Industrial Videoscopes — Borescope Selection Guide

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Choosing remote visual inspection equipment from pocket inspection cameras to measurement-grade videoscopes: rigid borescope vs flexible fibrescope vs videoscope, probe diameter and length against the access port, articulation, lighting, stereo and 3D phase measurement for defect sizing, what engine makers and class surveys actually require, rent-vs-buy arithmetic, and the GE Waygate Mentor Visual iQ and Olympus IPLEX ranges against entry-level tools.

The short version

Three instrument families, one decision tree. Rigid borescopes: straight-line optical access, best image per euro, surgery-grade detail through a fixed port. Flexible videoscopes: a camera on an articulating insertion tube, the standard for engines, turbines, boilers and pipework. Pocket inspection cameras: the entry class for workshops and quick looks — the Milwaukee M12 borescope class — valuable, but not an inspection record instrument.

Diameter and length are the first filter. The probe must pass the smallest port on the route: 4 mm class for fuel injector bores and small turbine ports, 6 mm as the general-purpose standard, 8+ mm where light and reach matter more than access. Working lengths run 1.5–3.5 m typical, 7.5–30 m for pipe and tank work (the Fluke 9 mm / 20 m reel probe class).

Measurement is what separates a camera from an inspection instrument. Stereo and 3D phase measurement let the scope size a defect (crack length, pit depth, blade edge loss) traceably — the difference between "there is something on cylinder 6" and a number an engine maker's limits table accepts. GE Waygate's Mentor Visual iQ (MViQ) with 3D phase measurement and Olympus' IPLEX NX are the reference instruments of this class.

Articulation quality decides whether you find the defect. 360-degree joystick articulation with fine control near full deflection, tip-change optics (field of view, direction of view, depth of field) and bright, adjustable illumination are the specs that matter in a dark crankcase; resolution figures alone mislead.

Rent the peak, own the routine. A measurement videoscope is a five-figure instrument used weeks per year on most sites: owning the 6 mm general probe and renting the specialised (long, thin, UV, measurement) configurations for shutdowns is the pattern that survives audits of both inspection quality and spend.

1. Rigid, fibre, video: what each buys you

Type | Image path | Best at | Limits |

Rigid borescope | Lens relay in a straight tube | Fixed-port inspections (injector sleeves, small bores); highest optical quality at low cost | Straight access only; fragile; eyepiece unless camera-adapted |

Flexible fibrescope | Coherent fibre bundle | Legacy flexible access without electronics | Honeycomb image, broken fibres accumulate; superseded by video for most work |

Videoscope | Camera chip at the tip, image by wire | Articulated navigation, recording, measurement, long probes | Cost; tip is the vulnerable asset (budget tip protection and insurance) |

Pocket inspection camera | Camera chip, basic screen | Workshop diagnosis, drains, panels — fast answers | No measurement, limited articulation and documentation |

2. Probe selection: diameter, length, tips

Probe class | Passes | Typical duties |

≈ 4 mm | M5–M8 class ports, injector bores | Aero and small gas turbines, fuel systems, small valves |

≈ 6 mm | Most engine ports, spark/injector holes on medium-speed engines | The general-purpose diameter: diesel cylinders, turbochargers, gearboxes |

≈ 8–10 mm | Handholes, manways, DN25+ pipe | Boilers, heat exchangers, tanks; brightest illumination, longest reach |

Long reels 10–30 m | Pipe runs, sewers, long tanks | Push-rod and reel systems (Fluke scope family spans 5.5 mm/1 m to 9 mm/20 m) |

Interchangeable optical tip adapters set field of view (40–120°), direction of view (forward or side) and focus range; a side-view tip is how cylinder liner walls and tube IDs are actually inspected. UV-illumination probes serve dye-penetrant and leak-tracing work (the Fluke 8.5 mm UV probe class). Tungsten-braided insertion tubes resist the abrasion that kills probes dragged over tube plates.

3. Measurement: stereo and 3D phase

Measurement tips turn pixels into millimetres. Stereo measurement triangulates from two lens views: point-to-point lengths, depths and areas with the operator placing cursors. 3D phase measurement projects a pattern and reconstructs the full surface: profile views, depth maps, automatic blade-tip-to-shroud distances, and defect sizing that is less operator-dependent — the capability that made the MViQ class the default for turbine franchise inspections. What the paperwork demands: measurement accuracy is certified per tip-and-probe combination and verified against a check block before each session; the saved image embeds the measurement data. If reports go to an engine maker, a class society or an insurer, specify a measurement-capable scope, the verification block, and operator familiarisation — the instrument alone does not make the measurement admissible.

4. Where each instrument earns its keep

Application | Instrument | Notes |

Medium-speed diesel cylinder/valve inspection | 6 mm articulating videoscope | Side-view tip for liner walls; see our Wartsila engine spares reference for the components being judged |

Turbocharger nozzle ring and blades | 4–6 mm with measurement | Edge-loss sizing against the maker's limits |

Boiler and heat-exchanger tubes | Side-view tip, 8 mm class or dedicated tube scope | Tube-sheet navigation; pair with UT thickness gauging for wall loss |

Gearboxes and thrusters | 6 mm, long probe, strong articulation | Through inspection covers; magnetic debris check alongside |

Pipework, drains, voids | Reel systems 9 mm/20 m class | Location by distance counter |

Workshop and electrical cabinets | Pocket class (M12 borescope) | Diagnosis, not documentation |

5. Rent, buy, or both

The arithmetic: a measurement videoscope with two probes and tips is a 30,000–80,000 euro class instrument; a capable non-measurement 6 mm videoscope a quarter of that; rental for a shutdown week runs low four figures. Fleets and plants that inspect monthly own the general-purpose scope (it also pays for itself in avoided "open it up to look" jobs — one avoided crankcase opening covers a mid-range scope); they rent measurement and specialty probes for planned overhauls, with the rental booked against the shutdown plan the way span gas is booked against the calibration calendar. What breaks the arithmetic is the unplanned event at sea or on a remote site — which is the case for owning at least the non-measurement scope wherever mobilising a rental takes days.

How buying works at cballast. We quote inspection instruments from pocket class to measurement videoscopes, with tips, verification blocks and cases itemised, and successor models declared when an installed instrument's probes are no longer serviceable. Accounts are vetted at onboarding; first order prepaid; established accounts on credit terms with repeat discounts; public bodies and utilities invoiced against purchase order from the first order. RFQs to sales@cballast.com.

Frequently asked questions

What is the difference between a borescope and a videoscope?A borescope relays the image optically — rigid lens train or flexible fibre bundle — to an eyepiece; a videoscope puts the camera at the probe tip and sends video up the tube, adding articulation, recording and (on the measurement class) defect sizing. In industrial practice "borescope inspection" is the job; a videoscope is usually the instrument doing it.
What probe diameter do I need for engine inspection?6 mm passes the injector and valve ports of most medium-speed diesels and is the general-purpose choice; 4 mm class covers small turbine ports and fuel components; 8 mm buys brighter illumination and tougher tubes where handholes allow it. The binding number is the smallest opening on the insertion route — measure it before specifying.
What is 3D phase measurement on a videoscope?The probe projects a structured light pattern and reconstructs the viewed surface in three dimensions, so defects are sized (length, depth, area, profile) from one view with less operator skill than stereo cursor placement. It is the capability engine and turbine makers' inspection procedures increasingly name — MViQ and IPLEX measurement configurations are the reference instruments.
Is a cheap inspection camera good enough?For workshop diagnosis, behind-panel checks and drains — yes, and every toolbox should hold one. For inspections that feed maintenance decisions or reports to makers, class or insurers — no: articulation, optics, illumination and measurement are what find and size defects, and the record must be traceable to a verified instrument.
Can borescope inspection replace opening the machine?That is its economic case: a scheduled scope inspection through existing ports replaces precautionary opening, and condition findings then justify targeted opening. Engine makers publish scope-based inspection intervals for exactly this reason; the saving from one avoided opening typically exceeds the instrument's cost.
Who supplies Mentor Visual iQ and IPLEX videoscopes?cballast.com quotes GE Waygate and Olympus (Evident) videoscopes, probes and tips, Fluke scope systems and entry-class instruments, with rental-vs-purchase options laid out per use pattern. Write the application (ports, lengths, measurement yes/no) to sales@cballast.com.

References and related guides

Sources referenced: maker documentation for GE Waygate Mentor Visual iQ and Olympus/Evident IPLEX ranges; engine makers' borescope inspection procedures; ASME and class society guidance on remote visual inspection as an NDT method (VT); ISO 9712 personnel certification context for documented inspections.

Ultrasonic thickness gauges — selection guide

Ultrasonic thickness gauges — DMS Go comparison

Process calibrators — Beamex, Fluke, Druck

Thermal imaging cameras — resolution and selection

Wartsila 32/46/50DF engine spares reference

Questions on a probe, a tip set or a rental window: write to sales@cballast.com. We answer whether or not you buy from us.

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