

SINPAR FTC Combination Research and Motor Method Octane Rating Unit



Shanghai Sinpar Scientific Instrument Co.,Ltd
Manufacturer of Octane Rating Engines in China
www.sh-sinpar.com



SINPAR

Professional Manufacturer of Octane Rating Engines

Locates in Shanghai, China, is a high-tech company integrated with researching, manufacturing, sales and service for Combination Research and Motor method Octane Rating Unit (ASTM D2699 RON & ASTM D2700 MON).

Since SINPAR was established, it has been devoted to R&D of the high quality Octane Rating Engines in China and committed to offer the perfect solutions to customer.

In Shanghai, SINPAR has set up a **R&D Center** which composed by experienced experts from National Petroleum Research Institute and professors from Petroleum Colleges. R&D Center integrates the advanced technology into the product innovation and offers the best technical support.

SINPAR FTC Octane Rating Unit which owning independent intellectual property rights in China, is in full compliance with **ASTM D2699(ISO 5164)** and **ASTM D2700(ISO 5163)** standard methods. In the years since it was first introduced to market, **FTC Octane Rating Engine** has been updated regularly with features that enhance test accuracy and accurate fuel octane ratings.

SINPAR FTC Octane engines are widely accepted and used in many countries and regions with its stable performance.

SINPAR offers world-class products and world-wide services focused on building long term satisfaction and commitment for international customers and partners.



SINPAR FTC-M1&M2
Combination (Research and Motor Method)
Octane Rating Unit

The Complete Solution For Octane Testing



SINPAR FTC Combination (RON&MON Method) Octane Rating Unit is used as a complete system for determining octane number of motor fuels, conforming to ASTM D2699 (ISO 5164) and ASTM D2700(ISO 5163) Standard Test Methods.

The FTC Combination Octane Rating Unit provides the convenient conversion between Research Method(ROn) and Motor Method(MON).

With either method, testing capabilities cover the 40-120 octane number range.

ASTM D2699 (Research Method), **ASTM D2700**(Motor Method)
ISO 5164 (Research Method), **ISO 5163**(Motor Method)
IP 237 (Research Method), **IP 236**(Motor Method)

FTC Octane Engine applies to the user which has the requirements of wide source test samples, large test quantity, long continuous test time, performing to ASTM test procedures. With excellent test accuracy and stable performance it is widely accepted and used in fuel testing laboratories.

FTC Combination Octane Rating Unit produces test results under these operating conditions:



Research Method (ASTM D2699)	Motor Method (ASTM D2700)
Engine Speed: 600 RPM +/- 1%	Engine Speed: 900 RPM +/- 1%
Spark Timing: 13° BTDC	Spark Timing: Variable Based on Cylinder Height
Intake Air Temperature: 52°C±1°C	Mixture Temperature: 149°C±1°C
Jacket Temperature: 100°C±1.5°C	
Oil Temperature: 57°C±8.5°C	
Oil Pressure: 25-30 PSI	
Intake Humidity: 25-50 grains of moisture/lb. of dry air	
Power Supply: 380V 50Hz/60Hz 10KW; 220V 50Hz/60Hz 2KW	

Technical Parameters

Basic Information	
Standard	ASTM D2699 RON ASTM D2700 MON
Working Range	40-120 octane number
Operation Conditions	
Engine Speed(Motor)	900±9 rpm
Engine Speed(Research)	600±6 rpm
Ignition Timing(Motor)	Variable as Cylinder Height (C.R.) is Changed (Basic Setting 26° at 5:1 C.R.)
Ignition Timing(Research)	13° BTDC
Intake Air Temperature(Motor)	38°C±1°C
Intake Air Temperature(Research)*1	52±1°C at Std. Barometer, Depends on barometric pressure
Intake Mixture Temperature(Motor)*2	149°C±1°C
Cylinder Jacket Coolant Temperature	100°C±1.5°C
Crankcase Oil Temperature	57°C±8.5°C
NOTE: *1 If IAT tuning is used to qualify the engine as fit-for-use, the temperature can be adjusted within ±22°C from the base temperature specified for the prevailing barometric pressure, and this temperature shall then be maintained within ±1°C when CR or KI results used for octane determination on each fuel are recorded. See ASTM D2699 for details.	
NOTE: *2 If intake MIXT tuning is used to qualify the engine as fit-for-use, the temperature can be adjusted between 141°C-163°C, and this temperature shall then be maintained within ±1°C when the CR or KI results used for octane determination on each fuel are recorded. See ASTM D2700 for details.	
Engine Information	
Compression Ratio (C.R.)	4:1-18:1
Cylinder Bore(Diameter)	82.55 mm (Standard)
Stroke	114.30 mm
Carburetor Venturi(Research)	14.30 mm
Intake Valve Clearance(Hot)	0.20 mm±0.025 mm
Exhaust Valve Clearance(Hot)	0.20 mm±0.025 mm
Intake Valve Opens Timing	10°±2.5° ATDC
Intake Valve Closes Timing	34° ABDC
Exhaust Valve Opens Timing	40° BBDC
Exhaust Valve Closes Timing	15°±2.5° ATDC
Crankcase Oil Pressure	172 kPa - 207 kPa
Function Information	
Compression Ratio Adjustment	Motor-Driven
Compression Ratio Display Device	Dial Indicator & Digital Counter
Engine Speed Conversion	Dual-Speed Motor
Carburetor	Four-Bowl (with a cooling function)
Ignition Timing Display	Digital (Auto-Set)
Crankcase Pressure Display	Yes
Crankcase Oil Heater	Yes
Oil Temperature Display	Yes
Air Humidity Control Apparatus	Yes
Unit Protection Systems	Yes (FTC-M2)

Operating Panel



Parameters are adjustable via operating panel according to ASTM D2699(RON) and ASTM D2700(MON) test method specifications.



The professional and clear design of operating area makes the octane rating operation convenient and the data is easy to read and record.



The auto-setting function of model FTC-M2 Octane Engine effectively simplifies operational procedures and improves the efficiency of octane testing.



The operating panel is equipped with a protect system and the push-button switches to avoid maloperation.



Function Features

Research/Motor Method Conversion

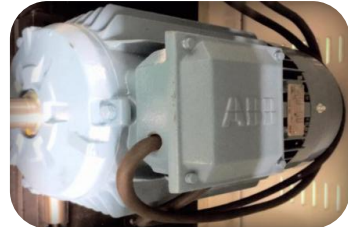
is easily accomplished by the use of Dual-Speed Motor provided with the Combination Octane Rating Unit. Switch the engine speed to meet either Research (600 RPM) Method or Motor (900 RPM) Method.

No need to change the flywheel.



Synchronous and Dual-Speed Motor

with Slide Base steadily provides constant engine speed as per ASTM D2699 and ASTM D2700 standard test methods during octane rating operation.



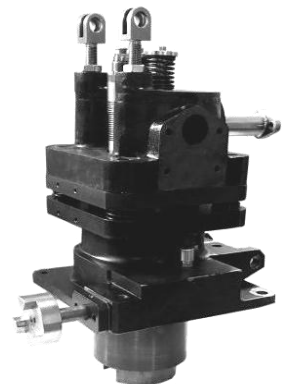
Engine Crankcase

is heavy-duty cast-iron, box-type design with high strength and rigidity for running octane tests of various types of fuels and long-lasting sealing system, that ensures long service life and carefree operation & maintenance. Removable side doors allow to easily check the internal components for inspection, maintenance and overhauls.

Variable Compression Cylinder and Sleeve Assembly

allows the Compression Ratio to be changed by adjusting the Cylinder Height during the engine operation. The available range is 4:1 to 18:1, which allows testing a wide range of fuels.

The Cylinder Height is expressed as C.R. Digital Counter Reading which is directly correlated to a specific octane value according to ASTM D2699 and ASTM D2700 methods specifications.



The Cylinder Height

is adjusted by the Electric Motor assembly. It is the most convenient method for turning the worm shaft in either direction to adjust engine Cylinder Height(C.R. Digital Counter Reading).

Standard Dial Indicator

is installed in Octane engine for direct reference to Cylinder Height and Compression Ratios. Both Dial Indicator reading and C.R. Digital Counter reading are directly correlated to a specific octane value as per ASTM test method specifications. It can improve the reliability and accuracy of test results.



C.R. Digital Counter and Ignition Timing

are directly displayed on the control panel for easy reference and recording.

C.R. Digital Counter has two indicating counters to establish the differential between compensated reading and uncompensated reading according to barometric pressure.

The adjustable spark timing system is a SINPAR factory set and it is adjusted **automatically** in accordance with ASTM MON&RON test methods.

Knock Measurement Equipment

is cabinet-mounted in the octane unit panel and connected to knock pickup assembly mounted directly in the cylinder's combustion chamber.

SINPAR Factory-calibrated Detonation Meter

converts changes in combustion knock to a stable and accurate analog signal. The 0 to 100 division analog indicating meter that displays the knock intensity signal from the analog detonation meter. Digital knock signal adjustment effectively improves octane test accuracy and test efficiency.



Four-Bowl Falling Level Carburetor

is available in multiple jet and venturi sizes for all applications. Fuel flow control system is used to permit adjustment of fuel-air ratio. The fuel level that produces maximum Knock Intensity is from 0.7 in. to 1.7 in.

Four Bowls are offered. The fourth bowl is equipped with a cooling system for testing highly volatile fuel octane.



Falling Level Model (Combination Octane Rating Unit FTC-M2 with SXCP) provides more sensitive fuel flow adjustment for obtaining more accurate result and delivers an efficient and accurate falling level test.

It allows determining maximum knock intensity without manual adjustment of fuel level. Operator can run accurate octane tests by PROCEDURE B (Bracketing-Dynamic Fuel Level) in ASTM D2699 & ASTM D2700.

Safety Systems

provide engine automatic shut-down with the fault indications, when any of follow conditions occurs on octane rating unit: low oil pressure, loss of cooling water, excessively high temperature of cooling water, electrical power loss or electrical overload of the motor.



The Sensors Assemblies

are connected to the control unit safely, reliably and conveniently through waterproof aviation connectors. The connection panel is clearly labeled for each sensor. It's very ease for operator to perform the maintenance and replacement.

Armored Cables have the great tensile strength and corrosion resistance for maximum service life.



Exhaust Surge Tank System

can eliminate resonance pulses and back pressure during the engine operation. Eliminating the interference of the variables makes the test result more consistent and accurate. Meanwhile, this system can effectively reduce noise and air pollution.

Intake Air Humidity Control Unit

with a adjustable refrigeration system is supplied to regulate the moisture content of intake air into octane engine at a constant 25-50 grains of moisture prescribed of dry air as specified by ASTM D2699 and ASTM D2700.



The Comparison of Engine Models FTC-M1 & FTC-M2

Features	Systems	Function	FTC-M1	FTC-M2	Function Introduction
Stability	Temperature Control	Intake Air Temperature Control Precision	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$	The higher precision of temperature control enhances stability of the output knock signal.
		Intake Mixture Temperature Control Precision	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$	
	Ignition System	Ignition Timing Setup and Display	Digital Display	Digital Display (AUTO-SET)	Digital Display is easy to read and record. Auto-Set system makes the operation more convenient.
Convenience	Lubrication	Oil Pressure Control	Manual	AUTO	Auto-Control System provides engine safety protection and easy operation.
	Cooling	Cooling Water Temperature Control	Manual	AUTO	
		Circulating Water Pressure Control	Manual	AUTO	
	Operating	Intake Air Temperature Conversion	Manual	AUTO	Auto-Conversion of IAT makes the conversion of RON&MON test methods so easy.
	Knock Measurement	Knock Signal Adjustment	Simulative Adjustment	Digital Adjustment	Digital Adjustment is more accurate and convenient.
Environment	Exhaust	Exhaust Emission	With Muffler	Exhaust Surge Tank System	Low noise design and Environmental protection



Model FTC-M1 Octane Engine



Model FTC-M2 Octane Engine

Combination Octane Rating Unit FTC-M2 With SXCP™ Digital Control Panel



ASTM D2699-18 (Research Method)
ASTM D2700-18 (Motor Method)

Combination Octane Rating Unit With SXCP™ Digital Control Panel

is the latest model of octane engine with many easy-to-use features including automatic functions and enhanced documentation capabilities, conforming to the latest ASTM D2699 (RON) and ASTM D2700(MON) Standard Methods.

SXCP™ Octane Digital Control Panel

delivers consistent and reliable test results, with standard features including on-screen operation, on-screen reports, falling level program, automated data recording, auto-set & auto-calculation system, integrated maintenance logs, and comprehensive safety system.

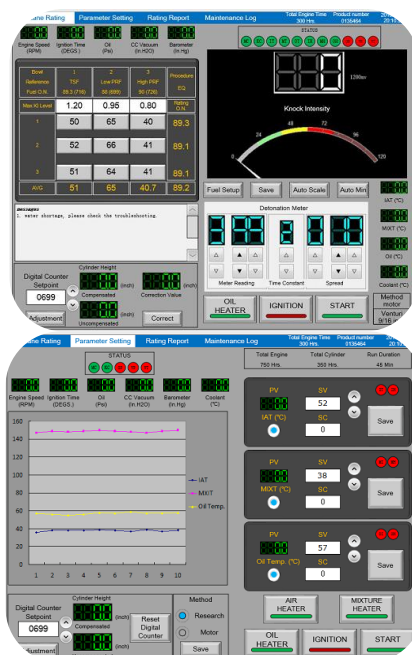
Function Features and Benefits:

☑ **Easy-to-use** SXCP touch-screen panel with easy-to-follow guidance simplifies the operation process.

☑ **Auto-Set** of intake temperatures, Auto-adjustment of Ignition Time and C.R. Digital Counter(Cylinder Height), Auto-control of temperature system.
Manual adjustment of basic parameters is also available.

☑ **Professional Software** provides user-friendly interface and simple fuel rating procedures of ASTM RON and MON test methods.

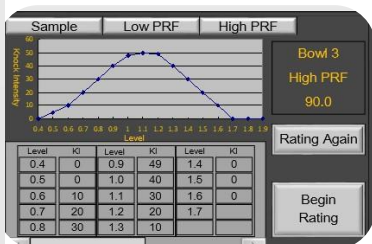
Automatic calculation and optimization system is offered to minimize human errors and other failures. New operator requires less training to achieve proficiency.



Fuel Name: TSF Operator: Operator_1

Procedure:

FL [v]
Bowl 1 [v] Bowl 2 [v]
TSF [v] Low PRF [v]
89.3 88.0
Bowl 3 [v]
High PRF [v]
90.0
Max Level [v] Min Level [v]
1.7 0.4
Rate (sec) [v] 20
Begin Rating



☑ **Falling Level Program** is used with four-bowl variable-level carburetor, that allows determining maximum knock intensity without manual adjustment of fuel level.

The operator can efficiently and accurately run a falling level test by PROCEDURE B (Bracketing-Dynamic Fuel Level) in ASTM D2699 and D2700.

☒ **Electronic On-Board Barometer**

automatically adjusts C.R. Digital Counter for Barometric Pressure as per ASTM method specifications.

✓ **Cylinder Height** is measured and auto-adjusted accurately. And the results are displayed on-screen in dual dimension values (compensated reading and uncompensated reading) that are recorded in the test reports.



☑ **Digital Knock Meter** displays actual and accurate knock intensity value and real-time waveform, thus realizes more consistent and reliable test results. This software eliminates the need to center on 50 KI or be constrained by 0-100 KI. Meanwhile automatically recording data, calculating results, and generating fuel octane rating reports are provided.

☑ Automated Data Recordings with octane rating reports including KI values, octane numbers, environmental data, fuel level values and critical operating parameters, are automatically captured and presented in an Excel report. That can avoid human recording and calculating errors. Report is easy to be reviewed and printed.

Quality Criteria

Date 2016 12 16

Fuel Name SINOPEC1643

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Print

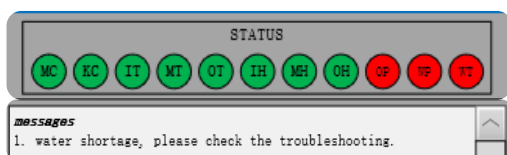
Operator a

Fuel Octane Number Report

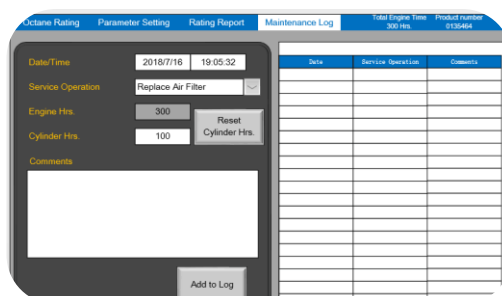
Product number 0135-46

Sample name		SINOPEC1643		Date		2016 12 16		Method		Research	
Operator		a		Time		15-33:22		Standard		ASTM D2699	
Total Engine Time		300 Hrs		Total Cycle Time		100 Hrs		Procedure		EQ	
IAT		52.2 °C		125.96 °F		Ignition Time		13"		Venturi	
MIKT		N/A		N/A °F		Engine Speed		603 rpm		30.1 in Hg	
Water Temperature		100.1 °C		213.98 °F		Oil pressure		28 psi		754 mmHg	
Oil Temperature		57 °C		134.6 °F		C/C Vacuum		2 inHg/0		101.76Pa	
Cylinder Height		Digital Counter		Dial Indicator		Motor Reading		3.67			
Compensated		716		0.504 inch		Time Constant		2			
Uncompensated		716		0.503 inch		Spread Reading		2.00			

Reference	Sample	Low PRF	High PRF	Rating O. N.	Sample Rating O. N.
Max Oil Level	Unknown	88	90		
Fuel K1 Level	1.2	0.9	0.8		
1st	30	70	42		
2nd	51	71	43		
3rd	52	72	44	89.3	
				89.3	
				O. N. (sample)=	89.3RON



 **More Safety System** protects octane engine with failure indication system and E-stop, that ensures long service life and carefree operation.



☑ Operation Manuals and Maintenance Logs
(including records of engine hours, cylinder hours, oil-change intervals and maintenance/service operation comments) are displayed on screen for easy reference.
Maintenance time is regularly reminded.

SXCP Octane Rating Parameters

Basic Information	
Standard	ASTM D2699 RON ASTM D2700 MON
Working Range	40-120 octane number
Operation Conditions	
Engine Speed(Motor)	900±9 rpm
Engine Speed(Research)	600±6 rpm
Ignition Timing(Motor)	Variable as Cylinder Height (C.R.) is Changed
Ignition Timing(Research)	13° BTDC
Intake Air Temperature(Motor)	38°C±1°C
Intake Air Temperature(Research)*1	52°C±1°C at Std. Barometer, Depends on Barometric Pressure
Intake Mixture Temperature(Motor)*2	149°C±1°C
Cylinder Jacket Coolant Temperature	100°C±1.5°C
Crankcase Oil Temperature	57°C±8.5°C
NOTE: *1 If IAT tuning is used to qualify the engine as fit-for-use, the temperature can be adjusted within ±22°C from the base temperature specified for the prevailing barometric pressure, and this temperature shall then be maintained within ±1°C when CR or KI results used for octane determination on each fuel are recorded. See ASTM D2699 for details.	
NOTE: *2 If intake MIXT tuning is used to qualify the engine as fit-for-use, the temperature can be adjusted between 141°C-163°C, and this temperature shall then be maintained within ±1°C when the CR or KI results used for octane determination on each fuel are recorded. See ASTM D2700 for details.	
Engine Information	
Compression Ratio (C.R.)	4:1-18:1
Cylinder Bore(Diameter)	82.55 mm (Standard)
Stroke	114.30 mm
Carburetor Venturi(Research)	14.30 mm
Intake Valve Clearance(Hot)	0.20 mm±0.025 mm
Exhaust Valve Clearance(Hot)	0.20 mm±0.025 mm
Intake Valve Opens Timing	10°±2.5° ATDC
Intake Valve Closes Timing	34° ABDC
Exhaust Valve Opens Timing	40° BBDC
Exhaust Valve Closes Timing	15°±2.5° ATDC
Crankcase Oil Pressure	172 kPa - 207 kPa
Function Information	
Operating Panel	SXCP Digital Control Panel
Knock Meter	Automated Digital Knock Meter
Compression Ratio Adjustment	Motor-Driven (Auto-Adjust)
Compression Ratio Display Device	Dial Indicator & Digital Counter
Engine Speed Conversion	Dual-Speed Motor
Carburetor	Four-Bowl Falling Level (with a cooling function)
Ignition Timing Display	Digital (Auto-Set)
Crankcase Pressure Display	Yes
Electronic Barometer	Yes
Crankcase Oil Heater	Yes
Oil Temperature Display	Yes
Report Generation	Yes
Maintenance Log	Yes
Air Humidity Control Apparatus	Yes
Exhaust Surge Tank System	Yes
Unit Protection Systems	Yes

Reference Fuel Blending System

Automatic Reference Fuel Blending Unit

with 6 tanks, is used for the automated preparation of cetane and octane reference fuels and standardization fuels for Octane Test Engine and Cetane Test Engine according to ASTM D2699, ASTM D2700, ASTM D2885, and ASTM D613.

Features & Benefits

Standard Applications

ASTM D2699, ASTM D2700, ASTM D2885, ASTM D613
It's suitable for *long-time error-free* octane/cetane rating operation.

High Precision

A high precision balance is used for gravimetric measurement to improve precision of octane/cetane test results.

Simple Operation

Touch-screen panel with *easy-to-use* software simplifies the blending operation process.

Accuracy and Efficiency

Automatic calculation program controls the whole blending process to *eliminates human error* and improve the efficiency of cetane/octane number test.

Real-Time Monitoring

Fuel temperature and blending material level in tank are monitored in real time.



Automatic Blending By Weight

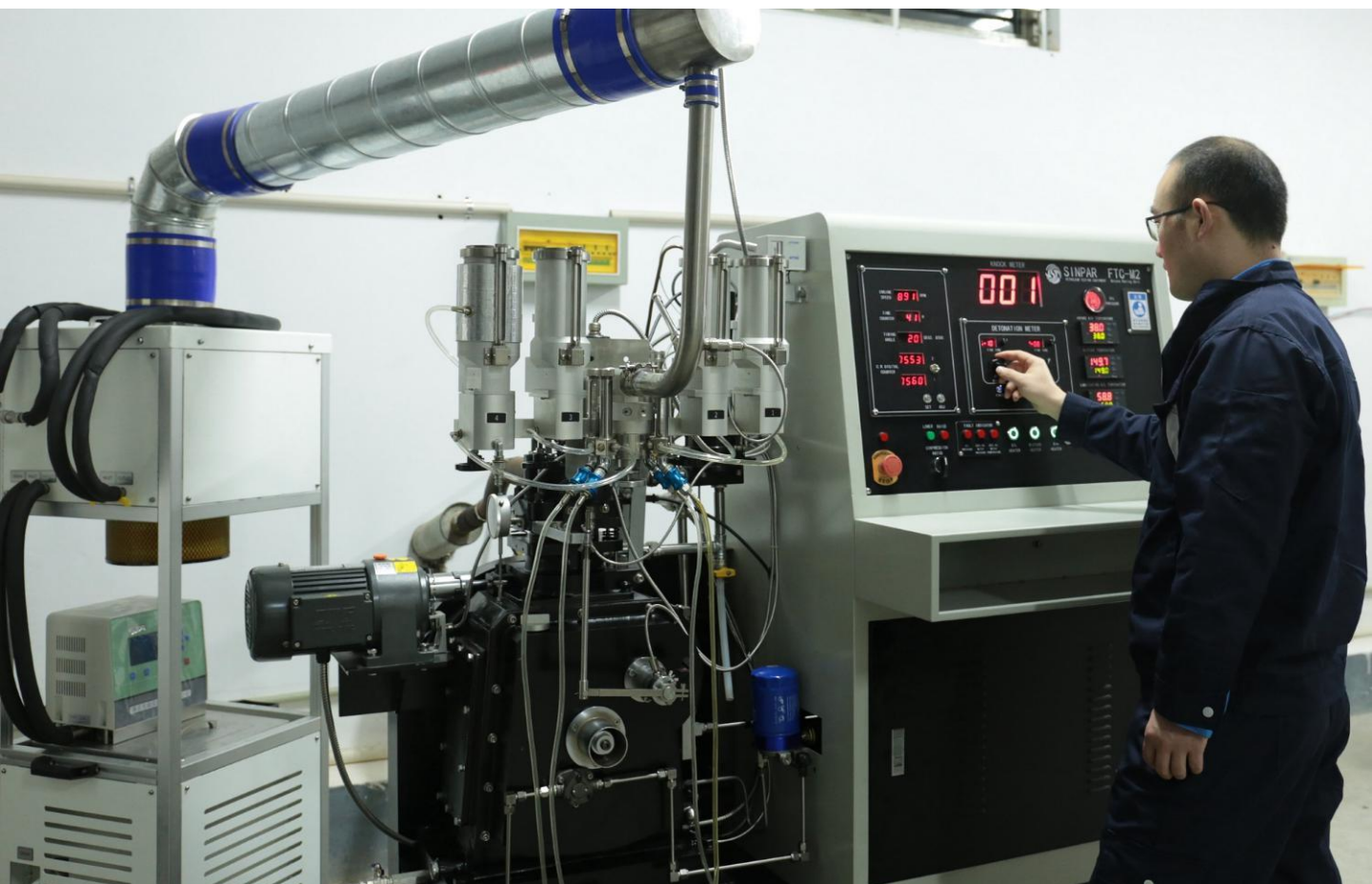
SINPAR Reference Fuel Blender prepares the reference fuel blends by weight (precision balance) based on the ASTM test methods. With the automatic calculation and control program, a high precision balance delivers an accurate and reliable fuel blend value with the precision of 0.01g.

Fuel Blending Software

The professional software controls all blending process, and makes blending operation simple. The operator just needs to select the standard method, input the target octane/cetane number and sample volume, start blending. The fuel blend is delivered automatically.

Blend data is automatically saved in the computer. Free Blending function is offered for a special fuel blending for special engines.





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