

F5 Cetane Rating System with XCP® TECHNOLOGY

CFR Engines Inc.

Providing Value and Confidence in Global Fuel Quality

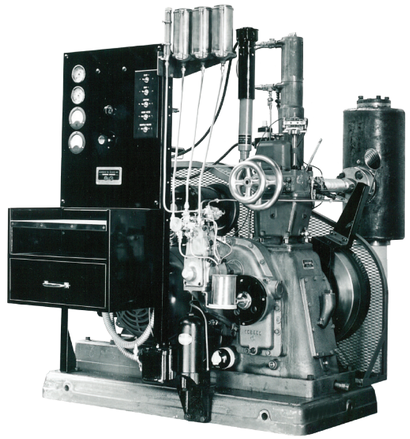
CFR® F5 Cetane Rating System with XCP® TECHNOLOGY

Most Accurate Method to Measure the Cetane Number

The CFR F5 Cetane Rating System is the globally accepted standard for determining and certifying the ignition quality of diesel fuels.

First introduced in 1938, the CFR F5 continues to provide a stable, accurate testing platform for defining the ignition quality of diesel fuels.

The CFR F5 enables the automotive and petroleum industries to develop new engines and fuels that perform together more effectively. As the most accurate method to measure the cetane number of diesel fuels, the CFR F5 also helps to ensure the integrity of the fuel supply chain from refinery to the pump.



Historical unit, first released in 1938



The CFR F5 is the specified equipment for testing fuels according to:

ASTM D613: Standard Test Method for Cetane Number of Diesel Fuel Oil

IP 41: Petroleum Products - Determination of the ignition quality of diesel fuels - Cetane Engine Method

EN ISO 5165: Petroleum Products - Determination of the ignition quality of diesel fuels - Cetane Engine Method



Features & Benefits

Providing value and confidence in global fuel quality

Whether working with a complete unit, an upgrade/conversion kit, or a CFR genuine part; the product has been designed, manufactured, and fully tested by the CFR team to work as an integrated solution for your operation.

Confidence in a Fully Integrated Fuel Testing System

A complete CFR cetane fuel testing system includes three main elements, each is designed to seamlessly integrate and deliver trusted results. With the CFR F5 Cetane Rating System, XCP® TECHNOLOGY, and a CFR exhaust surge tank; each critical parameter of a successful octane test is controlled.

Suitable Data Integrity with XCP® TECHNOLOGY

The XCP Digital Control Panel routinely captures critical information for each rating and presents it in a ready-to-use Excel-based report, minimizing calculation errors and the need to manually record data. The XCP standard report includes handwheel positions, fuel flow rate micrometer settings, environmental data (temperatures and pressures), and ignition advance delay values. The XCP is also capable of integrating with LIMS. Built-in prompts, clear graphics, and color-coded indicators simplify the fuel rating.

Reliability of Proven Design

Since 1938, thousands of users have relied on the proven service of the CFR F5 Rating Unit. This reliability has been consistently maintained through a long series of well-designed system upgrades and product enhancements. CFR systems and components, such as the robust engine crankcase and cylinder/head, are built to deliver unsurpassed operating life. With basic maintenance and upkeep, a user can expect CFR products to consistently withstand the demands of today's fuel testing environment with a true engine-based Cetane Number.

Precision through Modern Instrument Control

The CFR F5 with XCP TECHNOLOGY uses digital instrumentation to record and process critical aspects of system operation and performance. On-board handwheel position recording, automatic cetane number calculation, and multi-pass data recording are some of the many advantages of CFR's digital instrument control system. More accurate measurements and reduced operator interpretations lead to better overall precision.

Cost Savings with One System Flexibility

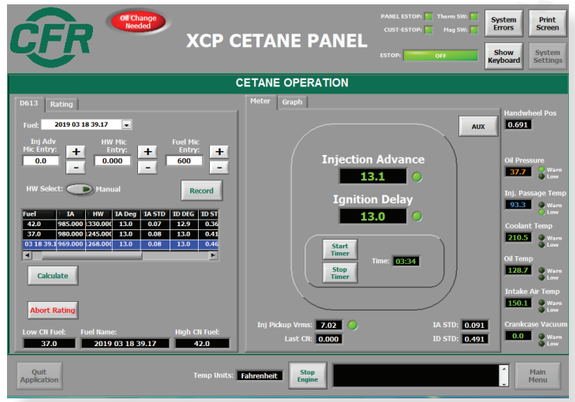
With standard product offerings, a CFR F5 Cetane Rating System provides the user unmatched flexibility and cost savings. With push button control and machine guided testing prompts, users can easily conduct the test procedure in ASTM Methods D613. Cost savings are realized in greater utilization of resources, quicker tests, and reduced operator training.

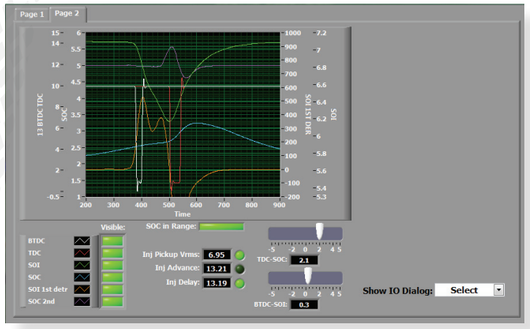
XCP® TECHNOLOGY for the CFR F5

XCP TECHNOLOGY remains the modern instrumentation of choice for cetane testing. CFR continues to apply advances in design, measurement, and control to its XCP TECHNOLOGY platform.

Intuitive & Complete Interface:

- Visible display of the injection advance
- Ignition delay displayed clearly
- Red and green color coding buttons
- Illuminated buttons to indicate when the injection advance or ignition delay are in or out of spec
- Green, orange, and blue color coding to indicate when temperatures and pressures are in or out of spec
- Standard deviation readings for both injection advance and ignition delay, ensuring quality ratings





The graph above shows a real-time generation during a test. The user can choose which sensor signals are displayed

Easily Troubleshoot Various Problems with Real-Time Monitoring:

- Evaluating whether an injector nozzle needs maintenance
- Determining whether a sensor or cable is malfunctioning
- Ensuring appropriate combustion

Auxiliary Sceens Allow Users to:

- Set and view basic parameters
- Calibrate sensors
- Monitor real-time conditions
- Perform diagnostics



XCP D613 Cetane Report

43.63

Date: 1/15/2018
Time: 10:58:01

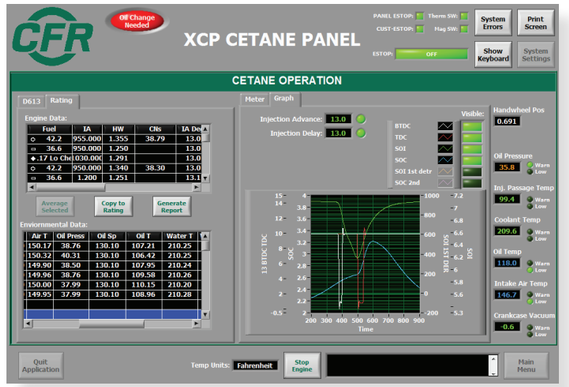
		Average Handwheel	Std. Deviation Hand Wheel
Sample ID:	Test	1407.5	3.536
Low Reference CN:		42.8	1394	5.657
High Reference CN:		48.1	1480	0.000
Operator:	dave		

Detailed Report Information:

Reference	Fuel	IA	Hw	CNs	IA Deg	IA Std	ID DEG	ID STD	Fuel Mic	Avg Hw	Avg CNs	Time	HW	Vacuum PS	Air Sp	Air T	Oil PSI	Oil Setpoin	Oil T	Water T	Vapor IN	pass Sp	INJ pass T
High CN	48.1	1071	1480	43.98	13.1	0.08	13	0.41	578	1480	43.63	0.450845	1.49	-0.52	150	150.1	27.7	130.1	130.1	209.62	115.73	0	85.98
Low CN	42.8	1069	1390	0	13	0.07	13	0.38	578	1394	0	0.447708	1.41	-0.45	150	150.06	28.09	130.1	129.88	209.53	115.62	0	86.01
Unknown	Test	1068	1410	0	13	0.09	13.1	0.33	578	1407.5	0	0.444282	1.41	-0.48	150	150.19	27.96	130.1	129.54	209.64	115.83	0	85.98
High CN	48.1	1074	1480	43.25	13	0.08	13.1	0.72	578	0	0	0.456956	1.49	-0.41	150	150.06	28.09	130.1	130.62	209.52	115.78	0	86.27
Low CN	42.8	1075	1398	0	13	0.07	13	0.46	578	0	0	0.452928	1.4	-0.52	150	150.07	27.58	130.1	130.21	209.58	115.7	0	85.88
Unknown	Test	1074	1405	0	12.9	0.1	13	0.31	578	0	0	0.454977	1.4	-0.45	150	149.84	28.21	130.1	130.33	209.53	115.76	0	85.98
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Convenient Octane Estimator Tool:

- Perform quick estimations of unknown samples
- A full fuel/air sweep is run on unknown sample
- Existing KI and bracket information used to calculate



Additional User Conveniences:

- All engines and test data automatically recorded in onboard database
- Timestamped record of test procedure
- Report automatically generated in Excel
- Data exportable to LIMS systems
- Graphs of each pass automatically generated



Trusted Design, Reliable Results

The core design around which the CFR engine is built has been tested and proven through rigorous and continued usage by customers around the world over many decades. Even as vehicle designs have changed and fuel performance has improved, the CFR F5 continues to be the gold standard for determining the cetane number of compression-ignition diesel engine fuels.

Variable Compression Cylinder Head

At the heart of the CFR engine lies the variable volume cylinder and head assembly. Varying the compression chamber volume by adjusting the handwheel makes it possible to compare unknown fuels to reference fuels with known cetane values. Cylinder volume is correlated to ignition advance and delay which can then be directly correlated to a specific cetane value as per ASTM Method specifications.





Fuel System

The CFR F5 Cetane Rating Unit is equipped with three fuel bowls, fuel selector valve, heavy duty fuel pump, and a robust fuel injector. These components work together to precisely manage fuel delivery and bracketing per the test procedure of ASTM Method D613.

CFR Crankcase

The CFR crankcase is a heavy-duty cast design that provides both strength and rigidity for the loads produced by various types of fuels, and will provide long service life when operated and maintained properly. Removeable side doors allow for easy access to critical internal components for inspection, maintenance, and repair.



Exhaust Surge Tank System

The F5 is equipped with a surge or expansion tank that eliminates the resonant pulsations and back pressure that occur in the CFR rating unit's exhaust lines during operation. Eliminating these variables in the testing process ensures consistent and accurate cetane ratings.



XCP TECHNOLOGY

The fully integrated control, data capture, and reporting of XCP TECHNOLOGY directly supports the accountability and traceability needs of today's testing environments.



Configurations and Specifications

Standard CFR F1/F2 System Inclusions:

- Engine unit mounted to rigid base
- Synchronous motor mounted to slide base (220/380/440 V; 3 Ph; 50/60 Hz)
- Variable compression ratio cylinder head with handwheel
- Handwheen position sensor
- XCP panel with touchscreen PC (120V, 1 Ph, 50/60 Hz)
- Fuel shut-off solenoid
- Three bowl fuel delivery system
- Intake air heater
- Exhaust surge tank system
- Water cooled exhaust manifold
- Desk with keyboard and mouse

Dimensions & Weight:

- Approximately 1.77 x 1.33 x 1.04m (H x W x D), 844 kg; (69 ¾ x 52 ¼ x 41 in, 1860 lb)
- Including concrete base: approximate height 2.15 m (84 ¾ in), weight 1754 kg (3860 lb)
- With exhaust surge tank: approximate depth 1.57 m (62 in)



Operation Conditions	Motor Method (ASTM D613)
RPM	900 +/- 1%
Injection Timing	13 BTDC
Water Jacket Temperature	100 °C +/- 2 °C (212 °F +/- 3 °F)
Oil Temperature	57 °C +/- 8 °C (135 +/- 15 °F)
Oil Pressure	172 kPa-207 kPa (25 psi-30 psi)
Crankcase Vacuum	25-150 mm H_2O (1-6 in H_2O)
Intake Air Temperature	66 °C +/- 0.5 °C (150 °F +/- 1 °F)
Intake Air Temperature	38 °C +/- 2.8 °C (100 °F +/- 5 °F)

Scan to learn more about the F5 Cetane Rating System →

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Form C635, Revision B