

INNOVATIVE TECHNOLOGIES

# Rotary Disc Electrode Atomic Emission Spectrometer

**TT-6595**



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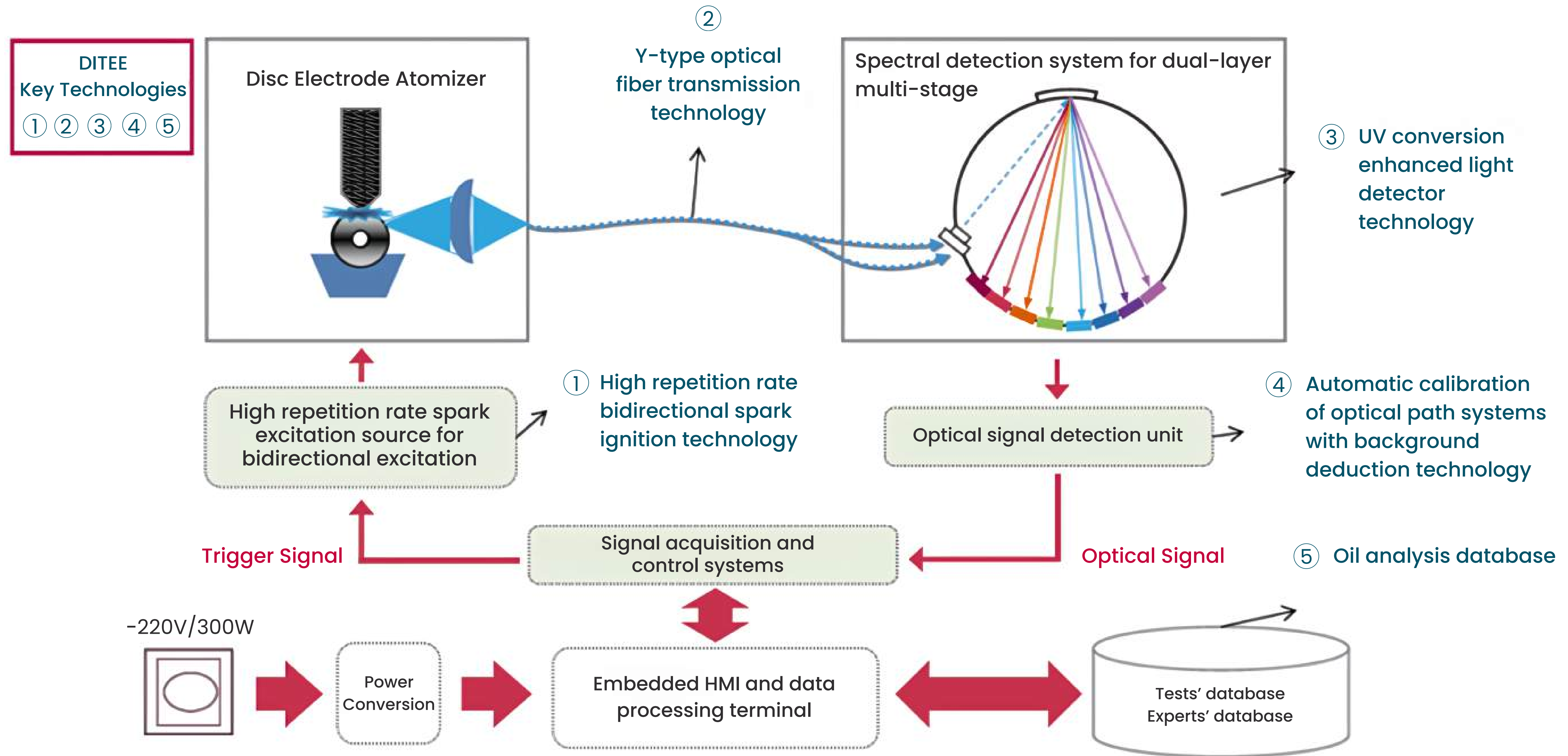
The TT-6595 Rotary Disc Electrode Atomic Emission Spectrometer (RDE-AES) is **designed to quickly test the content of various metallic elements in liquid samples** like lubricating oil, hydraulic oil, and fuel oil.

It completes the analysis of multiple elements in less than 2 minutes with just a single injection. No sample pretreatment, auxiliary gas, or cooling water is needed during operation. The instrument is durable and can be used in different environments, including on warships or in the field.

Conforms to the **ASTM D6595** and **ASTM D6728** standards for determining wear metals and contaminants in oils and fuels, this spectrometer is widely used for monitoring oil quality in large equipment such as aircraft, warships, high-speed railways, and heavy machinery. It is also used for analyzing mechanical wear and diagnosing faults in metallic elements in oils.



# WORKING PRINCIPLE DIAGRAM

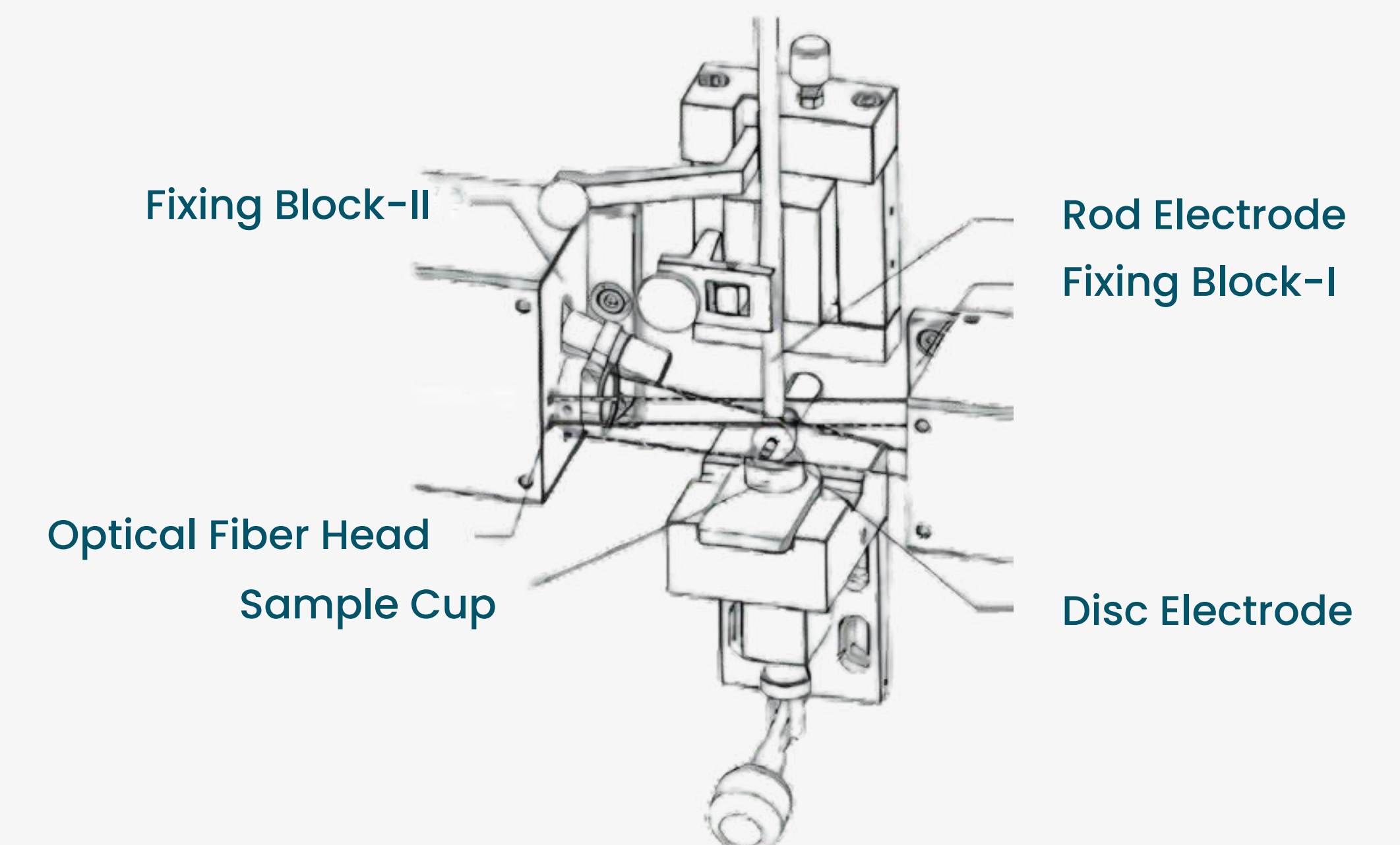
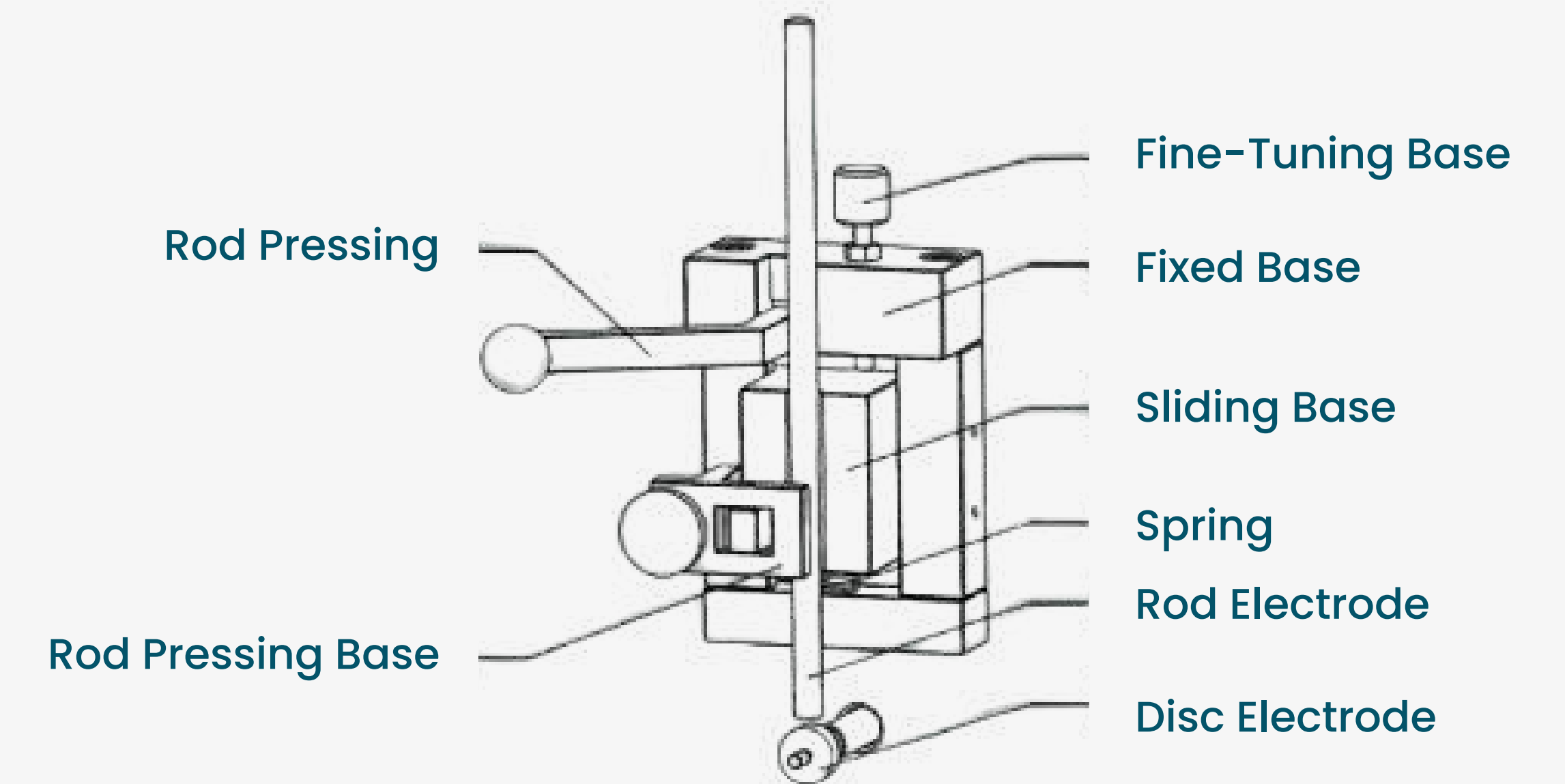


## OIL ANALYSIS SPECTROMETER COMPONENTS:

**Excitation System:** The excitation system generates an arc or spark that directly interacts with the oil sample, causing the outer electrons of the elements to produce characteristic spectral lines. A graphite disk electrode continuously rotates, carrying the oil between the counter electrodes. A significant potential difference between the graphite disk and rod electrodes creates a high-voltage discharge, resulting in an arc or spark. This produces an instantaneous high temperature, causing the oil sample on the disk electrode to burn, vaporize, and become plasma. The high temperature fully excites various elements in the oil sample, generating stable emission spectra. The spectral signal is then introduced into the Roland circle spectroscopic system through a UV optical fiber.

**Optical System:** The optical system uses a grating on the Roland circle to collect and split the characteristic spectral lines of the excited elements. The greater the focal length and the more grating lines available, the higher the resolution and the better the spectroscopic effect. The detector then receives these spectral lines and converts them into electrical signals.

**Readout System:** The readout system periodically reads the charges from the detector and converts them into digital signals. These signals represent the intensity of the characteristic spectral lines of the elements, which is directly proportional to the element concentration. The readout system analyzes, processes, and outputs the data using the external standard method to determine the content of the detected elements.



## FEATURES/ADVANTAGES

- **Precision and Versatility:** The RDE-AES is widely recognized across military, industrial, and commercial oil laboratories for its reliability and effectiveness in oil monitoring. It excels in both condition monitoring of key oil equipment and quality control of oil products, ensuring precise analysis across various applications.
- **Advanced Scanning and Optical Technology:** Equipped with an integrated scanner, the RDE-AES can quickly and accurately scan sample barcodes, eliminating manual data entry. The dual optical fibers cater to different wavelength requirements: one measures lithium, calcium, and sodium, while the other handles the remaining elements, enhancing the accuracy of multi-element analysis.
- **User-Friendly Design:** Users can easily create custom applications based on their specific needs without requiring manufacturer authorization. The integrated shaft design reduces the need for alignment, provided there are no faults, simplifying both operation and maintenance.
- **Durable and Secure Construction:** Built with a fully closed frame structure, the RDE-AES is resistant to impacts and deformation. The light chamber is equipped with a closed isolation heat exchanger to prevent contamination from dust, water mist, and oil mist, while the exhaust structure minimizes cross-contamination risks.
- **Efficient and Cost-Effective Operation:** The RDE-AES allows direct sample injection without pre-treatment, delivering results in approximately 40 seconds per test. The low operating costs are attributed to minimal consumable materials, including graphite disc electrodes and sample cups, and the system does not require argon gas or cooling water.
- **Comprehensive Element Detection:** The standard configuration can simultaneously determine 24 elements, including Ag, Al, Ca, Cr, Fe, Li, Mg, Mo, Na, P, Si, Zn, and more. Additional elements can be analyzed without hardware modifications, offering flexibility to meet various testing needs.

## MEASURING RANGE FOR DIFFERENT KINDS OF SAMPLES

ELEMENT	LUBRICANT & HEAVY FUEL OIL	LUBRICANT EXTENDED CAL	FUEL	LOW DETECTION FUEL	COOLANT	WATER
Aluminum (Al)	0~1000	0~1000	0~900	0~100	0~50	0~10
Barium (Ba)	0~1000	0~6000	-	0~100	-	-
Boron (B)	0~1000	0~1000	-	0~100	-	-
Cadmium (Cd)	0~1000	0~1000	-	0~100	-	0~10
Calcium (Ca)	0~6000	0~20000	0~900	0~100	0~50	0~10
Chromium (Cr)	0~1000	0~1000	0~900	0~100	-	0~10
Copper (Cu)	0~1000	0~1000	0~900	0~100	0~50	0~10
Iron (Fe)	0~1000	0~1000	0~900	0~100	0~50	0~10
Lead (Pb)	0~1000	0~1000	0~900	0~100	0~50	0~10
Magnesium (Mg)	0~2000	0~6000	0~2700	0~100	0~50	0~10
Manganese (Mn)	0~1000	0~1000	0~900	0~100	-	0~10
Molybdenum (Mo)	0~1000	0~1000	-	0~100	0~500	-

ELEMENT	LUBRICANT & HEAVY FUEL OIL	LUBRICANT EXTENDED CAL	FUEL	LOW DETECTION FUEL	COOLANT	WATER
Nickel (Ni)	0~1000	0~1000	0~900	0~100	-	0~10
Phosphorus (P)	0~2000	0~6000	-	0~100	0~2500	-
Silicon (Si)	0~1000	0~1000	0~900	0~100	0~500	0~10
Silver (Ag)	0~1000	0~1000	-	0~100	-	-
Sodium (Na)	0~1000	0~6000	0~100	0~100	0~1000	0~10
Tin (Sn)	0~1000	0~1000	-	0~100	-	0~10
Titanium (Ti)	0~1000	0~1000	-	0~100	-	-
Vanadium (V)	0~1000	0~1000	0~900	0~100	-	-
Zinc (Zn)	0~2000	0~6000	0~900	0~100	-	-
Potassium (K)	0~1000	0~1000	0~900	0~100	0~1000	0~10
Lithium (Li)	0~1000	0~1000	-	0~100	-	-
Antimony (Sb)	0~1000	0~1000	-	-	-	-

## TECHNICAL SPECIFICATIONS

ITEM	SPECIFICATIONS
<b>Optical System</b>	
Pashen-Runge, Roland Circle Optical Structure, Roland Focal Length	500mm
High-performance Holographic Diffraction Grating, Grating Notching	2700L/mm
Optical Resolution	0.006nm
Spectral Range	190~900nm
Short Wave Chamber Wavelength	190~470nm
Long Wave Chamber Wavelength	470~900nm
Temperature Control	Both Roland circle and the host machine are equipped with a constant temperature system to maintain constant temperature independently, $40\pm 1^{\circ}\text{C}$ ; temperature is adjustable.
<b>Computer System</b>	
Operating System & Connectivity	Instrument control and data management software based on Windows platform, with external connection to the control computer

ITEM	SPECIFICATIONS
<b>Power Supply and Environment Requirements</b>	
Voltage	220V $\pm$ 10%, 50/60Hz, AC power, built-in pressure stabilizing device, no special grounding required; (110V also available upon request).
Power Consumption	$\leq$ 1kw Fusing current: 16A
Operating Temperature Range	-40~50 $^{\circ}\text{C}$
Temperature Variation Allowance of The Maximum Temperature	$\pm 5^{\circ}\text{C}/\text{h}$
Operating Humidity	0~90%, no condensation
Working Altitude	$\leq$ 7000m
<b>Expert Spectral Analysis Software</b>	
User-friendly interface	
One-button detection	
Built-in working curve, operational after simple calibration with standard reference oil	
Dynamic drift correction for improved optical system stability	
Export and automatic storage functions	
Automatic pixel calibration (spectral tracing)	
Working curve correction	
Reference line setting	
Automatic spectral line selection	

## TECHNICAL SPECIFICATIONS

ITEM	SPECIFICATIONS
<b>Excitation Light Source</b>	
Performance	Bidirectional high-performance excitation light source, 14000V ignition pulse.
Digital Controls	Digital discharge parameter setting, digital pulse generator, digital offline pulse control.
Signal Detection	Dual-phase zero-crossing signal detection technology, avoids high-voltage spark electromagnetic compatibility interference, improves voltage stability.
<b>Excitation Chamber</b>	
Electrode Holder	Rod electrode holder with automatic adjustment of electrode pole distance device, ensures consistent electrode spacing for all measurements
Visual Monitoring	Excitation chamber equipped with a visual window to observe the entire excitation process
Safety Features	<ul style="list-style-type: none"> <li>- Excitation chamber door safety lock</li> <li>- Sample cup, disc electrode, rod electrode</li> <li>- Spark gap sensing monitoring device (laser light source automatic positioning)</li> <li>- Safety alarm and automatic flameout function</li> </ul>
Contamination Prevention	Semi-permeable cutoff to prevent oil sputtering contamination and filter stray light
Fire Prevention	Aluminum fire extinguishing device to prevent flames caused by volatile sample ablation
<b>Detector</b>	
Signal Transmission	Cluster optical fiber signal transmission dual-layer, multi-CCD detection spectrum system
CCD Arrangement	Linear array of multiple CCDs arranged in a Roland circular shape for continuous and simultaneous detection of the whole band and facilitates later development of other elements
CCD Detector	High-performance CCD detector, each CCD with 3648 pixels
Ultraviolet Enhancement	Ultraviolet band spectral enhancement technology enhances light intensity and prolongs detector life
<b>Power Supply and Environment Requirements</b>	
Dimensions	740mm (Length) x 560mm (Width) x 360mm (Height)
Weight	69 kg (152 lb)





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