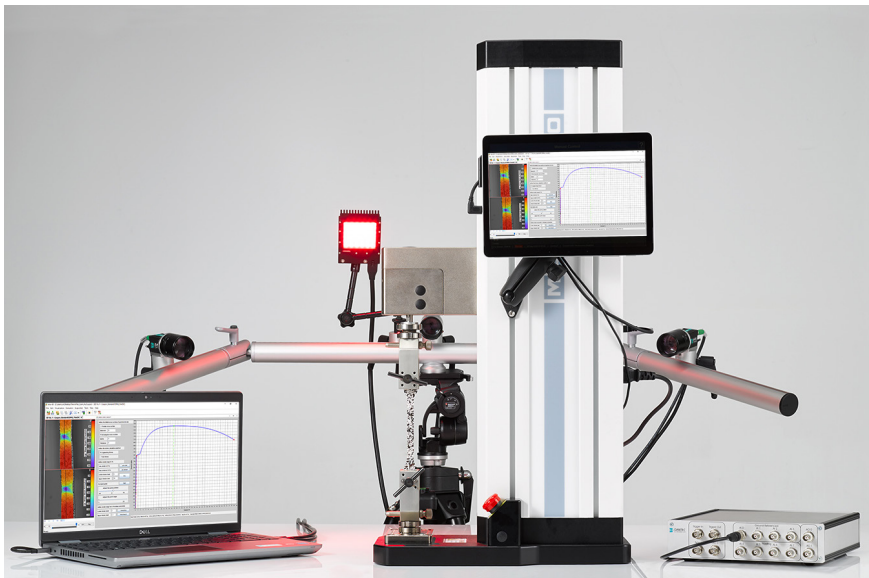


# FlexDIC System

Digital Image Correlation (DIC) system for advanced materials testing and motion analysis applications in industry & academia

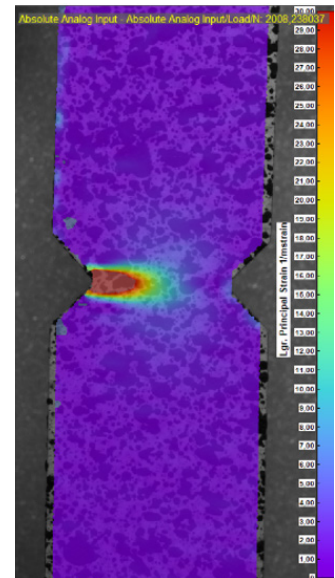


## A real measurement utility for any materials testing application

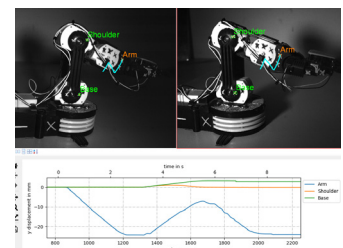
The FlexDIC is a Digital Image Correlation (DIC) measurement system designed as a flexible, robust and multi-functional industrial & academic utility for a wide range of materials testing & motion analysis applications. This easy-to-use system can perform all your testing needs allowing any user to quickly perform accurate & precise measurements for displacement, contour (shape), strain, and (discrete) kinematic quantities of tracked points. The FlexDIC is completely modular and can be upgraded with additional lenses, calibration targets, illumination systems, and also with additional cameras turning the system into a MulticamDIC system.

### Key benefits

- Complete & fully equipped measurement system
- Utilizes a 3-camera configuration (as standard)
- Incorporates USB3 or GiGE vision technology with either; 5 Mpx, 12.3 Mpx, or 24.4 Mpx cameras
- Upgradable system (i.e. to a MulticamDIC system)
- Real-time correlation & Point (marker) tracking
- Can be retrofitted with a stereoscopic microscope
- Operates in either; DAQ Triggered or Master/Slave mode



*Istra4D 2D-overlay visualization of Lg. Principle Strain 1 (Major Strain) of a notched, aluminium coupon in a quasi-static tensile test.*



*Istra4D Point Tracking function of a robot arm with 3-tracked markers.*

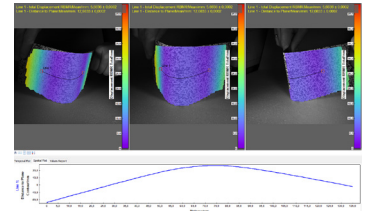
## Everything that is needed in a versatile DIC system

The FlexDIC is a complete & fully equipped measurement system supplied (as standard) with one Laptop PC, one DAQ Controller, lenses, calibration targets, mounting, and a tripod. The measurement performance of the FlexDIC system is harnessed using either; 1x, 2x, or 3x CMOS cameras with USB3 or GiGE Vision technology. (A standard FlexDIC system consists of a 3-camera system). Users have the option of selecting; 5 Mpx, 12.3 Mpx, or 24.4 Mpx cameras.

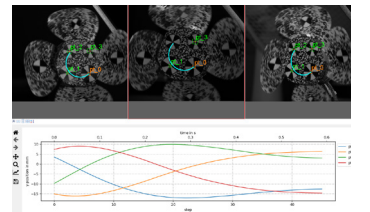
The system can operate in either; DAQ Triggered or Master/Slave mode. Using the DAQ Controller, the FlexDIC can read in up to 8x +/-10V analogue signals (i.e. for a load cell or LVDT). It also allows up to 2 analogue outputs to be read-out from Istra4D.



Setup of the FlexDIC system



Istra4D 2D-overlay visualization of displacement of a quasi-static bending test indicating the FoV from utilizing 3-cameras.

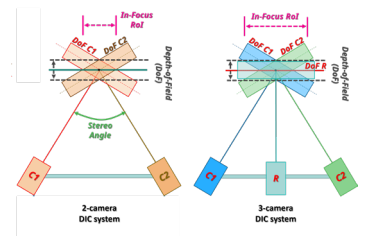


Istra4D Point Tracking function of spinning fan blade with 4-tracked markers.

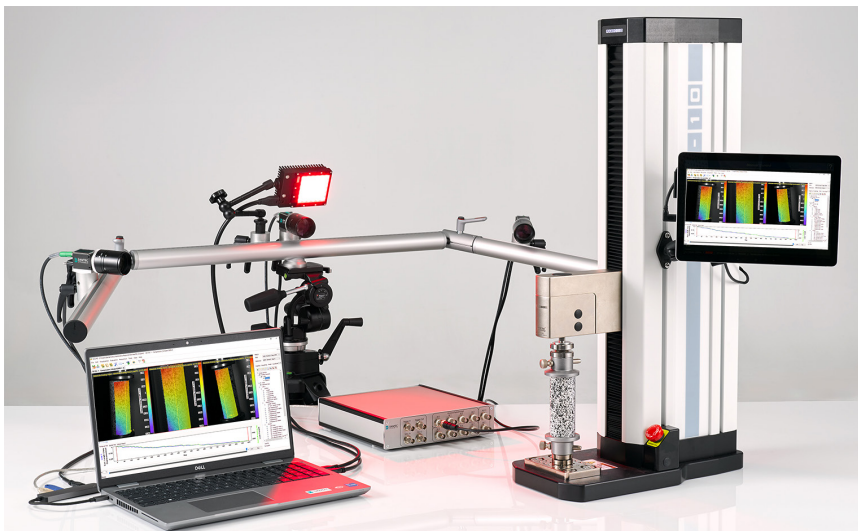
## The 3rd Reference Camera Perspective (CRCP)

Since 3D-information can only be calculated from objects that are imaged by at least 2 cameras, the Field-of-View (FoV) is limited to the overlap between each camera-pair FoVs. Achieving an overlap can be difficult, partially, due to the stereo-angle tradeoff, but also for the measurement of an object that is non-planar or curved.

The solution to overcoming this restriction is to use an additional perspective provided by a 3rd central camera positioned between the two outer cameras. The central camera is then assigned as the "reference" camera. This approach is known as the "Central Reference Camera Perspective (CRCP)".

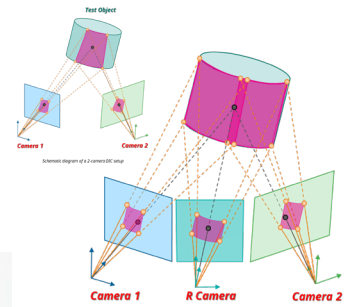


Schematic Diagram of a (traditional) 2-camera DIC setup & Schematic Diagram of a 3-camera DIC setup using the Central Reference Camera Perspective (CRCP).



FlexDIC system used to measure  $\epsilon_{g}$ . Principle Strain 1 (Major Strain) of a quasi-static compression test of a plastic tube.

When a CRCP is directed onto a 2-camera FoV, the outer camera FoVs can in turn be split & segmented with the FoV provided by the CRCP. This in turn increases the FoV of the measurement system, whilst retaining the spatial accuracy provided by the image scale as determined by the outer cameras. This allows for improved surface coverage on test specimens that are curved, cylindrical, or have uneven surface shapes and is particularly useful for the measurement of corners or edges with small radii.



Schematic diagram of a 3-camera DIC setup.



FlexDIC system used to measure the displacement of a quasi-static bending test. Components of the FlexDIC system.

## Application Notes & Success Stories

<p><b>Axial &amp; Biaxial Tensile Materials Testing Applications - Video</b></p> <p>Application #3: Crossform Aluminum Alloy - FlexDIC (3D)</p>	<p><b>Compression, Bending, Shearing &amp; FLC Materials Testing Applications - Video</b></p> <p>Application #6: Cylindrical foam - MultiCAM3D (3)</p>	<p><b>Fracture, Fatigue, Pressure &amp; Thermal Mechanic Materials Testing Applications - Video</b></p> <p>Application #9: Can Pressure Expansion - FlexDIC</p>	<p><b>Biomechanical &amp; Biomaterials Testing - Video</b></p> <p>Application #10: Compression Test Pinch (2)</p>
<p><b>Materials Testing Application Package (Istra4D V4.6) - Video</b></p> <p>Young's Modulus (Advanced UI)</p>	<p><b>IR Camera Analysis Package (Istra4D V4.7) - Video</b></p>	<p><b>Fracture Mechanics Package (Istra4D V4.7) - Video</b></p>	<p><b>FLC ISO12004 Applications Package (Istra4D V4.7) - Video</b></p>
<p><b>Esslingen University of Applied Sciences - Germany FlexDIC Success Story</b></p> <p>Success Story Esslingen University of Applied Sciences FlexDIC</p>	<p><b>Universiti Teknologi Petronas (UTP) - Malaysia FlexDIC Success Story</b></p> <p>Success Story Universiti Teknologi Petronas (UTP) FlexDIC</p>	<p><b>National University of Singapore (NUS) - Singapore FlexDIC Success Story</b></p> <p>Success Story National University of Singapore (NUS) FlexDIC</p>	<p><b>NUS - Singapore FlexDIC Success Story</b></p> <p>Success Story National University of Singapore (NUS) FlexDIC</p>

## Technical specifications

FlexDIC					
<b>Number of Cameras</b>		1, 2 or 3			
<b>Sensor, Frame Rate &amp; Interface</b>	5.0 Mpx (2448 x 2048 px) @ 77 Hz USB3 CMOS	5.0 Mpx (2448 x 2048 px) @ 24 Hz GiGE CMOS	12.3 Mpx (4096 x 3000 px) @ 30 Hz USB3 CMOS	12.3 Mpx (4096 x 3000 px) @ 9 Hz GiGE CMOS	24.4 Mpx (5312 x 4600 px) @ 5 Hz GiGE CMOS
<b>Std. Lens Focal Length</b>	25 mm				
<b>Camera Setup Configuration</b>	Adjustable				
<b>Std. Field-of-View (FoV)</b>	500 mm (H) x 350 mm (V) (down to 10 mm x 10 mm)				
<b>Std. Distance-to-Object (DtO)</b>	850 - 1500 mm				
Measurement Performance					
<b>Std. Spatial Resolution</b>	2 cameras	204 µm/px	122 µm/px	94 µm/px	
	3 cameras	112 µm/px	67 µm/px	52 µm/px	
<b>Std. In-Plane Resolution</b>	2 cameras	2 µm	1 µm	1 µm	
	3 cameras	1 µm	1 µm	1 µm	
<b>Std. Out-of-Plane Resolution</b>	2 cameras	4 µm – 20 µm	3 µm – 12 µm	2 µm – 9 µm	
	3 cameras	2 µm – 11 µm	2 µm – 6 µm	1 µm – 5 µm	
<b>Strain Resolution</b>	10 µstrain				

## Order information

We offer the FlexDIC as both a pre-configured/fixed configuration system and also as an unconfigured system.

Fixed/Standard Configuration		
	DSM 85600: 3-camera FlexDIC System	DSM 85700: 3-camera FlexDIC System
System	3x USB3 5.0 Mpx @ 77 Hz CMOS C-mount Cameras 3x C-Mount f=16mm Lens 3x C-Mount f=35mm Lens 1x Laptop PC with 1x USB-C 4-port USB-A Hub 1x DAQ Controller 1x Istra4D Software Package incl. Software Platform, Camera Acquisition, DAQ Triggering, 3D Correlation Evaluation, Real-time Correlation & Graphical Visualization. Application Scripting Modules (free-of-charge) FEA Validation Tool (free-of-charge) 1x 100mm Calibration Target 1x 150mm Calibration Target 1x XR-LED Illumination System (Red) 1x Mounting Rail & Brackets (0.7 m) 1x Mounting Rail Extension Arms (1 Pair) 1x Standard Tripod	3x USB3 12.3 Mpx @ 30 Hz CMOS C-mount Cameras 3x C-Mount f=16mm Lens 3x C-Mount f=35mm Lens 1x Laptop PC with 1x USB-C 4-port USB-A Hub 1x DAQ Controller 1x Istra4D Software Package incl. Software Platform, Camera Acquisition, DAQ Triggering, 3D Correlation Evaluation, Real-time Correlation & Graphical Visualization. Application Scripting Modules (free-of-charge) FEA Validation Tool (free-of-charge) 1x 110mm Calibration Target 1x 150mm Calibration Target 1x XR-LED Illumination System (Red) 1x Mounting Rail & Brackets (0.7 m) 1x Mounting Rail Extension Arms (1 Pair) 1x Standard Tripod