



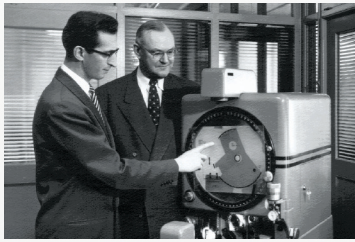
# Optical Comparators

Contour Projector® Technologies



# Optical Comparator History

For over 75 years, OGP® has been the world leader in optical measurement technology for manufacturing quality control. OGP has developed a wide range of technologies for optical measurement that have revolutionized the use of comparators in manufacturing.



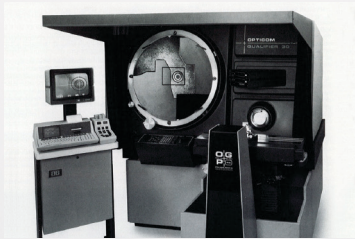
## 1945 – OGP is Founded

The optical comparator was invented in 1929 and was further developed by Eastman Kodak and employed extensively in the production of the Norden bombsight used by U.S. and Allied bombers during World War II. Edward C. Polidor (OGP founder), an officer in the U.S. Army Ordnance Division, worked closely with Kodak® engineers to optimize and improve the techniques of optical gaging.



## 1956 – Projectron

Projectron™, the world's first electronic edge detection system for optical comparators using photocell technology and analog circuitry, is introduced, foreshadowing the need for automation in the inspection industry.



## 1984 – VidiProbe Contour Projector

The VidiProbe introduction effectively bridges contour projector and video inspection technologies and was highly valued by customers who were looking for the “best of both worlds” – optical comparators and video systems.



## 1995 – Top Bench

As new demand for compact benchtop machines emerged, OGP responded with a revolutionary optical system – Top Bench®. Images were erect and unreversed, regardless of illumination used (profile or surface). The side of the part facing the operator was the same side seen on the screen. This combination of ergonomic features was unprecedented.



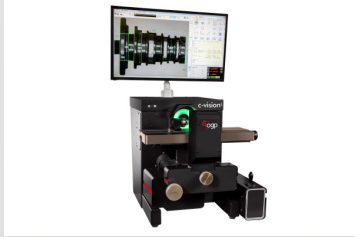
## 2009 – Groundbreaking Optical Comparator Technology

Innovative all-LED TruLight® illumination, a world-first use in optical comparators and eCAD®, an electronic overlay package that allows a CAD model to project virtual charts onto the comparator screen, for comparison with part images are applied to new benchtop horizontal Contour Projectors.



## 2013 – c-vision

OGP SNAP™ optics and software were incorporated into a horizontal projection optical comparator housing. Leveraging the OGP comparator worktable and motion system, provided a much heavier load capacity than seen on most video measuring systems of comparable travel.



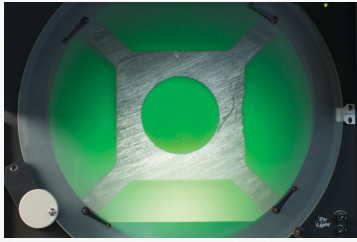
## 2018 – c-vision Lite

Taking the heart of the c-vision™ product, the heavy-duty worktable, and the large field-of-view optics and dispenses with the rest of the structure to provide the benefits of the concept at an attractive price.



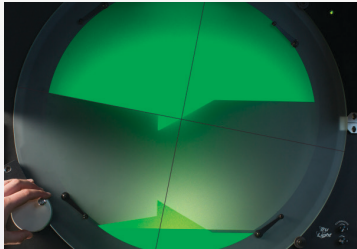
# Versatile Measurement Systems

OGP offers a complete line of optical comparators with the world's most advanced measurement technologies.



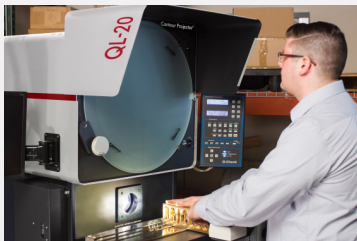
## Surface Inspection

TruLight through-the-lens surface light is a high intensity, pure-white light, projected parallel to the optical axis. This type of illumination is ideal for visual inspection of surface grain, texture, cracks, flaws, or colors in the object's surface. Three bright all-LED illuminators are available: Coaxial Surface Light, Profile Light, and Oblique Surface Light.



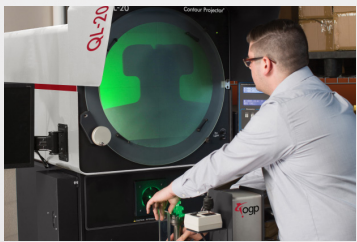
## Angle Measurement

The rotating screen ring and digital protractor readout allow direct measurement of angles. Radius and angle chart gages are available for direct comparison as well.



## Manual Inspection

OGP comparators offer a constant, long working distance between the part being inspected and the front lens. This large working area provides ample room for tooling fixtures, or for manual inspections without fixtures.



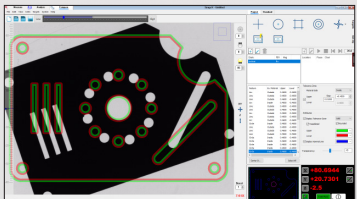
## Tool Pre-Setting

The comparator's high magnification and bright light make it convenient for use as a manual tool presetter. Ample room is available in the work envelope to manipulate the part by hand to facilitate alignments.



## Off-Axis Measurement

Helix motion allows measurement of threads, gears, and gear cutting hobs by rotating the part so that the features are presented correctly to the optics and measured normal to the part axis.

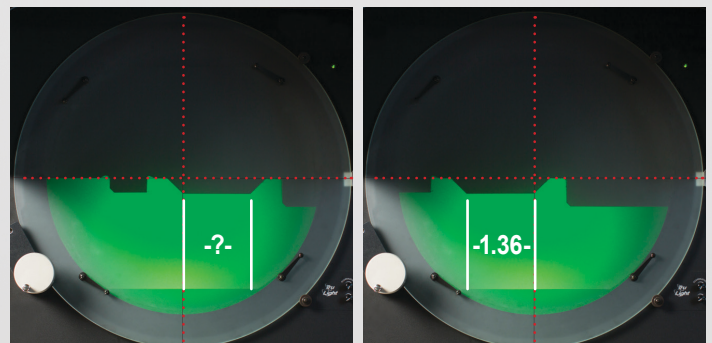


## Measurement by Comparison

Overlay charts provide a master outline of the nominal part, allowing easy comparison of the actual part to the master.

## Measurement by Motion

Distances between features can be measured manually using the standard DRO controller, or even using a ruler to measure directly on the screen and simply dividing the distance by the magnification. Fully automatic measurements can be made using optional edge detection and automation software.

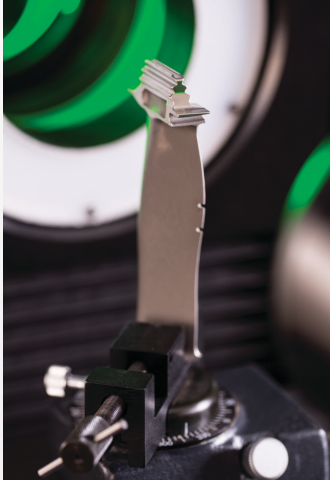




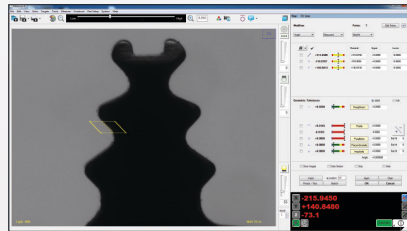
# Industries

OGP optical comparators use cutting-edge optical, lighting, and automation technologies, handling the tight tolerances and wide range of applications in the manufacturing process.

## Aerospace



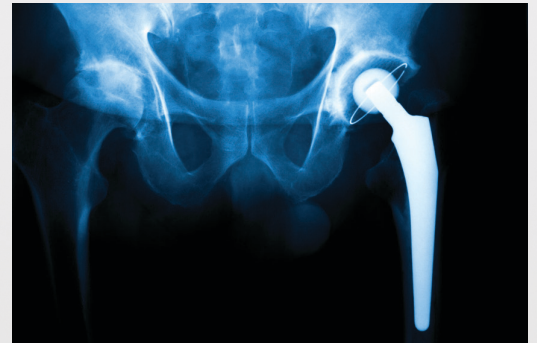
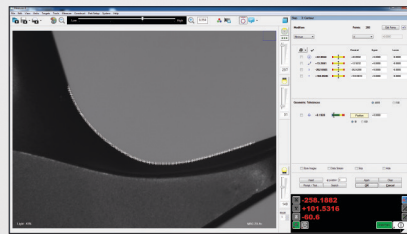
Aerospace parts often have complex shapes, critical dimensions, and tight tolerances. OGP Optical Comparators handle these requirements easily, with a high payload capacity, large helix motion and full featured measurement software.



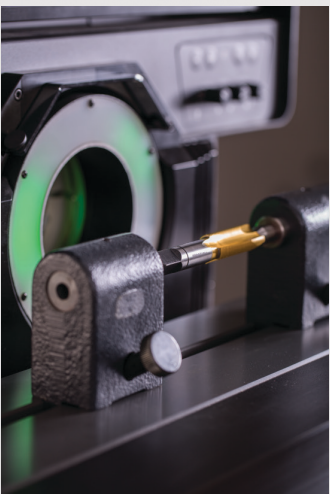
## Medical



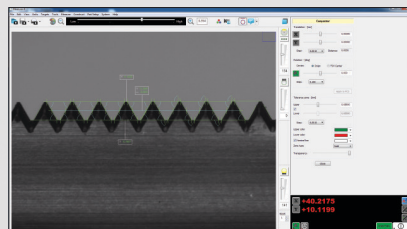
Medical devices such as orthopedic implants are designed to match the human form, with organic curves controlled by unconstrained profile tolerances. Optional Measure-X® software provides the tools for OGP Optical Comparators to measure these complex shapes and apply the geometric tolerances correctly.



## Manufacturing



Large castings, turned shafts and cylinders and other machined and formed parts are equally at home on the OGP Optical Comparators. The large throat clearance and generous XY measurement range let you measure most anything you can make in your shop.





# c-vision Video Contour Projectors

## The Best of Both Worlds

The c-vision™ Video Contour Projector® combines the speed and accuracy of a video measurement system with the rugged capacity of an optical comparator to create the world's easiest-to-use shop-floor measuring tools.



c-vision Floor Model

## Tough

Optical comparators are a mainstay of shop-floor measurement. Their tough construction and big viewing screen make measurements fast and easy.

## Fast

Traditional video measurement systems offer the high magnification and the speed of automatic measurement.

## Versatile

c-vision brings you the best of both worlds – the rugged, proven design of a profile projector and the accuracy of a precision video measurement system. With 60% more magnification range than a standard comparator, you can accurately measure features up to 4 inches without moving the worktable.

## Reliable

c-vision offers the rugged construction and high reliability you expect from OGP – the leader in non-contact measurement systems for over 75 years.

Scan to view c-vision video:





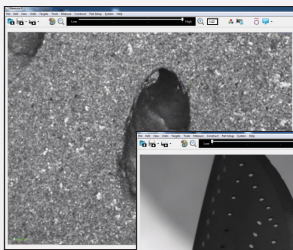
# Innovative Optics

c-vision multiple magnification, telecentric optical system offers the convenience of up to a 4-inch field of view, and the resolution to measure small features accurately.

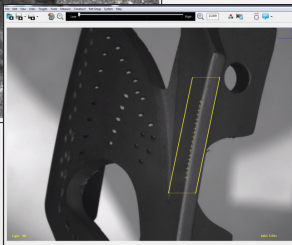
The heart of c-vision optics is the oversized front receiving lens which creates the large field of view. The optics are fully telecentric, ensuring accurate size measurements throughout the field.

The OGP digital megapixel metrology camera measures the entire field of view in one snapshot, enabling dozens of features to be measured at once. Instantly available electronic zoom settings enable inspection of small features up-close.

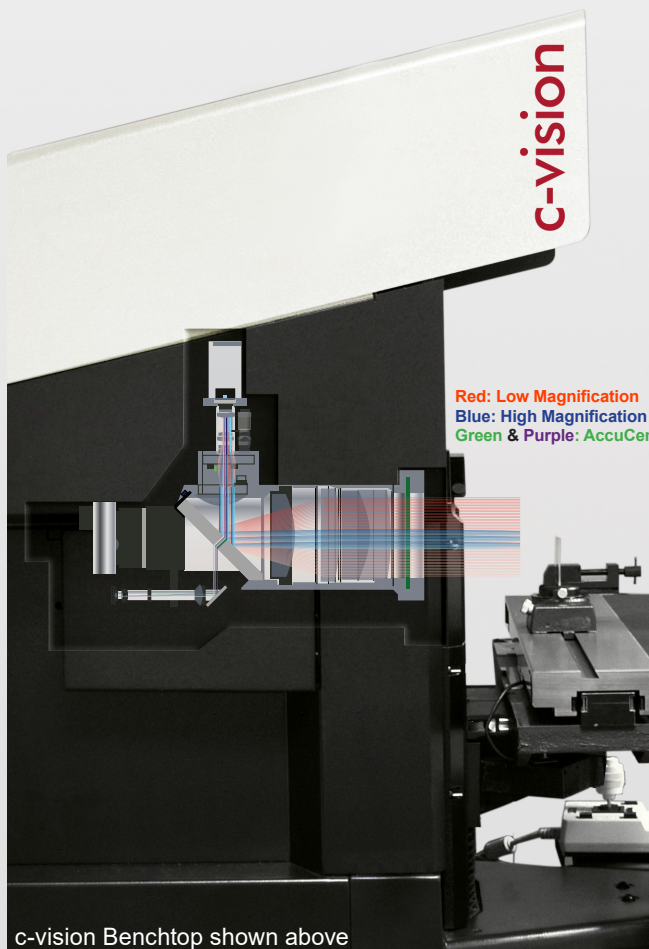
For small feature sizes, high optical magnification is needed to achieve the optical resolution required for high accuracy measurement. c-vision switches to high magnification at the touch of a button – with industry proven OGP AccuCentric®, calibrating paracentral and parfocal, this automatically compensates magnification for each mag lens change to ensure accuracy.



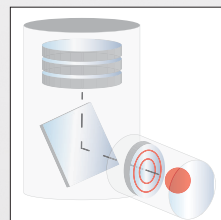
Switch instantly between low and high optical magnification and use digital zoom to zero in for a closer look.



Low magnification has up to 4-inch field of view – more than a 30-inch optical comparator with a 10x lens (which has 3-inch field of view). Optical magnification and digital zoom together provide a huge 16 to 1 magnification range.

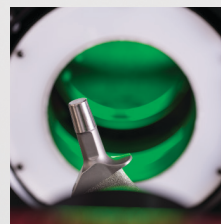


c-vision Benchtop shown above

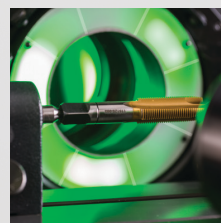


OGP's exclusive AccuCentric auto-calibration automatically confirms magnification with every mag-lens change.

Available on Benchtop and Floor Model systems only.



TruLight all-LED illumination sources are designed to complement the c-vision unique wide field optics. Backlight and square-on internal surface lights fill the field of view with uniform, bright light to pick up the smallest details.



The 8-sector programmable ring light highlights surface details, allowing measurements of features that standard optical comparators are unable to detect with conventional surface light.



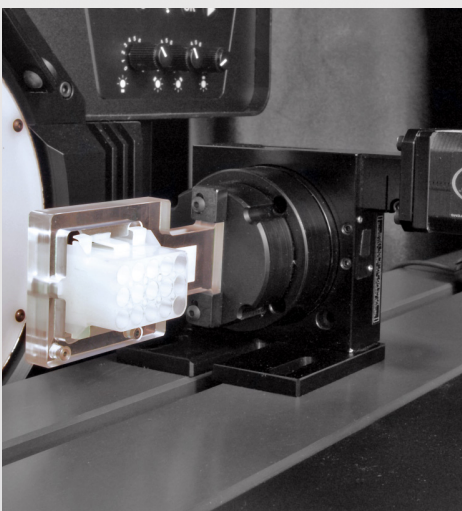
# A True Shop Floor Measuring Machine

c-vision offers rugged construction and simple controls that make it ideal for use right on the shop floor. Hardened worktables, fully enclosed optics and industrialized controls stand up to harsh environments.

c-vision has an open work envelope that makes it easy to load or unload large, heavy parts. Completely telecentric optics create crisp images that make measurements easy. Just load a part and simply push a button to measure your part instantly.



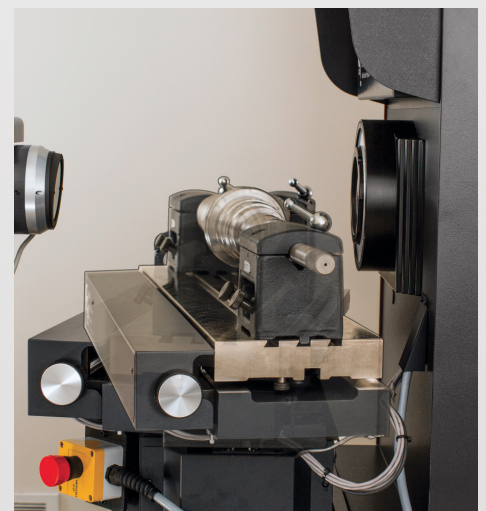
c-vision offers high load carrying capacity and the open work envelope of a horizontal comparator. The floor model offers a 350 lb load capacity.



Optional rotary stages automatically bring features of interest into view.



Operator controls are simple and easy to reach.



Helix stage motion of up to  $\pm 7.5^\circ$  allows the table to pivot for correct thread profile measurements.



# c-vision Video Contour Projectors



Features	c-vision Lite	c-vision Benchtop	c-vision Floor Model
<b>XYZ Travel</b>			
Standard	12" x 5" x 1.25"	15" x 6" x 2"	15" x 9" x 2"
Optional	—	18" x 6" x 2"	15 x 10" x 2", 18" x 9" x 2", or 18" x 10" x 2"
<b>Drive System</b>			
Motorized	✓	✓	✓
<b>Optics</b>			
Telecentric, upright and unreversed			
<b>Optical System</b>			
Standard	Fixed Mag with 1.88" Field of View and digital zoom	Motorized Dual Mag turret with 3.0" low mag Field of View and 4x high mag lens	Motorized Dual Mag turret with 4.0" low mag Field of View and 4x high mag lens
Optional	—	—	10x high mag lens in lieu of 4x
<b>Maximum Load Capacity</b>	45 lb	65 lb	350 lb
<b>Helix Angle Range</b>			
Standard	+/- 6.5 degrees	+/- 7.5 degrees	—
Optional	—	—	+/- 7.5 degrees
<b>Throat Clearance</b>	10"	10"	16"
<b>Swing Away Lamphouse</b>	—	*	*
<b>Illumination</b>			
Profile	✓	✓	✓
Oblique	*	*	*
Coaxial	—	*	*
<b>Software</b>			
Measure-X® Measure	✓	✓	✓
Measure-X® Compare	✓	✓	✓
Measure-X® Analyze	*	*	*
EVOLVE® SPC	*	*	*

✓— Standard    \* — Optional



# Traditional Optical Comparators

## Optical Comparators with the World's Most Advanced Measurement Technologies

The mainstay of shop-floor measurement, optical comparators' tough construction and big viewing screens make measurements fast and easy. Contour Projectors from OGP offer the industry's best value and performance for non-contact measurement. All OGP benchtop and floor model comparators use cutting-edge optical, lighting, and automation technologies, allowing for tight tolerances and a wide range of manufacturing process applications. OGP comparators are ISO 9001:2015 certified and are made in the USA with cast iron, granite, composite, and steel – and the finest optics, made in our own optics shop.

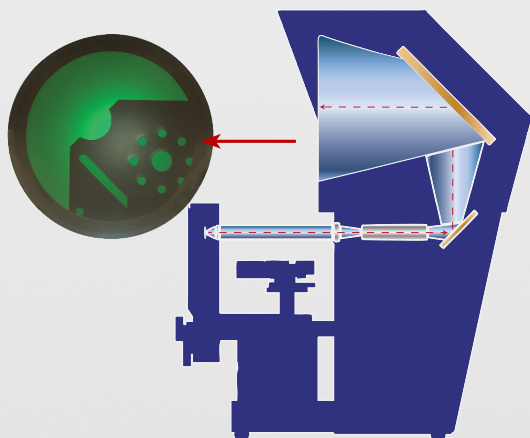
## Innovative Optical Technologies

### Telecentric Optics

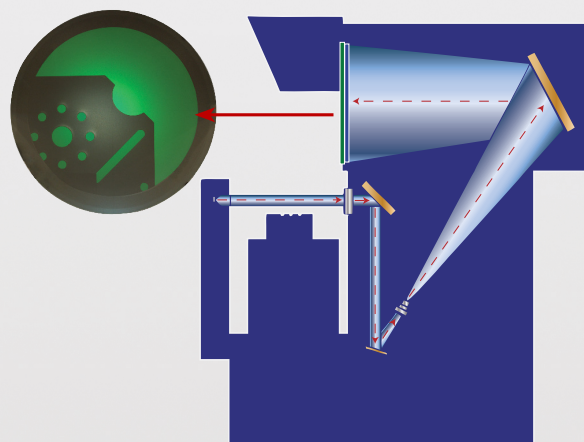
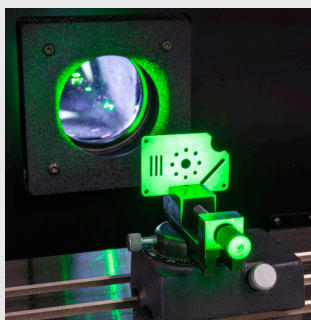
Telecentric optics are the foundation of all OGP comparators. Each model in the OGP optical comparator line uses one of our unique optical designs to ensure size measurements are accurate even when the image is not perfectly focused, allowing any user to achieve accurate measurements with ease.

All OGP comparators provide a constant working distance between the front lens and the part being measured at all available magnifications. It is never necessary to reposition or re-stage a part when a different magnification is selected. All lens changes are internal via a turret with the same focus points for each lens.

OGP's exclusive relay lens system maintains an accurate distortion free image for all magnifications. The profile light collimating lens is well matched to the front receiving lens for optimum optical resolution.



Focus dual mirror optics produce an upright and reversed image.



QL-20™ three mirror optics produce an upright and unreversed image.

Scan for more information  
on traditional optical  
comparators:



Viewing Screen Diameter			
Lens Selected		14"	20"
	10x	1.40"	2.00"
	20x	0.70"	1.00"
	31.25x*	0.45"	0.64"
	50x	0.28"	0.40"
	62.5x*	N/A	0.32"
	100x	0.14"	0.20"

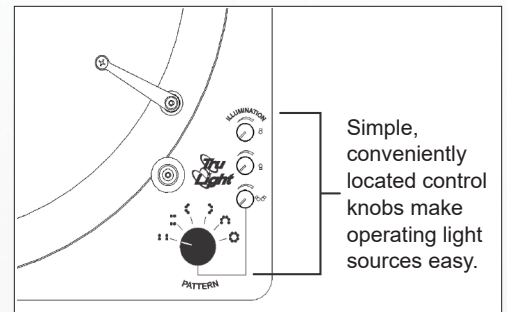
\*31.25x Magnification = Using a machinist's rule on the screen, 0.001" at the part becomes 1/32" on the screen

\*62.5x Magnification = Using a machinist's rule on the screen, 0.001" at the part becomes 1/16" on the screen



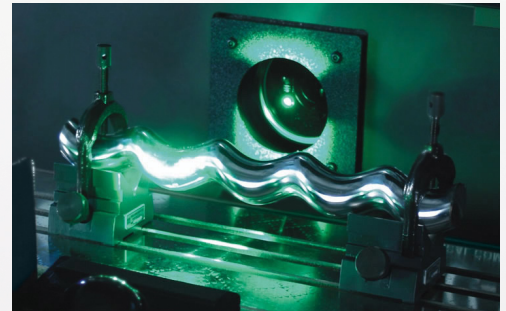
## Illumination

Exclusive TruLight LED lighting has transformed OGP optical comparators into modern, high-tech measuring systems. High brightness LEDs offer low power consumption, cool operation, indefinite lifetime, and continuously variable intensity control – all for very bright, crisp imaging. Stable, digitally controlled – ideal for automatic edge detection (Projectron).



## Profile Light

Monochromatic green light provides maximum contrast, maximum screen brightness with minimal glare, preventing eye strain.



## Coaxial Surface Light

Through-the-lens coaxial surface light provides white, brightfield illumination across the entire field of view, fully illuminating part surfaces.



## Oblique Surface Light

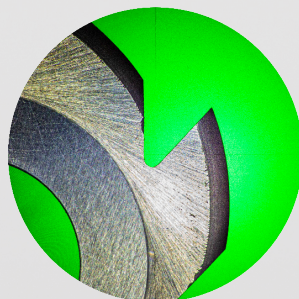
Oblique dark field ring light provides six selectable patterns allowing you to highlight surface details for maximum image clarity and change light direction to match surface geometry.



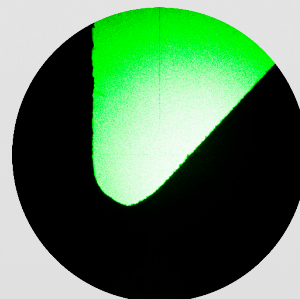
## Surface Contrast



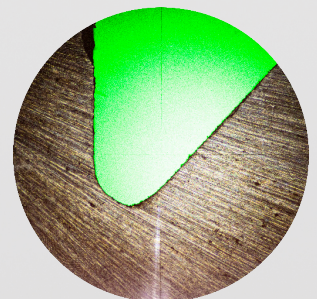
Profile Illumination 10x  
10



Surface Illumination 10x



Profile Illumination 50x



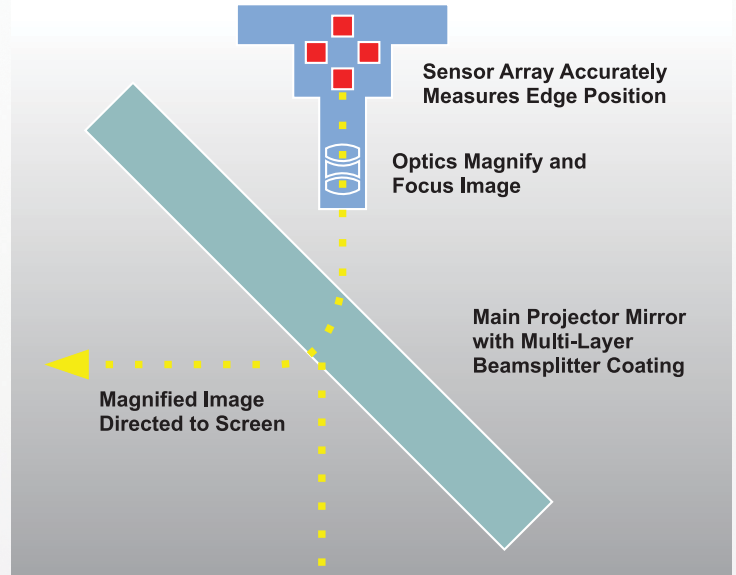
Surface Illumination 50x



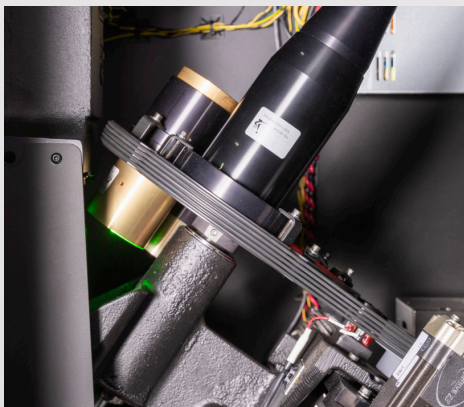
## Edge Detection

Automate measurement routines with Projectron image analysis.

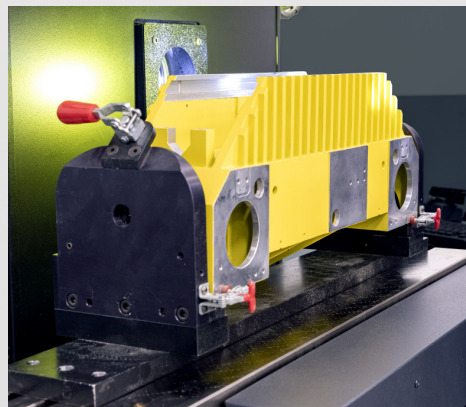
- Improve accuracy and repeatability – Eliminate variability due to operator influence
- Accurate with any edge orientation – Horizontal, vertical or 45° edges are located accurately with repeatability better than 0.0002" (5.0  $\mu\text{m}$ )



Focus with VidiProbe



All OGP comparators have internal lens turret up to 5 positions to keep lenses safe and ready for use



High-Load worktable capacity



Precise rotary screen ring for highly accurate rotational measurements



# Traditional Optical Comparators

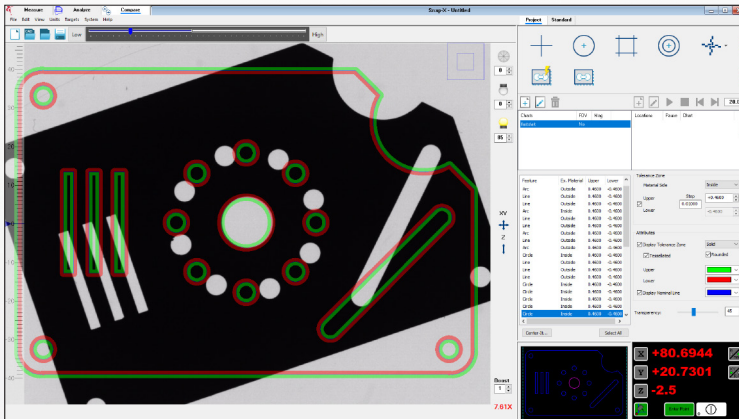


Features	Focus	QL-20
Screen Size (viewable)	14"	20"
<b>XY Travel</b>		
Standard	12" x 5"	15" x 9"
Optional	—	15 x 10", 18" x 9", or 18" x 10"
Z Focus Travel	1.25"	3"
<b>XY Drive</b>		
Manual	✓	—
Motorized	*	✓
Optics	Telecentric, upright and reversed	Telecentric, upright and unreversed
<b>Optical System</b>		
Lens Mount	3-position turret	Standard: Fixed Lens Optional: Motorized 5-position turret
Lens Options	10X, 20x, 31.25x, 50x, 100x	10X, 20x, 31.25x, 50x, 62.5x, 100x
Maximum Load Capacity	45 lb	350 lb
<b>Helix Angle Range</b>		
Standard	+/- 6.5 degrees	—
Optional	—	+/- 7.5 degrees
Throat Clearance	9"	19"
<b>Illumination</b>		
Profile	✓	✓
Oblique	✓	—
Coaxial	✓	*
Illumination Type	LED	
Projectron Edge Detection	*	*
VidiProbe	*	*
<b>DRO</b>		
Q-Check®	✓	✓
<b>Software</b>		
Measure-X® Measure	**	**
Measure-X® Compare	**	**
Measure-X® Analyze	***	***
EVOLVE® SPC	*	*

✓— Standard    \* — Optional    \*\*— Included with VidiProbe    \*\*\* — Optional with VidiProbe



# c-vision Software – Measure-X

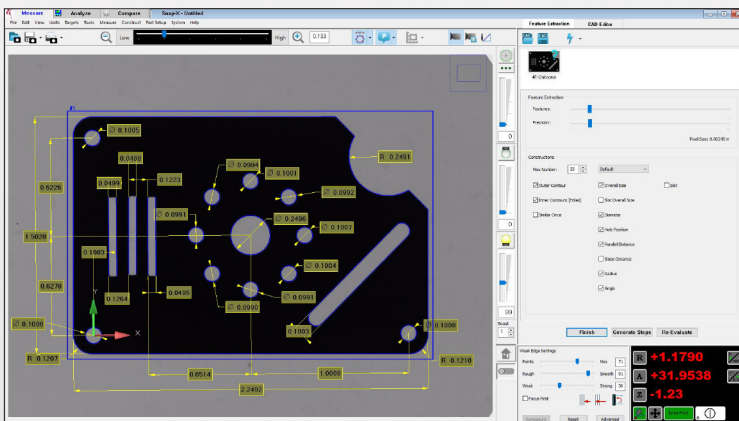


## Compare

The most basic measurement. No variable data, a widely accepted method of quickly assessing part acceptability.

The Compare Tab is selected, a CAD file is imported, and the operator is able to fit the part image to the CAD overlay on the monitor.

This allows the user the ability to use effective surface illumination, easy to maintain CAD overlays, and the option to change mag with the same overlay – all within a smaller footprint versus a traditional optical comparator.

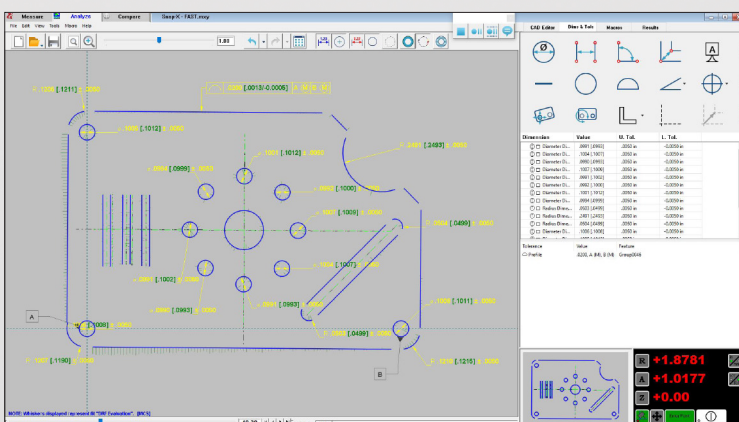


## Measure

With the Measure Tab selected, various measurement tasks can be performed, depending on the mode selected:

**Program Mode:** Measurements can be taken, and programs can be created. An operator creates a program as usual with a video measurement system, or from a CAD file of the part.

**Run Mode:** A pre-set selection of a desired routines is available for the operator to select.



## Analyze

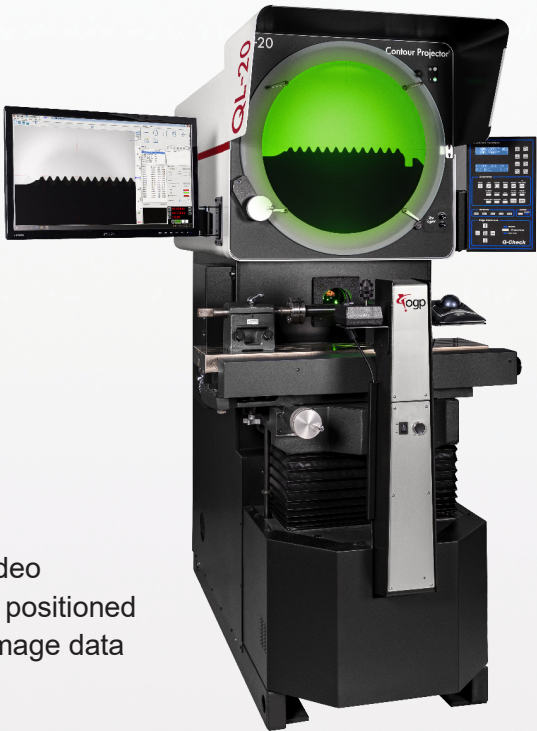
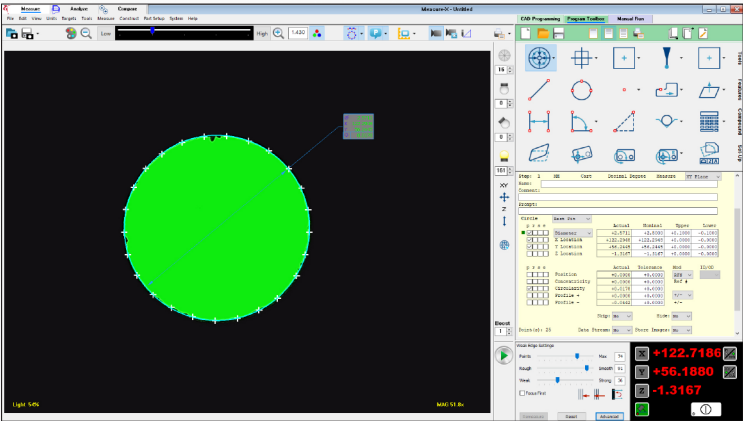
Users have the ability to address more complex GD&T requirements such as profile, true position of features when datum features of size allow mobility on the feature and the datums.

The display and reporting capabilities with Analyze provide both graphical, color coded whiskers of deviation, and GD&T callouts on the part CAD.

Analyze works seamlessly with Measure-X functions.



# Contour Projector Software



## VidiProbe

VidiProbe transforms the traditional comparator into a fully automatic video inspection system using Measure-X software. An internal video camera positioned to capture the image formed by the comparator optics provides digital image data to the software for fully automatic measurement routines.

# Digital Readout

OGP offers a digital readout controller for all new comparators. The DRO offers an intuitive user interface and simple display that reduces errors, improves operator productivity, and saves time and money.



## Q-Check DRO

The Q-Check® Digital Readout with its dual backlit two-line LCD displays and durable construction is designed to survive in almost any shop environment. Its full geometric processing power makes quick work of tough measurements. Q-Check supports Projectron auto edge detection and VidiProbe video measurement systems.

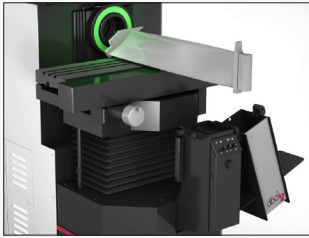
Q-Check Digital Readout	Availability
Displays in inches and mm; Digital protractor display	✓
Remote footswitch support	✓
Printer support	✓
RS-232 data output	✓
Measurement of 2D features	✓
Edge detection	✓
Supports VidiProbe	✓

✓ – Standard

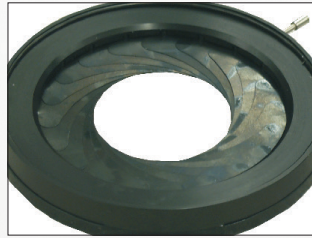


# Optional Accessories

OGP offers a full line of comparator tooling and accessories to make measurements more convenient.



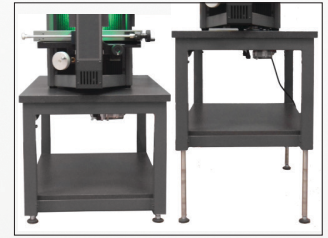
**Swing Away Lamphouse** allows oversized parts to be staged (c-vision only).



**Direct Projection Iris** helps reduce reflections from shiny surfaces.



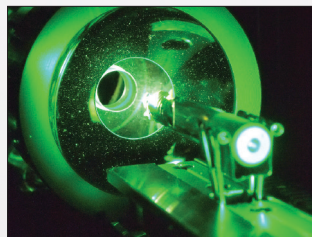
**Sturdy Benches** for mounting benchtop comparators.



**Ergonomic Motorized Stand** with adjustable height.



**Helix Stage Motion** allows the worktable to pivot for gear and thread measurements.



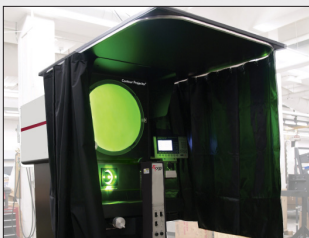
**Surface Concentrator** intensifies surface light for a brighter image.



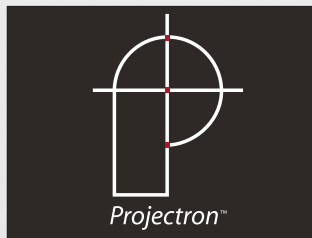
**Programmable Motorized Rotary Indexer** for staging shafts and cylinders.



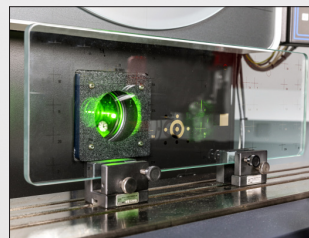
**Fresnel™ Lens** focuses all screen illumination at the normal viewing position.



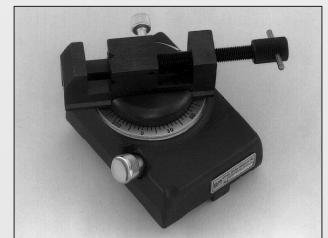
**Light Curtain** controls excess ambient light.



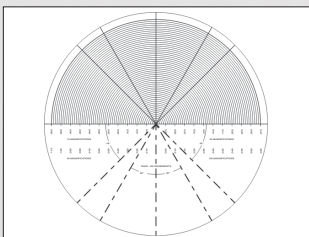
**Projectron™** auto edge detection is an internally mounted unit that automatically locates edges using grayscale processing.



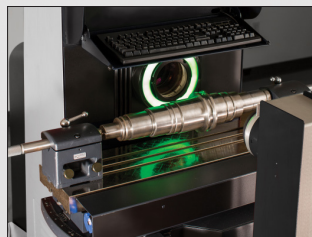
**NIST Traceable Calibration Reticle** artifacts are specifically designed for OGP Contour Projectors.



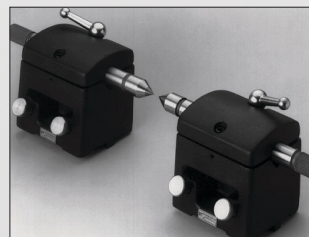
**Rotary Staging Vise** Provides quick, convenient staging for a variety of parts.



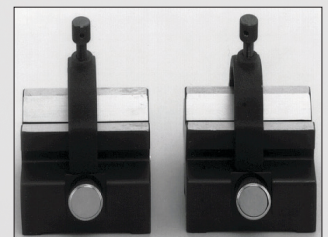
**Overscreen Chart Gages** provide comparison of actual part features to nominals.



**Extended Travel** – standard stage travel can be extended up to 18 inches on both c-vision models



**Standard and Heavy-Duty Staging Centers** hold cylindrical parts securely and allow free rotation.

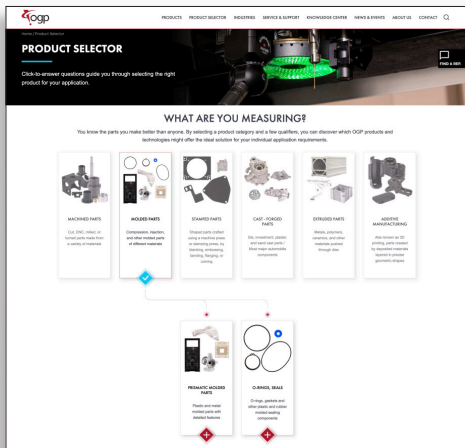


**V-Blocks** are available in 1", 2" and 3" sizes to accommodate a range of parts.



## ADDITIONAL INFORMATION ABOUT OGP SYSTEMS

Explore a range of knowledge assets to help guide your research!



### Product Selector

This self-guided selector assists customers in identifying OGP products as a solution to their unique measurement needs.

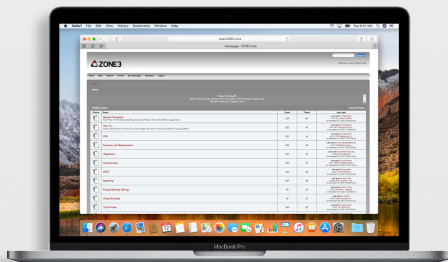
Customers select what kind of parts they manufacture, what size the parts are, and the tolerances they need to meet – the Product Selector suggests a featured system and other recommendations based on the customer's input.



### Knowledge Center

Find numerous white papers, case studies, tech reports and other educational material about dimensional metrology and OGP product solutions.

You can also quickly learn about OGP technology and solutions by watching product explainer videos.



### ZONE3.zone

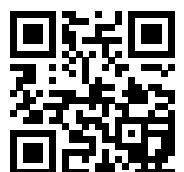
ZONE3.zone is the online community for ZONE3 users. Connect with fellow ZONE3 users and OGP Application Engineers to share metrology tips and get answers to your questions about ZONE3 features.



### Find a Sales Rep

OGP Authorized Representatives are metrology specialists, qualified to evaluate your measurement requirements and recommend the solution that best fits your needs.

Your local representative is ready to help you with product details, demonstrations, training, or purchase information.



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