VIDEOSTROBOSCOPES

IEEE 1394a, 1394b and GigE based Highspeed Strobcams and
USB, PCMCIA and PCI Synchronisation/Triggersystems

Principle

The Videostroboscope is used for visualization and recording of **vibrations** and **rotations** in slow-motion – on shaker, test benches, at non-accessible locations (endoscope-use) and on large or micro objects. It is an easy-to-use turnkey system and provides a low cost alternative to high speed cameras. No need for flash lights permits day light use. It allows automatic monitoring and provides a wide range of analysis tools. In combination with our special nanosecond light pulses it can be applied for frequencies up to 100 kHz as well as for high speed rotations.

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Advantages of Videostroboscope to the classical light Stroboscope

Automated monitoring: Image analysis permits automatic process control of test setups or in production via sensitivity to object location or vibration amplitudes or phase (please ask for details).

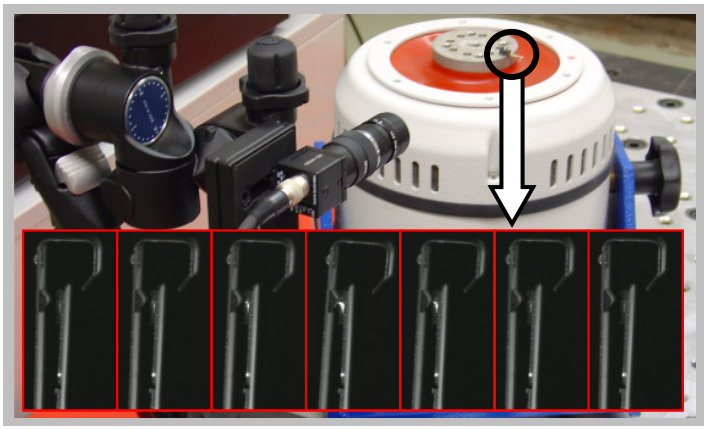
Recording: Sequences or single shots can be recorded and stored digitally. The images or sequences (avi, jpg etc.) can be further processed and included to presentations. Compared to conventional High Speed cameras this can be done over a very long period as the image streem is recored to the computer memory or hard-disks directly. Using solid state drives (SSD) this is possible with high frame rates an resolutions e. g. over 200Hz at VGA.

Micro-objects:

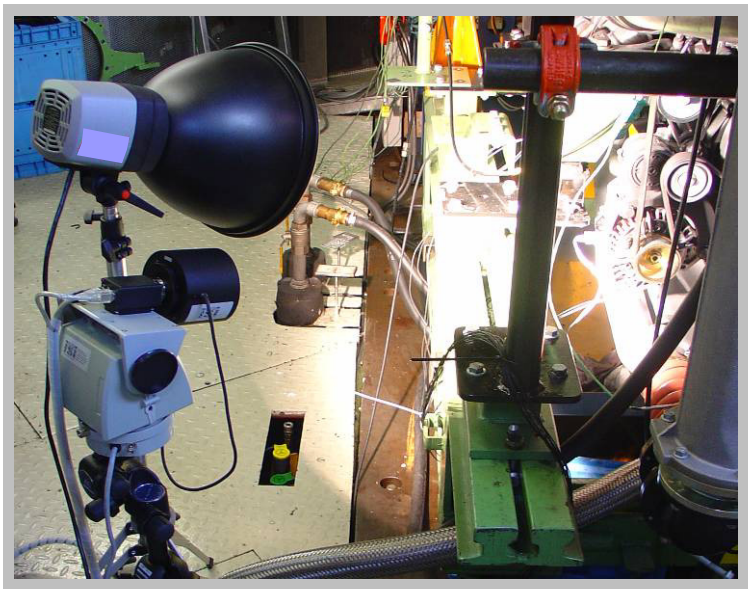
Applying zoomlenses or microscopes permit magnification of small objects.

Quantitative evaluation:

The images include information for comparison of objects or states. Image processing tools such as automated edge detection or correlation and measurement tools permit quantitative evaluation of vibration amplitudes.



No need for dark rooms, no eyestrain: In opposite to conventional systems based on flash lights, the video-stroboscope enables the user to work without eyestrain e. g. under daylight. High power flash lights are harmful for the eyes allowing short application periods only.



Security and image transmission:

The observer can be spatial separated from the object or danger zone by remote controlled versions (e. g. engine test stands). Object-observer distance up to 70m (unlimited using glass fibre).

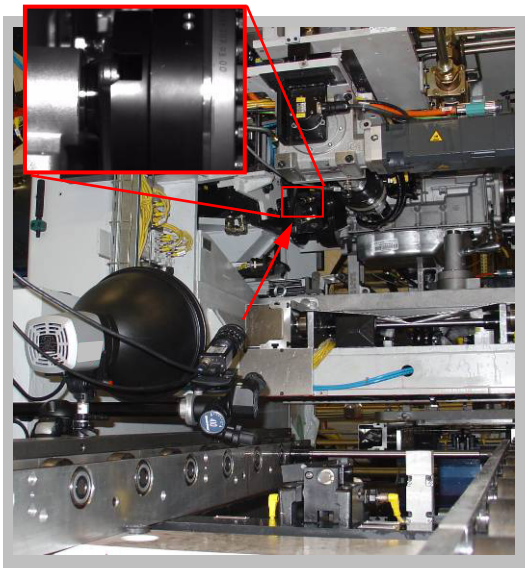
Environmental:

Operation is possible under extreme conditions (e .g. climatic chambers).

Accessibility:

The cameras can be installed on locations with difficult access for the human eye. Endoscope accessories for cameras are available.

Reproducibility: The "observer" (camera) permits reproducible positioning. The application is more flexible and precise than the observation by eye and stroboscopic illumination.



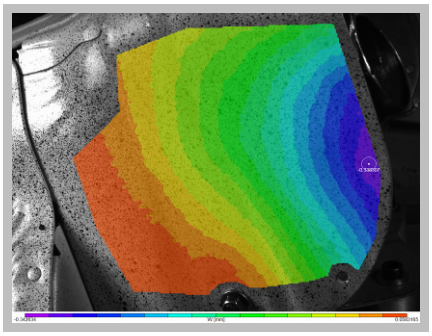
Visualising rotations:
The rotating object can be observed at a defined rotation or crank angle for each revolution. Due to the short shutter times of the camera, even high speed rotations are clearly visible. For extreme speeds the combination of IR-LED and daylight filters and CCD integration time of e. g. ¼ sec is available.

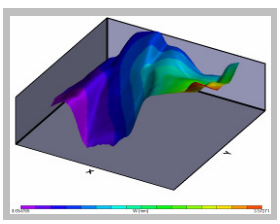
Vibration and rotation Sensors:
Synchronisation is possible via analog or TTL input signals. Digital outputs of light barriers or photo sensors (e. g. for rotations) can be directly connected to the device as well as analog excitation signals or outputs of sensors such as accelerometers or inductive sensors.

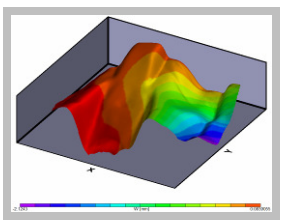
Trigger options:
The system analyses an external input signal (e. g. frequency and amplitude) and synchronises a digital or an analog output signal with adjustable properties such as phase delay, bandwidth etc.

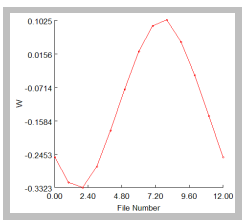
Portability:
The **isi**-synchronisation and trigger system is also available as mobile system (PCMCIA or USB) for laptops in combination with fire-wire cameras. The laptop package versions are delivered within a transportbox including all components.

Full field 3D deformation and strain analysis:
Combined with stereo image correlation the video-stroboscope turns into a 3D multi axis vibrometer. The **3D Vibrocorrelation-System** simultaneously measures all three axes of deformation or vibration amplitudes as well as the complete strain tensor on the entire surface. It works on non-planar surfaces and is not affected by large rigid body movements. Based on the software package VIC of correlated SOLUTIONS the accuracy is down to 1/100 pixel and 100 µstrain. Calibration is simple and quick.









2D Vibrocorrelation

While the stereo videostroboscope system in combination with image correlation permits the simultaneous measurement of all **three displacement axes** on the entire specimen surface (see prior section) a setup with one camera allows to measure 2D in-plane movements, accelerations, velocities or strain only in the camera plane. Simple 2D Vibrocorrelation methods are included to isi-Studio especially for **qualitative** sensitivity enhancement of motion and accelerations compared to observation by eye.

Quantitative evaluation of absolute movements in the image plane requires a calibration; while e. g. 2D strains can be evaluated directly as it is a dimensional value. The example shows qualitative vectors corresponding to the velocity of point, which moves in the image plane. The software automatically selects areas with high contrast. Only locations where is e. g. dark and white color on the surface show true rigid body movements and corresponding velocity. Areas with direct reflections and shadows should not be evaluated. For areas, which do not provide natural markers, the surface can be prepared artificially. For full field measurements especially for 3D strain and deformation measurement an artificial speckle field is easily generated as shown in the following.

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