveal quickly where in the production process the mistake has occurred.







Part inspection in running production

### Your advantages at a glance:

- Identification of the 3D position and speed of a variable number of measuring points for an unlimited time period
- Performance of long-term tests at frequencies up to 490Hz
- Significantly reduced setup work in comparison to traditional sensors such as travel sensors
- · Direct link to central data acquisition system
- 3D deformation analysis also possible in destructive testing thanks to inexpensive target accessories
- Clear visualization of results including shifting vectors, way-path-diagrams and video sequences
- · Further fields of application in vehicle dynamics

## Specifications

Acquisition frequency up to 1000 Hz at 1280 x 512 pixels

# MoveInspect HF

# MoveInspect HR





Hardware		
Sensor	TraceCam F stereo bar	TraceCam 2M / 5M trinocular system
Distance of cameras	variable	variable
Body	camera body suits industrial needs (IP 65)	camera body suits industrial needs (IP 65)
Flash	LED ringlight	LED ringlight
Resolution	1.3 megapixels	2.0/5.0 megapixels
Acquisition frequency	up to 490Hz	up to 5Hz
Size	1,000 mm x 100 mm x 100 mm	1,000 mm x 100 mm x 100 mm
Weight	approx. 7.0 kg	approx. 8.5 kg
Control unit	TraceCam F syncbox for 1-4 cameras (cascadable), ext. synchronization, power supply 12V or 90/240V, Lemo connector	TraceCam 2M / 5M syncbox for 1-4 cameras (cascadable), ext. synchronization, power supply 90-240V, Lemo connector
Data transfer	TCP/IP	TCP/IP
Processing computer	high-end laptop computer	high-end laptop computer
Operating system	Microsoft <sup>®</sup> Windows <sup>®</sup> XP	Microsoft <sup>®</sup> Windows <sup>®</sup> XP
Accessories	tripod, high end laptop computer, calibration panel, reference cross, one set of coded targets (ANCO-code), thereof 50 on magnetic mount, 5,000 retro reflecting targets (Ø10mm)	tripod, high end laptop computer, calibration panel, reference cross, one set of coded targets (150 pcs), thereof 50 on magnetic mount, 5,000 targets black-and-white (Ø10mm)
Software	MoveInspect Software	MoveInspect Software
Interfaces	interface to all established data acquisition systems (e.g. DIAdem, MatLab)	interface to all established data acquisition systems (e.g. DIAdem, MatLab)
Measuring Modes	Offline, Online, Realtime	Offline, Online
Position accuracy	$\pm$ 0.10 mm for measuring volume 1,000 mm x 1,000 mm x 500 mm	$\pm$ 0.05 mm for measuring volume 1,000 mm x 1,000 mm x 500 mm

Technical data are subject to change without notice.



# **MoveInspect**

3D measurement of dynamic processes

- Analysis of motion and deformation behavior of objects
- High-frequency measurement independent of number of measuring points
- Also applicable for long-term tests
- Replaces traditional travel sensors
- Reduction of setup work







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