Rigid Borescope
Remote Visual Inspection

Precision Optics
Durable Construction
Cost Effective
People buy our Remote Visual Inspection products because they either have a problem, think they have a problem, or need to know there isn’t a problem. We try to provide the solution to these questions with images from deep inside structures, turbine and reciprocating engines, aircraft, machines and products of all kinds. We offer you the most cost-effective solution to your inspection problem.

In our core business of Remote Visual Inspection, we offer a complete portfolio of equipment including Rigid Borescopes, Industrial Fibrescopes, Industrial VideoProbe® systems, CCD cameras and related products for video documentation and photography.


Additional Rigid Borescopes, with conventional lamp illumination at the tips, include the low-cost Econoscope, in 9.0 mm (0.35 in.) and 6.5 mm (0.25 in.) diameters, while the TEW Extendible Rigid Borescopes come in 9.0 mm (0.35 in.), 14.0 mm (0.55 in.), 18.0 mm (0.70 in.) and 24.0 mm (0.95 in.) diameters.

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Inspection Solutions

Precision Optics
GE Rigid Borescopes feature precision lenses, prisms and cover-glasses that deliver bright, clear images. The use of a special penta-prism at the tip ensures correct image orientation without the need for a compensating dove-prism.

Special attention to maximizing light transmission in the optical path results in increased image brightness, and the on-axis resolution at the image center is held as high as possible towards the edge of the field of view. This uniform, flat field makes the smallest defects visible, and greatly reduces user eyestrain.

Diameter and Length Options
Standard range Rigid Borescopes are available in diameters 4.0 mm (0.15 in.), 6.0 mm (0.24 in.), 8.0 mm (0.31 in.) and 10.0 mm (0.39 in.).

The standard range is available in working lengths from 100.0 mm (3.94 in.) to 905.0 mm (35.63 in.). There are five choices of direction-of-view (DOV) and, on some diameters, three different fields-of-view (FOV) can be specified.

Superior Illumination Performance
By bringing the illumination fibers close to the viewing window at the distal tip, in a “wrap-around” arrangement, the parallax between illumination and optical fields is virtually eliminated, considerably reducing the closest illuminated viewing distance.

All GE Rigid Borescopes are designed to correctly illuminate the entire field-of-view, right down to their minimum focusing distance.

Tip Length
Unique tip design with shortest tip length and wrap around fibers

Rigid Borescopes
**Rotary Scan™ Rigid Borescopes**

GE’s Rotary Scan™ Rigid Borescope allows 360° rotational viewing without moving the body of the scope.

**Tip Length and Chisel-tip Design**

The “wrap-around” fiber arrangement reduces the tip length of the oblique, lateral and retro-view instruments to an absolute minimum.

With the 45° and 70° direction-of-view instruments, the distal tip is wedge-shaped, like a chisel, allowing the Rigid Borescope to provide clear views to the bottom of blind holes. A typical example would be to view the roots of turbine blades with greater clarity.

**Direction-of-view (DOV)**

<table>
<thead>
<tr>
<th>Tip</th>
<th>Field-of-view (FOV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td><img src="image" alt="90° FOV" /></td>
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<tr>
<td>45°</td>
<td><img src="image" alt="60° FOV" /></td>
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<td>70°</td>
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<tr>
<td>90°</td>
<td></td>
</tr>
<tr>
<td>110°</td>
<td></td>
</tr>
</tbody>
</table>

**Field-of-view (FOV)**

The 90° field-of-view, shown at the far left, produces the lowest magnification. The 60° and the 35° field-of-view provide increasingly greater magnification.

**Magnification**

Relationship between field-of-view, objective distance and magnification.

**360° Rotary Scan**

The insertion tube of the Rigid Borescope can be rotated, allowing the viewing field to be scanned 360° (with overlap from field-of-view) without moving the body of the borescope. A positive stop is built into the body to prevent over-rotation of the lighting fibers.

**Viewing Direction Indicator**

When inspecting inside a closed cavity or inspection area, the tip of the Rigid Borescope might not be visible to the operator and it can be difficult to determine which direction is being viewed. On all Rigid Borescopes with oblique, lateral or retro directions-of-view, a raised indicator mark in the rotary scanning control allows viewing direction to be monitored by feel alone, without taking one’s eye from the eyepiece.

**Fiber and Bearing Life-Tested and Proven**

During development testing, Rigid Borescopes were subjected to 20,000 operating cycles, stop to stop. Bearing surfaces between the insertion tube assembly and the bore of the body showed no measurable wear, and there was no loss of lighting performance due to fiber breakage.

**Hardware Features**

**Rugged Construction**

GE Rigid Borescopes are specifically designed to meet the demands of harsh industrial environments, with all-metal construction, triple-tube shafts and durable hard-anodized aluminum bodies.

**Triple-Tube Insertion Shaft**

The insertion tube assembly consists of a double-walled stainless steel tube surrounding illumination fibers and the optical cover-glass. Fuel, oil and watertight, this sealed outer-tube assembly is pressure tested during the manufacturing process to protect the prism and lens system, which is assembled separately and fitted inside. In addition to protecting the precision optical components, this design also permits easy disassembly for service and repair.

**All-Metal Body**

An anodized aluminum body provides a secure and rugged location for the rotatable insertion tube and the ocular eyepiece.
**Swing-Prism Rigid Borescopes**

GE’s Swing-prism Rigid Borescope can fulfill the function of two or three separate conventional borescopes, reducing costs and inspection time. You can adjust the direction-of-view from 55° to 115° and scan an object’s entire length.

**Swing-prism Rigid Borescope with Rotation and Zoom Ocular**

Swing-prism Rigid Borescopes come with variable direction-of-view, a focusing device, rotatable objective tube and an optional variable magnification zoom ocular. Providing the capability to view steplessly in a range of directions, from 55° forward-oblique to 115° retro-view, one instrument can function in the place of two or three separate conventional Rigid Borescopes.

This multiple viewing capability is further enhanced by the rotatable insertion tube, which provides 340° of rotation stop-to-stop (360° effective viewing with overlap from field-of-view).

This versatility allows the same scope to be used for multiple applications and reduces inspection time by removing the need to stop the inspection to change scopes.

GE Swing-prism Rigid Borescopes are available in three diameters, 6.0 mm (0.24 in) 8.0 mm (0.31 in) and 10.0 mm (0.39 in). On all models, two alternative fields-of-view are available, the standard 56° FOV being supplemented by an optional narrow-angle 35° FOV, giving higher magnification.

An optional variable magnification zoom eyepiece can be selected on the 8.0 mm (0.31 in) and 10.0 mm (0.39 in) instruments, making the Swing-prism Rigid Borescope one of the most versatile Rigid Borescopes around, offering variable direction-of-view, variable focus, variable magnification and circumferential rotary scanning.

**Rigid Borescope Identity Code**

<table>
<thead>
<tr>
<th>Rigid Borescope</th>
<th>Working Length</th>
<th>Field-of-View</th>
</tr>
</thead>
<tbody>
<tr>
<td>R6 – 23 – 45 – 56</td>
<td>Diameter</td>
<td>Direction-of-View</td>
</tr>
</tbody>
</table>

**Greater Versatility**

Field-of-View options: 35°, 56°, 70° and 90°

**Adaptable Light Guide Fitting**

All Rigid Borescopes have detachable click-on/click-off pistol grips that make them easy to handle, and protects the light-guide. The ACMI male light guide post can be converted to ACMI female / Olympus, Wolf, Storz and other pattern fittings.

**Zoom Eyepiece Option**

All Rigid Borescopes can be specified with a variable magnification zoom eyepiece, which gives a stepless adjustable magnification range of an additional 2:1. When used on an instrument with a narrow field-of-view of 35°, the zoom gives similar magnification, at all viewing distances, to Rigid Borescopes with a very narrow field-of-view, but without the decreased depth-of-focus associated with such instruments. This capability is particularly valuable when the image plane is neither flat nor perpendicular to the axis of the instrument.

The super-large exit lens of the zoom ocular delivers images that are big, bright and very easy to view.
GE’s Mini-Rigid Borescopes are uniquely constructed to make them more tolerant of accidental bending than conventional small-diameter rigid borescopes—without compromising image quality.

**Main Features**

- Outer tube, body and light-guide connection are made of stainless steel.
- Light condenser funnel of clad-glass provides 30-percent more light output at the tip.
- Light-guide post is convertible to ACMI male or female, Wolf or Storz by means of screw-on adapters.
- Eyepiece is the DIN standard 32 mm (1.26 in.) diameter pattern and made from a high-temperature resistant durable plastic.
- Triple-tube connection on the 1.9 mm (0.075 in.) and 2.7 mm (0.106 in.) mini-rigids protects the Rigid Borescope’s lens and optics, while keeping them accessible for easy service and repair.
- Patented short rod-lens optical system provides outstanding image brightness and depth-of-field from 1.0 mm (0.04 in.) to infinity.
- Wide-angle field-of-view is ideal for inspecting large surface areas.
- Resistant to fuels, oils, all common industrial solvents and water.

**Short Rod-lens System**

This patented system improves on the best optical features of the rod-lens system, with better tolerance to mechanical stress for industrial applications.

Each rod-lens is either a two- or five-element assembly bonded together. At a lens length that is approximately 60 percent of that found in rival instruments, three lenses are used per relay length rather than two, making the borescope more flexible and able to tolerate bending loads that would crack most lenses. The system also transports a much higher aperture, which results in outstanding image brightness.

1.7 mm, 1.9 mm, and 2.7 mm diameter

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**Specifications**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Diameter</th>
<th>Working Length</th>
<th>Direction of View</th>
<th>Field of View</th>
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<tbody>
<tr>
<td>RM-37-10-30-65</td>
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<td>50°</td>
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<tr>
<td>RM-10-30-65</td>
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<td>65°</td>
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<tr>
<td>RM-22-45-56</td>
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<td>56.0 cm (22.0 in.)</td>
<td>45°</td>
<td>56°</td>
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<tr>
<td>RM-26-35-56</td>
<td>2.6 mm (0.102 in.)</td>
<td>35.0 cm (13.8 in.)</td>
<td>45°</td>
<td>56°</td>
</tr>
</tbody>
</table>

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**Mini-Rigid Borescope**

- Operating Temperature: -40° to 121°C (-40° to 249°F)
- Pressure Resistance: 3 Bar (44 psi)
- Fluid Resistance: Insertion tube will withstand immersion in aviation fuel, kerosene, gasoline, diesel fuel, mineral and synthetic lubrication oils and hydraulic fluids, most industrial solvents and water.

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**Swing-Prism Rigid Borescope**

- Body Length: R 55.5 mm (2.2 in.)
- PR 50 mm (2.0 in.)
- 8 Bar (116 psi)
- 8 Bar (116 psi)
- Fluid Resistance: Insertion tube will withstand immersion in aviation fuel, kerosene, gasoline, diesel fuel, mineral and synthetic lubrication oils and hydraulic fluids, most industrial solvents and water.

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**Inspection**

- Viewing of an air-brake compressor after machining.
- Exceptional tolerance to bending.
- Oil-way clear and free of debris and burrs.
- Resistant to fuels, oils, all common industrial solvents and water.

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**Images**

- Rigid Borescope: Inspecting an air-brake compressor after machining.
- Mini-Rigid Borescope: Exceptional tolerance to bending.
- Swing-Prism Rigid Borescope: Oil-way clear and free of debris and burrs.
Light Sources & Accessories

GE rigid borescopes are ideal for documentation and recording images, and with the appropriate adapter, can be used with conventional and digital cameras as well as color video cameras.

The following documentation accessories are available:
- Adapters for coupling all kinds of cameras.
- Video Cameras for recording and documentation.
- Monitors for displaying enlarged images.
- Light Sources

Glass fiber optic cables and liquid light-guide cables from GE are available in various lengths, with interchangeable end-fittings that allow connection to borescopes and light sources from other manufacturers.

For Rigid Borescope work where headroom is limited or access is difficult, different angle viewing attachments and an X2 magnification attachment provide a better view.