A Buyer's Guide to Borescopes

for Wind Turbine Technology

This Buying Guide will discuss Remote Visual Inspection (RVI) camera and bore-scope technology, along with an overview of how the right inspection equipment can improve your preventative maintenance procedures and help keep long-term and short-term costs down.

Borescope inspection of wind turbines can help identify worn or damaged bearings and gears, points of excess deterioration, foreign object debris, and other issues that could cause unscheduled outages.

The right inspection borescope can help your company win and keep your wind turbine maintenance contracts, meet schedules, and maintain ISO certifications, all while staying within your budget. The wrong buying decision can result in a piece of equipment that sits on the shelf because it doesn't work for your particular inspection environment, no one knows how to use it, or it's too expensive to repair.

A Quick Primer on the Various Types of Borescopes

Rigid Borescopes – Basic straight-in inspection functionality. Visual inspection is via attached eyepiece.

Swing Prism Borescopes – Similar to rigid borescope technology but with a bendable tip. Visual inspection is via attached eyepiece.

Video Borescopes (Videoscopes) – Cameras are located in the articulating tip. Visual inspection is via remote screen. Probe tips can be quite small (as small as 2.4 mm) and can maneuver in very tight spaces.

This guide focuses mostly on video borescopes, as they are the most flexible of the inspection camera options and the most useful for turbine inspections.

Borescope Buying Factors to Consider:

- Image Quality and Brightness
- Compact, light and easy to carry

- Functionality vs. Price
- Service Costs
- Probe Diameters and Focal Lengths
- Flexibility
- Durability
- Data Collection
- Customer Support/Customization
- Ease-of-Use
- Limited Downtime
- Battery Life
- Best-in-Class vs. Brand Name Recognition
- Certifications
- Extras

Image Quality and Brightness

The better the image, the better the quality of your inspection. Bottom line - **does the borescope provide enough light to the inspection area to give a clear, bright image?** If it's a video borescope, is the screen large enough to display the image in good detail? Is there zoom capability, so the operator can zoom in for a closer look?

Compact, light, and easy to carry

When you have to work hundreds of feet off the ground, the last thing you want is large, heavy, unwieldy equipment. How heavy is the borescope? How portable?

Functionality vs. Price

Rigid Borescopes

- Basic straight-in inspection functionality.
- No built-in data collection.
- Very price efficient for limited inspection requirements.

Swing Prism Borescopes

- Rigid borescope technology but with a bendable tip.
- No built-in data collection.
- Price efficient but with more flexibility than rigid borescopes.

Articulated Video Borescopes

- Can do everything a rigid or swing prism borescope can do plus much more flexibility.
- Built-in data collection.
- Covers a much wider ranges of inspection requirements.

- More features + more flexibility.

Service Costs

High-end industrial borescopes can rack up high-end service costs, which should be figured into your budget. Some borescope manufacturers charge as much as 75% of the unit's original price to repair a borescope. How much does the borescope cost to service? Is there a warranty? What does it cover?

Probe Diameters and Focal Lengths

- Does the borescope come with probes in a wide variety of diameters? Very small diameter probes may be needed to be able to access turbine gearboxes – make sure the borescope's tip diameter fits the inspection hole.
- What are the dimensions of the items to be inspected? Item length also needs to be factored into your focal length requirement.
- What is the overall shape of the inspection item? If the piece is domed or slanted, a fully articulated videoscope is the best solution.
- Is the borescope solution scalable as your requirements shift?

Flexibility

Borescopes - Fully Articulated, Rigid, or Swing Prism?

Do you need a rigid borescope, or a scope with a flexible probe? The answer depends on the inspection area. Wind turbines require more than just the straight-in view that a rigid borescope can provide. Wind turbine inspection needs a 360° view of the turbine interior in order to locate foreign object debris, check for worn gear teeth, or identify work or damaged bearings. **For this reason, we recommend only fully articulated video borescope technology for wind turbine inspections.**

Most newer wind turbine gearboxes are designed to have a small portal for inspection equipment. Fully articulated borescopes have a long tube-like probe with the camera located at the tip – the user feeds in the lead and can manipulate the probe tip. Probe tips are flexible – some can even look behind themselves.

Durability

What's the good of a borescope if it breaks the first time it's dropped (and it will get dropped), requiring costly repairs or replacement? **Durability is the major factor in lifespan of RVI products.** Is the borescope made of impact-resistant materials? Does the borescope need to withstand extremes in temperature? Does the borescope need to be water-resistant? Will the borescope be transported to various locations?

Data Collection

Do you need still images only, or video and still images? Do you need to collect and store the data for ISO certification or Quality Improvement programs? How do you need that data collected and exported? Can you compare historical images of the turbine with the live image?

Customer Support/Customization

Will the vendor walk you through the best choice for your application, or just sell you whatever they have in stock? If your requirements are non-standard, can they provide a customized solution? Is local support and on-site training available? Is the vendor reliable and willing to stand behind their products?

Ease-of-Use

Is the borescope intuitively easy-to-use, or will it require extensive training? What makes a borescope easy to use? Tactile feel, ergonomic controls, brightness and screen size all contribute to a scope's ease-of-use. Straight-forward controls and minimal buttons with intuitive symbols.

Limited downtime

What are the bottlenecks in your maintenance schedule? The right borescope can help, the wrong borescope will add more. Does the operator have to change borescope tips to accommodate different focal lengths, or can one tip handle multiple focal lengths? How much time will your operators need to spend training on the equipment?

Battery Life

How often does the borescope's battery need to be charged? Does the borescope come with an extra, easily changed battery? How long can you afford to have a borescope be out-of-commission while charging? How long must the QA Engineer spend in taking a borescope to its charging station and swapping out scopes?

Best-in-Class vs. Brand Name Recognition

What makes a borescope best-in-class? Superior imaging, superior support, all of the elements listed above. What about brand name recognition? You will pay (a lot) more for less functionality and quality just for brand name recognition.

Certifications/Warranties

How to be assured that the borescope you're buying is a reliable, quality product? What certifications does the scope have? What kind of warranty?

Extras

Add-ons might include grabbers that can clear foreign object debris. Are the scopes customizable for your particular needs?

Why ITS Videoscopes?

We hope you've found this guide a useful walkthrough of some of the questions you should be asking when looking to purchase RVI technology.

We'd like to share with you how ITS Videoscopes answers those questions, providing **best-in-class technology at a price point well below the brand-name competition.**

The answers below are for our EV-Series Videoscope line, which we recommend for wind turbine maintenance, though we also offer high-quality rigid borescopes, swing prism borescopes, and our XT series of explosion-proof video borescopes.

How ITS Videoscopes' EV-Series borescopes stack up:

- Image Quality and Brightness
    - A high-power LED light source
    - 5" screen display
    - VGA 640x480 screen resolution
    - 3.5x digital zoom
    - Brightness and Contrast Controls

- Service Costs

    - ITS Videoscopes' repair charges run approx. 50% of unit cost. Other vendors' repair charges run up to 75% of the cost of the unit. We believe more in supporting our customers and products than in making a profit off repair charges.

- Scope Diameters and Flexibility

    - Probe tips as small as 2.4 mm
    - Full 4-way articulation
    - 1 – 8mm adjustable focus distance available on a single tip
    - Scalable solutions

- Durability

    - Braided Tungsten cables
    - Heat resistance to 284°F/140°C
    - Water resistance to 1 Bar
    - Rugged Pelican© carrying cases

- Data Collection

- Up to 500 hours of video or 32,000 still images on supplied 32GB SD card
- Text overlay for note taking right on the screen
- Be able to recognize changes to the inspection object on-the-spot - our Smart Inspector© technology that allows you to compare saved images with the live image.

- Customer Support/Customization

  We believe in our products and stand by our customers by providing:

  - Application support provided by Engineers with Aerospace Manufacturing experience
  - Customizable solutions
  - We're worldwide, but provide local and on-site support and training
  - 1 year warranties

- Ease-of-Use

  Be up and using our EV-Series videoscopes in less time!

  - Tactile feel
  - Ergonomic, intuitive controls

- Limited Downtime

  Our EV-Series Videoscopes feature:

  - Less training time
  - Longer battery life/extra battery pack included
  - One scope tip to handle a range of focal lengths - no downtime needed to change tips for various applications.

- Battery Life

  Our EV-Series Videoscopes feature:

  - 6 hour rechargeable Lithium Ion battery
  - Extra battery pack

- Certifications

  Our EV-Series Videoscopes feature:

  - ISO 9001-2008
  - CE
  - UL
  - NFPA 70 – Class 1 Division 2

    - ATEX
    - TUV

- Extras

    - Magnets, tweezers, or baskets that can clear foreign object debris
    - We would be happy to work with you to design a scope that fits 100% of your needs.

Our borescope technology is used worldwide in a variety of industries, including extensively in wind turbine inspection. By going with us, you'd be selecting a borescope with a proven track record in the wind turbine maintenance industry.

Please contact us today for a quote or a demo of how ITS Videoscopes can work with you to improve your inspection processes. We're confident that you will find our borescopes offer you **world-class quality at extremely competitive pricing!**

Check out the EV-Series Data Sheet

Check out our full website

Thank you for your attention!

The staff at ITS Videoscopes