

Innovate T5 Optical Emission Spectrometer

From **Jiebo Technology**



Instrument Overview

Innovate T5 Full Spectrum Optical Emission Spectrometer adopts the international standard of design and manufacturing technology. It uses the most advanced CMOS signal acquisition device from Japan Hamamatsu Co. Each CMOS can be set for the number of sparks separately. It adopts vacuum light chamber design and full digital excitation light source. This CMOS Spectrometer is not only contain the feature of full spectrum of CCD spectrometer but also have the advantages of PMT spectrometer which has very low detection limit for nonmetallic elements. The design of the whole machine is reasonable. It also has many advantages such as easy operation, high accuracy test result, long-term stability etc.

1. Main Technical Parameters

Application Field	Metallurgy, foundry, machinery, scientific research, commodity inspection, automobile, petrochemical, shipbuilding, electric power, aviation, nuclear power, metal and nonferrous metal smelting, processing and recovery Industry.
Analysis Matrix	Fe, Al, Cu, Zn, Ni, Mg, Pb etc.
Optical System	Para-Runge-Roland Circular Full-Spectral vacuum optical system
Wavelength Range	140~680nm
Grating Focal Length	401mm
Detector	High performance CMOS array
Light Source Type	Digital light source. High energy precombustion technology.
Discharge Frequency	100-1000Hz
Discharge Current	Max 400A
Working Power	AC220V 50/60Hz 1200W
Dimension	780*565*360mm
Weight	78kg
Analysis Time	According to the sample type, normally is about 20s.
Electrode Type	Tungsten Spray Electrode
Analytical Gap	4mm
Other Functions	Vacuum, temperature, software automatic control pressure, Communication monitoring.

2. Main Technical Features

High Performance Optical System	The arc flame generated by the excitation of optical system is directly introduced into the vacuum optical chamber by the lens which realizes the optical path through and effectively reduces the loss of the optical path.
	High precision CMOS detector can accurately measure the nonmetallic elements such as C, P, S, As, B, N and all kinds of metal elements.
	The test results are accurate, reproducible and long-term stable.
Automatic Optical Path Calibration	Automatic optical path calibration. Optical system automatic spectral line scanning to ensure the correctness of the receiving and eliminating the tedious peak scanning work.
	The instrument automatically identifies a particular spectral line and compares it with the original storage line, determines the drift position, and finds out the current pixel position of the analytical line for measurement.
Design of Plugged Lens	The vacuum optical system adopts unique incident window and vacuum isolation which can be operated in the working state of the vacuum system. The optical lens adopts a plugged lens structure which is convenient for daily cleaning and maintenance.
Vacuum Chamber Integration	The unique structure of the light chamber makes the volume of the vacuum chamber smaller and the vacuum pumping time is only 1 / 2 compared with the ordinary spectrometer.
	The integrated design and high precision processing of vacuum chambers ensure the vacuum status more durable.
Vacuum Anti-oil Technology	Multistage isolation vacuum anti-oil technology adopts vacuum pressure differential valve to ensure the vacuum light chamber and vacuum complete isolation when the vacuum pump is not working.
	The vacuum oil filter device is added in the middle to ensure that the vacuum pump oil does not enter the vacuum chamber and that the CMOS detector and optical elements work in a reliable environment.
Open Spark Table	The flexible sample clamp design of the open spark table is designed to meet the sample analysis for various shapes and sizes at the customer site.
	The minimum analysis of the wire can reach 3mm using a small sample clamp .
Jet Electrode Technology	Using the most advanced spray electrode technology in the world and using tungsten electrode. Argon jet flow will be formed around the electrode under the excited state. So the excitation point will not be in contact with the outside air during the excitation process and the excitation accuracy will be improved.
	By a unique argon gas design, greatly reduce the amount of argon gas consumption and save the customer's cost.
Integrated Gas Path Module	The air path system adopts the free maintenance design of the gas path module instead of the solenoid valve and the flow meter. The self-blowing function of the electrode creates a good environment for the excitation.
Digital Excitation Light Source	Digital excitation light source adopts the most advanced plasma excitation light source in the world. The super stable energy is released in argon environment to stimulate the sample.
	The full digital excitation pulse is used to ensure the ultra-high resolution and high stability output of the sample plasma.
	The parameters of the light source can be adjusted arbitrarily to meet the excitation requirements of various materials.

High-speed Data Acquisition	The instrument adopts high performance CMOS detector and each CMOS has the function of collecting and analyzing the data. It can automatically monitor and control the operating state of the modules such as temperature, vacuum, argon pressure, light source, excitation chamber etc.
Ethernet Data Transmission	The Ethernet card and TCP/IP protocol are used between the computer and the spectrometer to avoid the disadvantages of electromagnetic interference and optical fiber aging. At the same time, the computer and printer are completely external which is convenient to upgrade and replace.
	Remotely monitor the instrument status, multi-channel control system and monitor all instrument parameters.
Prefabricated Working Curve	With different materials and grades of the standard library, the factory prefabricated work curve before delivery which is convenient for installation and commissioning in order to timely production.
	The analysis program will be different according to the metals and elements. The excitation and test parameter of the instrument has been adjusted well before delivery. According to the analysis program, the optimal test condition can be automatically selected.
	The scope of analysis is attached to the specification and can be freely drawn or extended according to the standard sample supplied by the user.
Fast Analysis Speed	The analysis speed is very fast. It only takes 20s for one test.
	According to different analysis materials, by setting pre-burning time and measuring time, the instrument can achieve the best analysis effect with the shortest time.
Multi-matrix Analysis	The optical path design adopts a compass structure. The detectors are arranged alternately up and down so that all the spectral lines are received. Even though the hardware facilities are not added, the multi-matrix analysis can be realized.
	It's easy to add matrix, material types and analytical elements without hardware cost according to production requirements.
Software System	The instrument operation software is completely compatible with Windows7/8/10 system.
	The software is easy to operate even if no spectrometer knowledge and operational experience. Only after simple knowledge of training can be used.

3. Scope of Supply

1) Instrument Attachment List

No.	Name	Specification	Qty.
1	Optical Emission Spectrometer (Main Unit)	Innovate T5	1 pcs
2	Calibration Standard Sample	As per customer's requirement	1 pcs
3	Vacuum Pump	VRD-4	1 pcs
4	Vacuum Oil Filter	55×77mm	1 set
5	Differential Pressure Valve	GYC-JQ16	1 pcs
6	Vacuum Clamp	KF16	2 set

2) Spare Parts List

Name	Specification	Unit	Qty.	Note
Tungsten Electrode	74×5mm	pcs	1	
Pole Gauge	4.0mm	pcs	1	
Electrode Brush	110×8mm	pcs	1	
Stainless Steel Clean Pipe	6mm	m	2.5	
Argon Gas Regulator	YQY-12	pcs	1	0-2.5MPa
Special Stainless Steel Connector	Φ6	pcs	1	
National Standard Power Wire	10A	pcs	1	
Triangular Key	T5	pcs	1	
Stainless Steel Fastener	5×10mm	pcs	4	Inner Hexagonal
Mouse Pad	240×210mm	pcs	1	
PVC Tube	12×8mm	m	1.5	
Fluoro Rubber Ring	13×11mm	pcs	1	
Fluoro Rubber Ring	6×4mm	pcs	1	
Fluoro Rubber Ring	11×9mm	pcs	1	
Screwdriver	6*100mm	pcs	1	
Inner Hexagon Spanner	2.5mm	pcs	1	
Inner Hexagon Spanner	3mm	pcs	1	
Inner Hexagon Spanner	4mm	pcs	1	
Inner Hexagon Spanner	5mm	pcs	1	

Sample Tray	Oblong	pcs	1	
Internal Pressure Filter	10 "2"	pcs	1	
Electrode Wrench	3×100mm	pcs	1	
304 Tighten Screw	M6×8mm	pcs	1	
Network Wire	1.5m	pcs	1	
Vacuum Clamp	KF16	set	1	

Special statement: the buyer knows and agrees that the seller may adjust the supply of the equipment spare parts when the manufacturer changes due to technological progress, product upgrading, market changes etc.

3) Optional Accessories

Name	Qty.	Note
High precision magnetically saturated stabilized power supply 1 KVA, Iron Tower or Ochis brand)	1 pcs	
Argon Gas Purifier	1 pcs	If the user can't supply high purity argon gas
Grinding Machine for Ferrous Metals	1 pcs	Necessary
Small Lathe for Non-ferrous Metals	1 pcs	Necessary

4. Technical Configuration

1) Specifications and Technical Parameters

Item	Index
Analysis Matrix	Fe, Al, Cu, Zn, Ni, Pb, Mg etc.
Analysis Time	According to the sample type, normally is 20s.
Optical System	Para-Runge
Wavelength Range	140 ~ 680nm
Working Power	(220±20) V AC, (50±1) Hz, Single-phase power supply with protective grounding.
Working Temperature	(10 ~ 30)°C
Storage Temperature	(0 ~ 45)°C
Working Humidity	20% ~ 80%
Argon Gas Purity Requirement	99.999%
Argon Gas Inlet Pressure	0.5MPa
Argon Gas Flow Meter	Excitation flow rate 3.5L/min, Maintain flow rate 0.4L/min, Standby flow rate 0.1L/min.
Dimension	L726mm*W565mm*H360mm
Weight	78kg
Maximum Excitation Power	400VA
Standby Average Power	100VA
Light Source Type	Pulse synthesis all digital light source (programmable pulse all digital light source)
Discharge Frequency	Max 1000 Hz
Discharge Current	Max 400A
Ignition Pulse	1 ~ 14kV
Spark Excitation Pulse	20 ~ 230V
Arc Excitation pulse	20 ~ 60V
Spark Table Hole Diameter	12mm

2) Optical System

- Full spectrum optical system with Ipa-Runge structure
- Wavelength Range: 140 ~ 680nm
- Multiple high performance CMOS detectors
- Resistance to environmental temperature change
- Integrated optical chamber design, CMOS detector ensures short wave to achieve the best performance.
- Constant temperature control of optical room. Temperature is 36 °C.

3) Sample Spark Table

- The special design of the excitation chamber makes the cleaning of the sample excitation chamber more convenient.
- The optimized argon gas path is designed to ensure the effective cooling of the firing station and the effective entry of metal dust into the filter during the excitation process which makes the sample excitation more stable and greatly reduces the intake of metal dust by the human body. It's for protect the health and safety of operators.
- Smaller excitation space which makes less argon consumption.
- Sample fixture which is easy to use.
- The electrode has the function of self-blowing which makes the life of electrode longer and much easier to clean the electrode.
- The size of 13mm excited pore is more favorable for sample analysis.
- The open sample generator can be used for the analysis of samples of various sizes and shapes.
- The design of lens structure makes the lens disassembling and wiping more convenient and argon washing design can prolong the lens cleaning cycle.

4) Digital Light Source

- Pulse synthesis full digital light source (programmable pulse full digital light source) . The highest frequency up to 1000 Hz.
- High energy pre-combustion technology
- Optimal design of control and power circuit and perfect excitation safety protection function.
- Provide optimal spark, arc or combination excitation waveform for different analysis samples.
- Frequency: (100 ~ 1000) Hz
- Discharge Current: max 400 A

5) Data Acquisition System

- High performance DSP processor with ultra high speed data acquisition and control function.
- Single spark acquisition and spectral delay acquisition to achieve more optimized element content measurement.
- External computer (user optional)
- High speed Ethernet data transmission

6) Analysis Software

- Graphical Analysis Software based on Windows operating system, convenient and practical.
- Complete automatic system diagnosis function.
- Perfect database management function, easy to query and summarize data.
- Intelligent correction algorithm to ensure the stability and reliability of the instrument.
- Complete spectral line information and interference deduction algorithm to ensure analysis more accurate.
- Adapting to the latest Windows operating system.

7) Main Core Components list and Origin

No.	Name	Brand	Origin
1	CMOS Array	HAMAMATSU	Japan
2	Grating	Zeiss	Germany
3	Optical Glasses	Zeiss	Germany
4	Optical Fiber	Agilent	China
5	Slit	lenoxlaser	China
6	Filter	TDK	Japan
7	Pressure Sensor	SSI	China
8	Valve Block	Airtac	Taiwan
9	Digital Light Source Modular	Jiebo	Jiebo
10	Master Control and Data Acquisition	Jiebo	Jiebo
11	Vacuum Pump	Ulvac	China (Japanese sole proprietorship)
12	Vacuum Optical System	Jiebo	Jiebo
13	Firing Station Module	Jiebo	Jiebo
14	System Software	Jiebo	Jiebo
15	Standard Samples	National Standard	China or Foreign brand

5. Analysis Elements and Range

Program	Fe-Low alloy		Fe-Cr-Ni steel		Fe-Cr steel	
Elements	Min	Max	Min	Max	Min	Max
C	0.0006	1.3	0.008	2.5	0.04	2.2
Si	0.01	3.9	0.09	4	0.1	1.4
Mn	0.03	2.1	0.12	16	0.1	1.5
P	0.002	0.12	0.003	0.3	0.006	0.05
S	0.002	0.16	0.001	0.4	0.001	0.3
Cr	0.01	4.5	7.4	32	7.8	24
Ni	0.004	4.4	0.8	48	0.09	4.2
Mo	0.0004	1.3	0.08	4.2	0.02	1
Al	0.003	1.5	0.005	1.7	0.1	1.7
Cu	0.0002	0.5	0.05	4.5	0.02	0.5
Co	0.001	0.5	0.008	17	0.01	0.5
Ti	0.002	1.2	0.005	1.1	0.006	0.4
Nb	0.002	0.3	0.02	2		
V	0.0003	0.9	0.02	9.5	0.03	1.1
W	0.03	2.1	0.002	4.1	0.05	0.7
Pb	0.0003	0.03	0.0001	0.02		
Mg						
B	0.0006	0.02	0.0007	0.02		
Sn	0.001	0.09	0.0003	0.05		
Zn	0.002	0.04	0.006	0.008		
As	0.0007	0.1	0.0004	0.04		
Bi	0.0001	0.01	0.00004	0.003		
Zr	0.004	0.35				
La						
Ca	0.0004	0.002	0.0003	0.001		
Ce						
Sb	0.0002	0.02	0.0005	0.022		
N	0.002	0.09	0.004	0.9		
Te						
Fe						

Program	Red Copper		Be-Bronze		Si-Bronze	
Elements	Min	Max	Min	Max	Min	Max
Zn	0.001	0.3	0.005	0.23	0.2	6
Zn						
Pb	0.001	1.5	0.005	0.3	0.01	0.8
Sn	0.001	0.3	0.005	0.18	0.05	0.7
P	0.001	0.02			0.005	0.08
Mn	0.0001	0.1	0.005	0.08	0.2	1.8
Fe	0.001	0.2	0.02	0.28	0.1	1.7
Ni	0.001	0.5	0.005	0.35	0.05	1
Si			0.02	0.3	1.5	5
Mg	0.001	0.01			0.002	0.01
Cr	0.001	0.03	0.002	0.006		
Te	0.005	0.05				
As	0.005	0.3			0.005	0.08
Sb	0.005	0.35			0.005	0.07
Cd	0.001	0.03				
Bi	0.001	0.07			0.002	0.02
Ag	0.006	0.05				
Be			0.32	3.2		
Co	0.001	0.05	0.15	2		
Al	0.002	0.02	0.02	0.2	0.02	0.35
S	0.001	0.05			0.005	0.02
B	0.001	0.03				
Se	0.001	0.06				
Cu						

Note:

- This program sheet is filled out according to the actual contract requirement of the customer.
- If customers have standard sample requirements, provide sample numbers and purchase by themselves. If sales personnel buy it, the standard samples will be shipped separately from Wuxi.
- If the customer uses is special application and is willing to provide sample for developing the curve, the customer must provide the accurate sample element content and ensure the uniformity of sample, but this curve can't act as the acceptance index of instrument.

6. Laboratory environment

1) Environment requirement

The instrument must be placed in a special laboratory with an indoor area greater than 10 square meters, and ensure the lab is no harmful, flammable and corrosive gas around.

Caution: it is forbidden to place this instrument in chemical analysis laboratory.

Working temperature: 10°C ~ 30°C, and room temperature fluctuation within 3 hours is less than 2 degrees. The laboratory is required to install air conditioning.

Storage temperature: 0°C ~ 45°C

Relative humidity of environment: 20% ~ 80%. For wet areas, a dehumidifier is required.

If not meet the above requirements, the service life and measurement accuracy of the instrument may be will be affected.

2) Power requirement

Power supply: single phase 220 + 20V, 1KVA.

Ensure the normal use of the Innovate T5 spectrometer, please install a voltage regulator with 1kVA to 3kVA single phase 220V AC.

Ensure the reliable use of the instrument, please prepare a single ground wire for the instrument, and the grounding resistance is less than 4 ohms.

3) Argon requirement

Purity \geq 99.999%, oxygen contents \leq 2ppm, H₂O content \leq 5ppm, (The argon gas cylinder can not be stored in the open air, and the rain is strictly prohibited.)

If no have high purity argon, it is recommended to use argon purifier.

Argon gas flow: standby flow approx 0.1L/min, Maintain flow approx (0.4-0.5) L/min, Excitation flow approx 3.5L/min.

argon gas controlled pressure: 0.5Mpa.

4) Argon connection tube

It is necessary to use the special stainless steel argon connection tube.

5) Exhaust bottle

The instrument exhaust gas is discharged through a PVC enhancement tube (14mm inner diameter) into a filter bottle. Need to clean up and replace in time.

6) Sample preparation

For iron base samples, the samples must be prepared by special grinding mechanism, a double disc grinding machine and a ground grinder required, which for grinding on the surface of iron and steel samples. The white cast iron sample must be uniformity.

The user needs to prepare a cutting machine for the treatment of samples which are not suitable for spectroscopic analysis.

The samples must be uniform, no pores and no casting defects, the surface must be smooth, no oxide, no oil stain and no burrs.

7) Standard sample requirement

One standard sample is given at random to correct the overall spectral curve of the instrument. In addition, users need to prepare extra suitable standard samples for their own product types for calibration of instrumental analysis curves.

8) Computer and printer requirement

Prepare a computer with conventional configuration, memory 1GB or above, CPU dual core 1.8G Hz or more, to install Innovate T5 spectrometer analysis software.

Prepare a printer to printing the analysis reports.

7. Installation and debugging

1) Inspection and custody

When the instruments arrive at, the buyer should check whether the outer packing is intact. If the outer package is damaged or the instrument is damaged, the user shall keep the relevant evidence and notify the seller in time, and cooperate with the seller making the claim to the responsible party. Otherwise, the buyer shall bear the damage to the goods by themselves.

When the instruments arrive at, the buyer should store the instrument in the indoor environment (temperature 0°C ~ 45°C and humidity 20% ~ 80%). The buyer can not open the package before the installation engineer arrived. Otherwise, the goods will be considered as qualified.

2) Installation and debugging

Within one month after the instrument arrival, the buyer shall have the installation conditions and notify the seller for installation.

When the installation engineer arrives, the packing list and acceptance items will be checked together and signed by both parties. If have missing part, the installation engineer need indicate on the installation acceptance sheet, the Seller shall send it separately.

If the buyer still does not have the installation conditions or damage the instrument during the two months of the instrument arrival, the seller has the right to require the buyer to pay the additional installation expenses and all the expenses for the damage to the instrument in the custody.

During the installation and commissioning, the buyer shall provide the installation engineer with convenient working conditions. At the same time, the buyer need assume the installation engineer's round-trip transportation expenses, room and board expenses.

3) Installation steps

The engineers install and debug the instrument according to the installation procedure.

Test sample selection:

According to the content and grade of the test materials, after determined by the mutual consultation between the buyer and engineers, to select a standard Calibration sample to meet daily analysis requirements.

4) Instrument test:

Turned on the instrument, when the instrument's temperature, pressure and argon meet the normal working requirements, the installation engineer establish the working curve and the test precision of the instrument with the prepared standard samples. Generally, 4~6 data are used to calculate standard deviation (SD) or relative standard deviation (RSD) value.

Formula of precision calculation:

$$\text{relative standard deviation (RSD)} = \frac{\text{standard deviation (SD)}}{\text{average value (AVG)}} \times 100\%$$
$$(SD) = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

average value (AVG)

AVG = average value of multiple measured values

8. Aftersales and others

1) Random technical data and software

Drive and application software installation CD-ROM
User handbook
Daily maintenance page

2) Training

During installation and commissioning, the installation engineers will organize staff and maintenance personnel to receive training, normally 2-3 days. Through training, users will have a better understanding of the relevant technology of spectrometer analysis, and skillfully operate and maintain the instrument.

The seller will hold regular or free technical training courses. The training notice will be sent to the user in time, users decide whether to attend training according to own situation

3) After-sale service

3.1 The warranty: The warranty shall be subject to the contract.

If not specified in the contract, the warranty shall be implemented in accordance with the following terms:

- The warranty shall be 12 months from the time of instrument acceptance, or 12 months from the buyer's receipt of the instrument.
- The general fragile parts (mouse, ordinary keyboard, etc.) are guaranteed for three months from the date of the factory.
- The warranty for external parts (PC, printer, stabilized power supply, etc.) is subject to the manufacturer's regulations.
- The warranty of the rework parts is three months.
- Consumables (filter cotton, electrode brush, etc.) are not guaranteed.
- If Instrument have any quality related problem and affect the use, the warranty will be postponed.

3.2 During warranty, if the instrument fails under the normal use, it will be corrected free of charge, However, the seller will charge the cost and maintenance fee due to the user's wrong operation and the damage caused by the force majeure (war, earthquake, lightning, flood, etc.).

3.3 When the instrument is repaired, the seller will confirm the fault by telephone and solve the problem. If it needs to be solved at the scene, the engineers can rush to the scene within 48 hours.

3.4 Maintenance outside the warranty:

Exceeds the warranty, the seller will continue to provide maintenance services If need the scene service, the seller will charge the cost of spare parts and service charges.

3.5 Spare parts and consumables supply: the seller will supply spare parts and consumables to the buyer with favorable price.