Revised version

IMT Quick-Scan™

Motorized control stage applications

- Filter contamination analysis

  ISO 16232: 2018, ISO 4406-4407, NAS 1638, VDA 19-1:2015, STD 5091,52

One-Shot Solution™

for filter contamination analysis

- Type A
- Type B

We hold patents on the principles, methods and designs for all One-Shot Solutions™ Type A and Type B.

iMTechnology
(Image & Microscope Technology)
www.imt-digital.com
www.IMT-Solution.com

Filter contamination analysis Quick-Scan™

Automatic analysis system for Filter contamination

Automated analysis system for filter contamination
Filter contamination analysis according to ISO 16232:2018 / ISO 4406-4407 / NAS 19-1:2015, STD 5091, 52, VDA 19-1:2015

Micro system

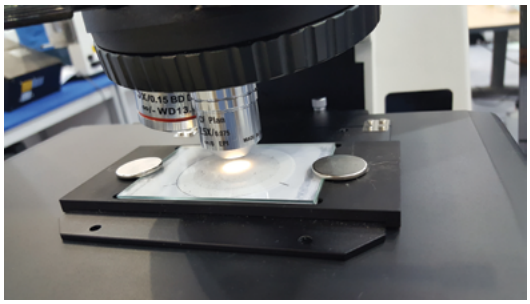
System components:

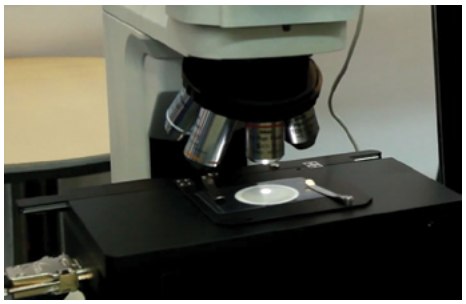
Option 1: High-power upright or inverted microscope using polarized light (stereo microscopes or zoom lenses are not recommended for finding and measuring particles smaller than 50um) + motorized control stage + computer + DT-M program. Recommended stages include Marzhauser, Prior Scientific, Ludl, and ASI.

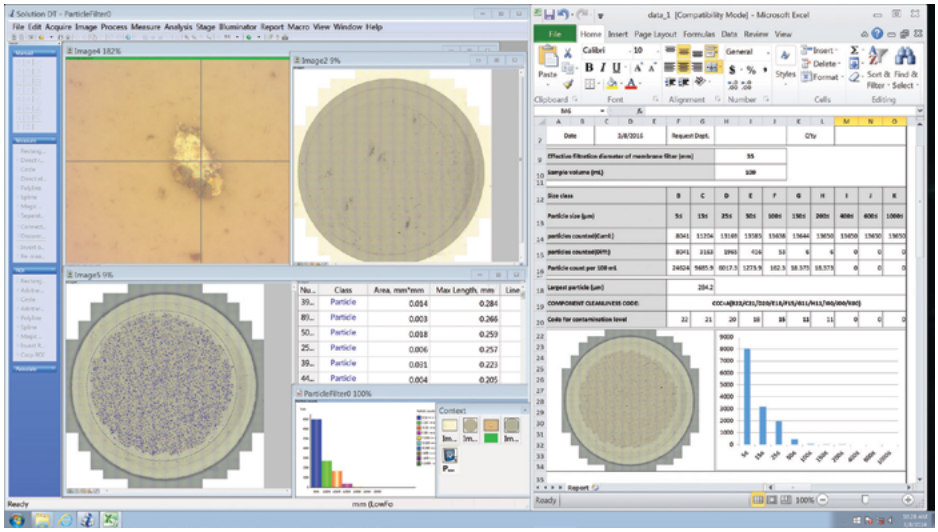
Option 2: One-Shot Solution™
(Recommended for finding 50um and larger particles) + computer + DT-M program.

Filter contamination analysis according to ISO 16232: 2018, ISO 4406-4407, NAS 1638, VDA 19-1:2015, STD 5091,52

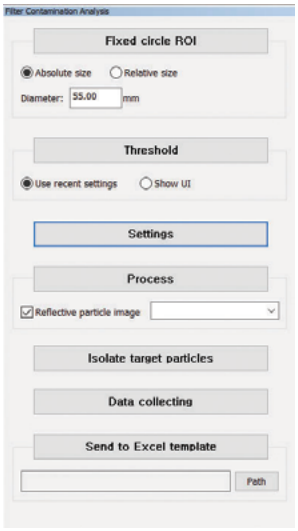
- Very fast scanning: Fast scanning time to capture images.
- Automatic image overlap correction: Live image overlap correction using accumulated data.
- Multiple scanning methods: Circular, rectangular and square shapes.
- Theta correction for camera and stage misalignment: Images are automatically corrected for camera and/or stage misalignment.
- Automatic shading correction: Shading correction is automatically applied during scanning.
- Auto focus adjustment: The Z focus is automatically adjusted as the stage moves in the X and Y directions during scanning.
- Stage position memory: The X/Y/Z stage positions are remembered for later recall.
- One-click position recall: With a single mouse click on the mosaic image, the stage moves to the exact position for further observation. It allows the user to switch to a higher magnification objective for more detailed inspection and image capture.
- Export to Excel template: Results can also be exported to a custom Excel report.
- Quick results review: The largest particles are highlighted for better observation.
- Automatic detection of Metal shiny (Metallic shiny particles), Particles (The others), and Fibers (Fibres) : They are automatically defined and classified using a reference image.







• Largest particles or metals are highlighted

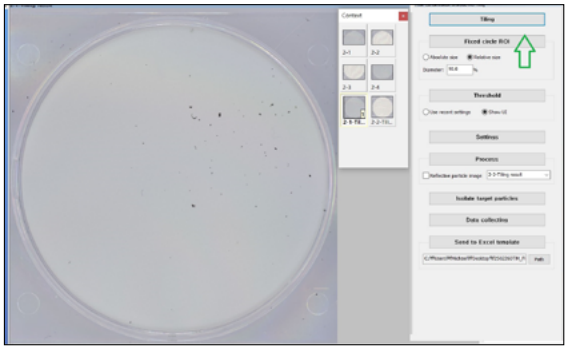


• Workflow for easy and fast analysis

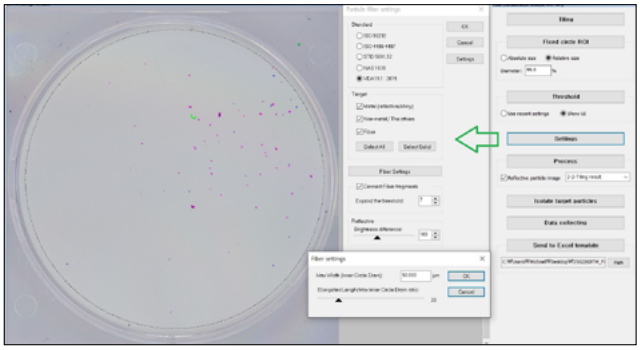
• Filter contamination analysis Quick-Scan™

Workflow for easy and fast analysis

• Workflow makes it easy and fast for even beginners to use.
Follow the workflow and get results and reports automatically with just a click of the mouse.



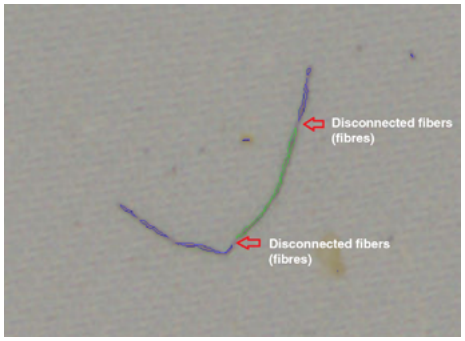
• Image capture and automatic tiling

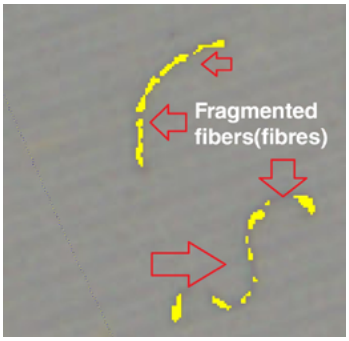


• Making settings and auto detection

Added special features for fiber extraction and measurement.

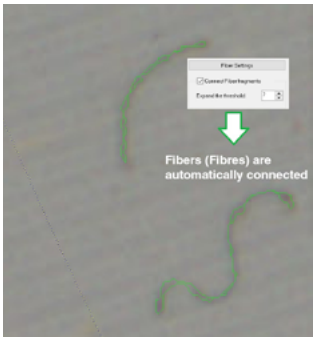
• Fibers are thin and long, with no distinct contrast, unlike shinny metals and regular particles. This often causes them to break apart or break into pieces at threshold.



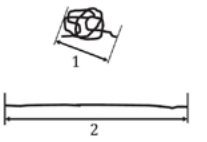


Therefore, in order to accurately extract and measure fibers, we added a special function to automatically connect fragmented fibers.

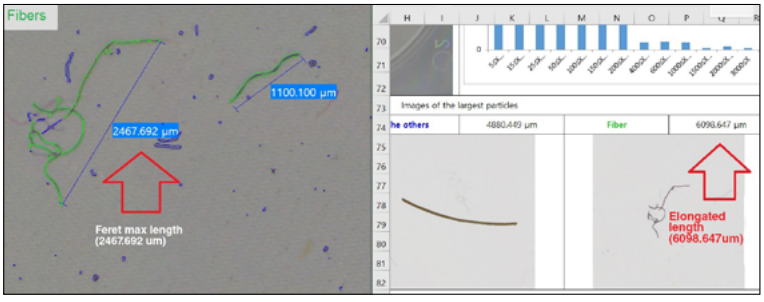
• As opposed to other particles, (textile) fibres tend not to have a fixed shape, with the result that their orientation, position, bends or twist on an analysis filter is generally quite haphazard. With such an arbitrary shape, stating the length as Feretmax is less suitable for characterizing such particles. Therefore, the length of a fibre can alternatively be expressed as the “elongated length” This length, which corresponds with an untangled, elongated fibre, can be calculated using computational image-processing methods.



• Fibers (Fibres) are automatically connected

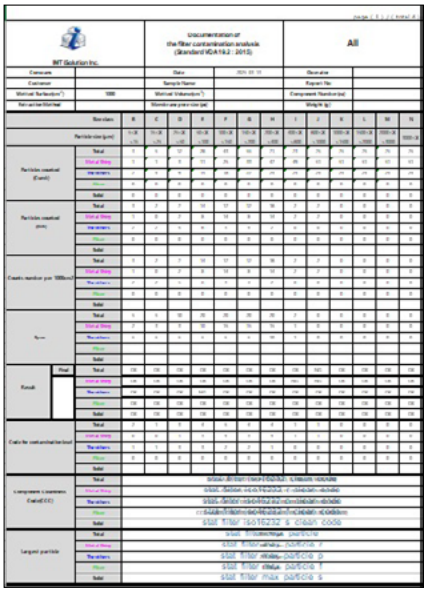


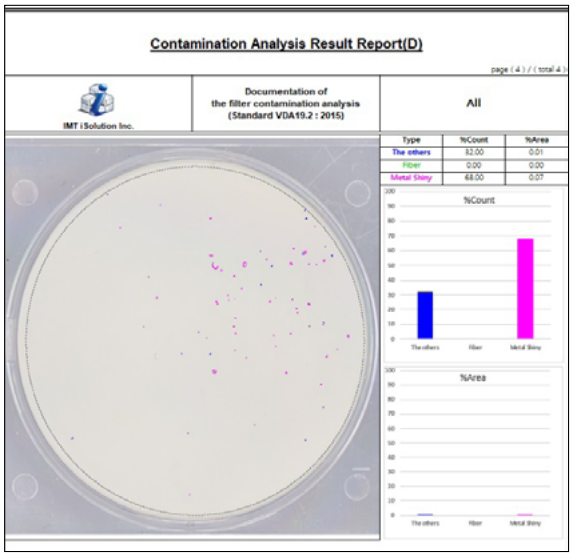
Key
1 length = $Feret_{max}$
2 length = elongated length

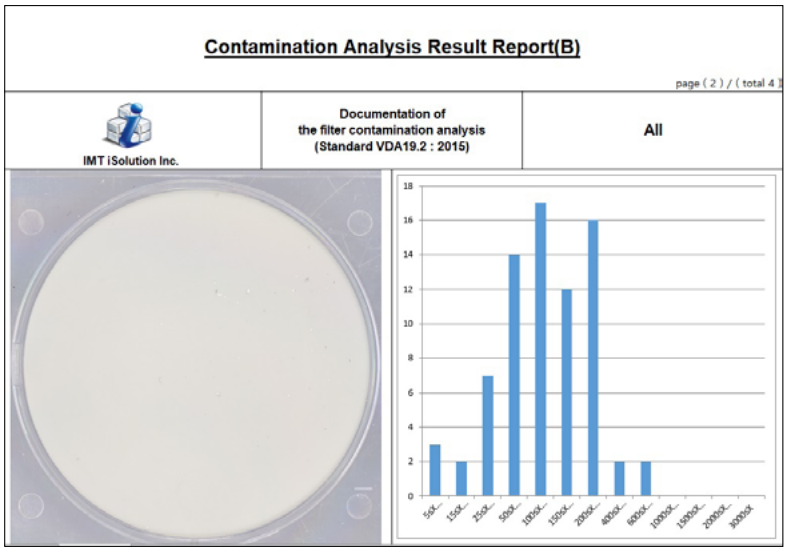


• In the report, Fibers (Fibres) are expressed in elongated length.

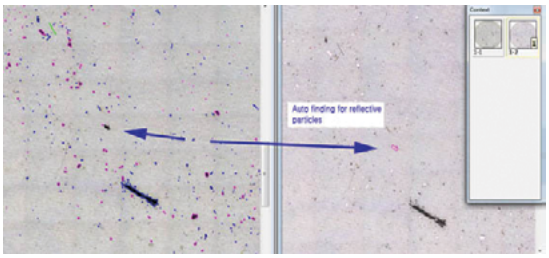
By following the workflow and clicking the mouse, a contamination analysis result report is automatically generated.

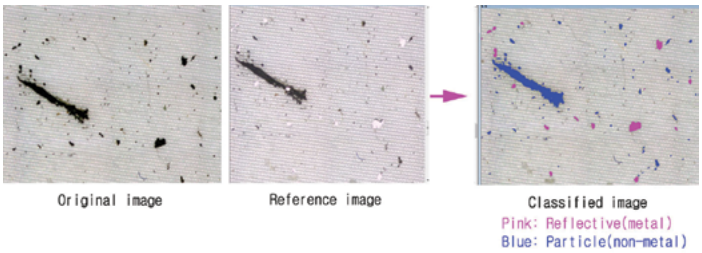


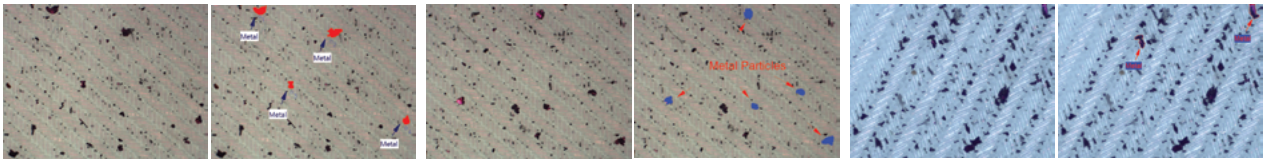




Automatic detection of Metal shiny (Metallic shiny particles) and Particles (The others): Two different methods can be used optionally. The simple thresholding method of common image analysis routines is not enough to define organic and inorganic objects such as metal and non-metal objects. We integrate special algorithms to find visual texture differences and other parameters to define and classify metal and non-metal objects with similar color and brightness.



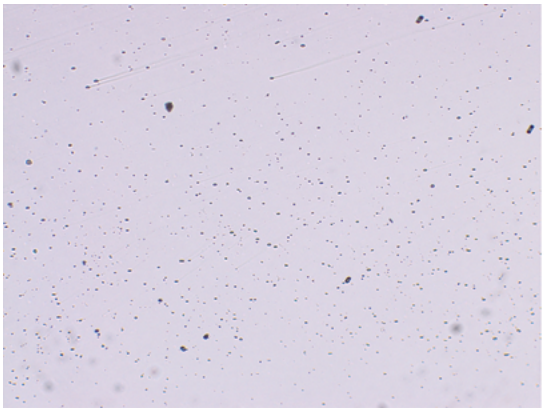


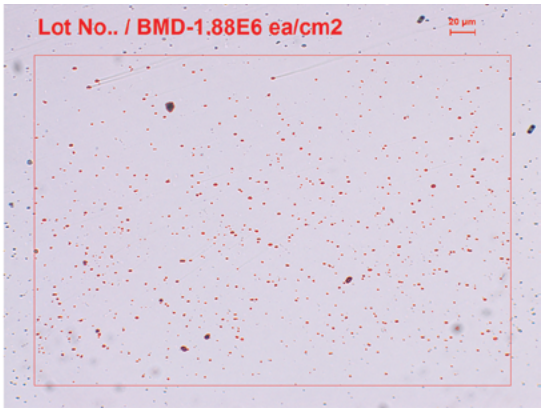


• Filter contamination analysis Quick-Scan™

Custom Particle Analysis

- Analysis can be applied to multiple images or to selected fields of interest (FOI). Annotations such as text and scale bars can be added to the images to gain more detailed information.



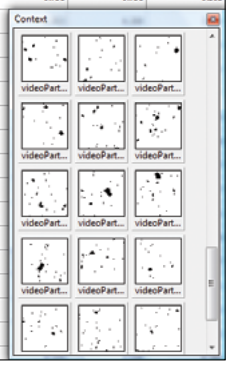


Particle Shape and Size Analysis

- Particles across multiple images are classified by shape and size. Custom parameters are available for selecting and sorting data. Volume distributions and other statistics are generated. The particle gallery shows the shape of each object in each classification range in the data collector table. All resulting data and particle gallery can be exported to MS Excel with a simple mouse click.

Statistics	Image Name	Object View	Equal Circle Diam	Min Feret Diam	Max Feret Diam	Avg. Feret Diam
Min	0.000	0.000	1.271	0.098	0.796	0.505
Max	0.000	0.000	114.691	102.757	166.021	136.663
Mean	0.000	0.000	7.796	6.122	9.582	8.040
Std.Dev.	0.000	0.000	10.550	9.365	14.914	12.436
Variance	0.000	0.000	111.302	87.712	222.443	154.662
Skew	0.000	0.000	4.697	4.668	5.099	4.922
Excess	0.000	0.000	32.845	32.189	37.843	35.092
Var.Coeff.	0.000	0.000	135.309	152.962	155.645	154.669
Sum	0.000	0.000	6463.649	5075.737	7943.763	6665.649
# Samples	10	829	829	829	829	829
# Blocks	10	10	10	10	10	10
95% confidence	0.000	0.000	0.602	0.535	0.852	0.710
Relative accuracy	0.000	0.000	7.730	8.739	8.892	8.836

Number : Block	Object View	Equal Circle Diam	Min Feret Diam	Max Feret Diam	Avg. Feret Diam
691 : 9		3.114	0.796	6.416	4.322
692 : 9		6.098	4.561	7.345	5.903
693 : 9		2.697	1.593	2.518	2.089
694 : 9		1.271	0.796	0.796	0.505
695 : 9		1.271	0.796	0.796	0.505
696 : 9		4.120			
697 : 9		6.031			
698 : 9		11.584			
699 : 9		9.766			
700 : 9		7.192			
701 : 9		1.798			
702 : 9		3.241			
703 : 9		2.010			
704 : 9		15.390			
705 : 9		6.847			
706 : 9		2.982			
707 : 9		8.809			
708 : 9		3.919			
709 : 9		10.092			
710 : 9		6.483			



Automated analysis system for filter contamination

- Filter contamination analysis according to ISO 16232:2018 / ISO 4406-4407 / NAS 19-1:2015, STD 5091, 52, VDA 19-1:2015

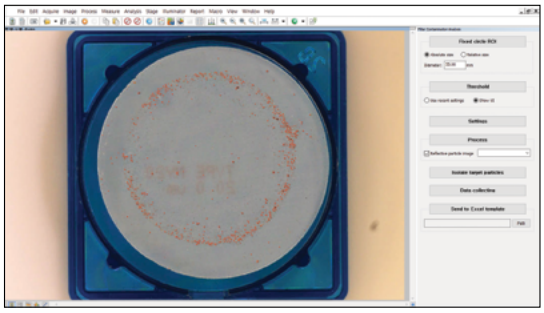
One-Shot Solution™

We have the patents in the principle, method,
and design for all one-shot solution™ type A and type B.

Automated analysis system for filter contamination

Filter contamination analysis according to ISO 16232:2018 / ISO 4406-4407 / NAS 19-1:2015, STD 5091, 52, VDA 19-1:2015

System components: One-shot machine + Software + PC

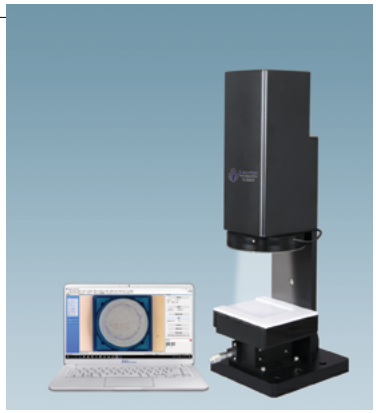


Type A

Telecentric lens
- Optical magnification: 0.16x- WD: 240mm
- DOF: 6mm- Optical distortion: 0.01%
- FOV: 75mm x 50mm
- Camera: 45MP/ 20MP, 1.4 inch/ 1 inch sensor size, USB3.0 interface.
- Windows OS: Win11/ Win10/ Win7
- ISO 16232: 2018, ISO 4406-4407, NAS 1638, VDA 19-1:2015, STD 5091,52
- Automatic and fixed methods for illumination and thresholding
- Export to Excel template: You can also export the results to a custom Excel report.
- Quick view of results: The largest particles are highlighted for better observation.
- Automatic detection of Metal shiny(Metallic shiny particles), Particles(The others), and Fibers(Fibres) : They are automatically defined and classified using a reference image.
- Workflow for easy and fast analysis

Type B

Telecentric lens
- Optical magnification: 0.26x - WD: 130mm
- DOF: 1.6mm - Optical distortion: 0.03%
- FOV: 50mm x 35mm
- Camera: 45MP/ 20MP 1.4 inch/ 1 inch sensor size USB3.0 interface.
- Windows OS: Win11/ Win10/ Win 7
- ISO 16232: 2018, ISO 4406-4407, NAS 1638, VDA 19-1:2015, STD 5091,52
- Export to Excel template: You can also export the results to a custom Excel report.
- Quick view of results: The largest particles are highlighted for better observation.
- Automatic detection of Metal shiny(Metallic shiny particles), Particles(The others), and Fibers(Fibres) : They are automatically defined and classified using a reference image.
- Workflow for easy and fast analysis



The Advantages of Telecentricity

Provided by Edmund Optics

The ability to quickly perform repeatable, high accuracy measurements is critical to maximize the performance of many machine vision systems. For such systems, a telecentric lens allows the highest possible accuracy to be obtained.

Zero Angular Field of View: Parallax Error Elimination

Conventional lenses have angular fields of view such that as the distance between the lens and object increases, the magnification decreases. This is how the human vision behaves, and contributes to our depth perception. This angular field of view results in parallax, also known as perspective error, which decreases accuracy, as the observed measurement of the vision system will change if the object is moved (even when remaining within the depth of field) due to the magnification change. Telecentric Lenses eliminate the parallax error characteristic of standard lenses by having a constant, non-angular field of view; at any distance from the lens, a Telecentric Lens will always have the same field of view. See Figure 1 for the difference between a non-telecentric and a telecentric field of view.

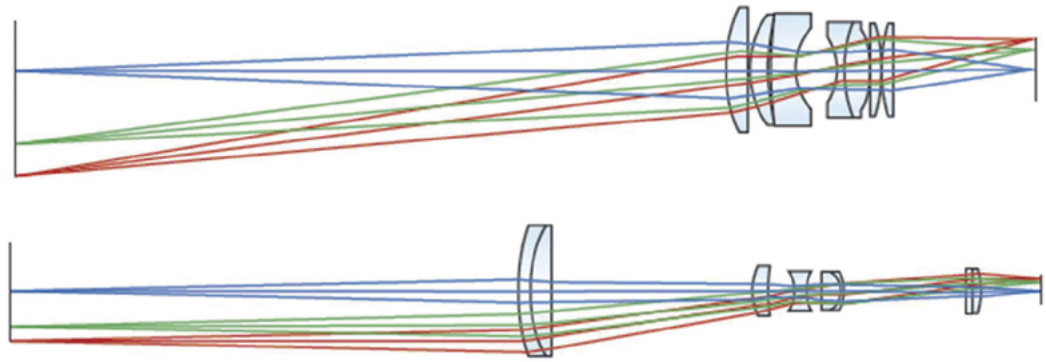


Figure 1:
Field of View comparison of a Conventional and Telecentric Lens. Note the conventional lens°Øs angular field of view and the Telecentric Lens's zero angle field of view

A Telecentric Lens's constant field of view has both benefits and constraints for gauging applications. The primary advantage of a Telecentric Lens is that its magnification does not change in respect to depth. Figure 2 shows two different objects at different working distances, both imaged by a Fixed Focal Length (non-telecentric) Lens (center) and a Telecentric Lens (right). Note that in the image taken with a Telecentric Lens, it is impossible to tell which object is in front of the other. With the Fixed Focal Length Lens, it is quite obvious that the object that appears smaller is positioned farther from the lens.

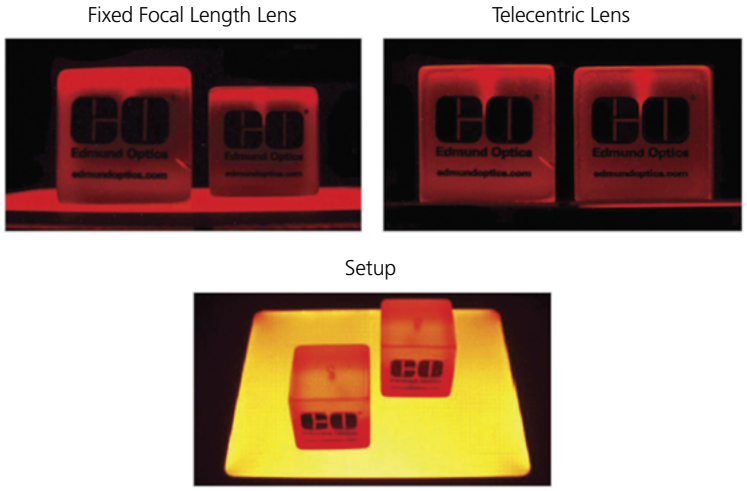


Figure 2:
The Angular Field of View of the Fixed Focal Length Lens translates to Parallax Error in the Image and causes the two Cubes to appear to be different sizes

Telecentricity and Distortion

Another advantage of using Telecentric Lenses in metrology applications is that Telecentric Lenses typically have lower distortion values than Fixed Focal Length Lenses. Distortion causes the actual position of an object to appear as though it is in a different location, which can further decrease measurement accuracy. For example, Figure 5a shows jumper pins on a circuit board that has been imaged by a Fixed Focal Length Lens with high distortion. The distortion, coupled with the parallax error inherent to non-telecentric lenses, makes the pins toward the edge of the image appear as though they are bent toward the center. When looking at the same pins with a Telecentric Lens, as in Figure 5b, it is apparent that the pins are indeed straight.

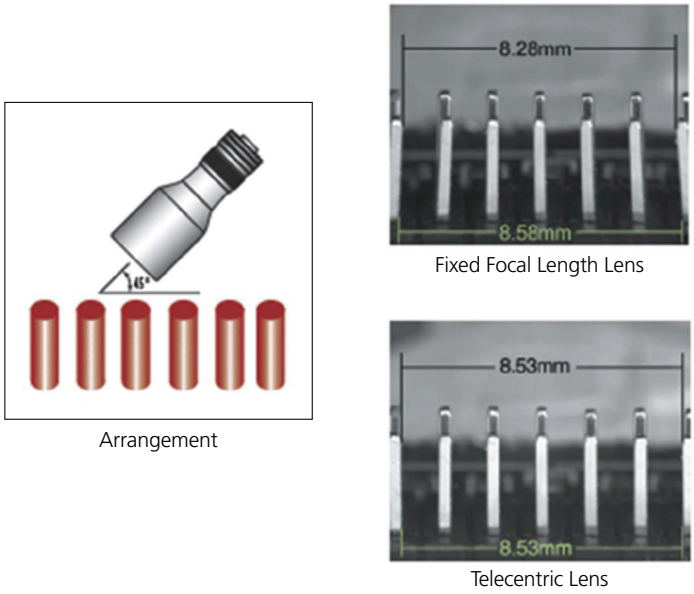


Figure 5:
Comparison of Jumpers on a Circuit Board. Figure 5a shows an image that has been taken with a Fixed Focal Length Lens. Figure 5b shows an image that has been taken with a Telecentric Lens. Note that the pins do not appear bent in the telecentric image

IMT Quick-Scan™

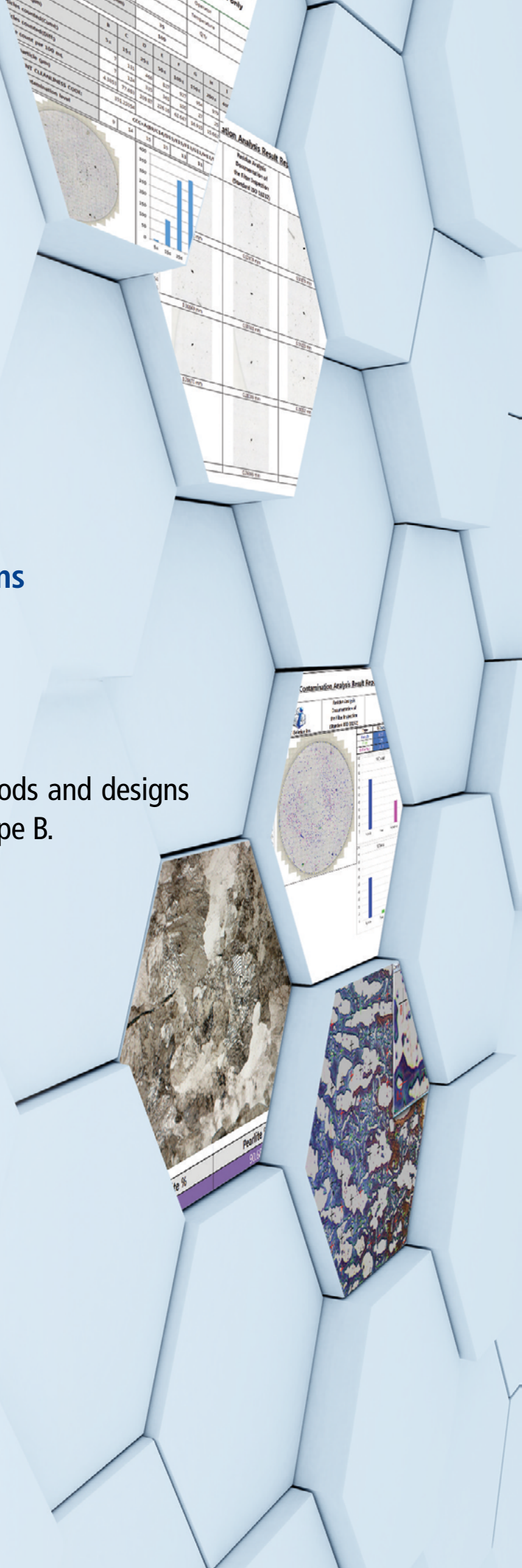
Motorized control stage applications

- Filter contamination analysis

One-Shot Solution™

We hold patents on the principles, methods and designs for all One-Shot Solutions™ Type A and Type B.

- Type A
- Type B



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